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July 2013



Virgin River Comprehensive Management Plan / Environmental Assessment
Zion National Park
Bureau of Land Management, St. George Field Office

Utah

United States Department of the Interior

NATIONAL PARK SERVICE
Zion National Park
State Route 9
Springdale, UT 84767

ERRATA

Virgin River Comprehensive Management Plan/Environmental Assessment
July 2013

Chapter 1 – Impact Topics Retained for Further Analysis – Table 4. Impact Topics – Page 43

TEXT CHANGES:

Impact Topics Analyzed in Detail: Wildlife ORV (including the threatened Mexican spotted owl)

Impact Topics Eliminated from Detailed Analysis: Threatened, Endangered, and Candidate Plant and Animal Species

Chapter 1 – Impact Topics Dismissed from Further Analysis – Page 46

TEXT CHANGES:

Threatened, Endangered, and Candidate Plant and Animal Species

The Endangered Species Act of 1973 requires examination of impacts on all federally listed threatened, endangered, and candidate species. Section 7 of the ESA requires all federal agencies to consult with the U. S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of the listed species or critical habitats. In addition, The *2006 Management Policies* and *DO-77: Natural Resource Management* requires the NPS to examine the impacts on federal candidate species, as well as stated listed species.

In 2010 the USFWS directed the National Park Service to their Information, Planning, and Conservation System (IPAC) on the internet to obtain a list of species that may occur in project area. The list included the following species: greater sage grouse, Mexican spotted owl, southwestern willow flycatcher, yellow-billed cuckoo, Virgin River chub, woundfin, Gierisch mallow, Jones cycladenia, Las Vegas buckwheat, Shivwits milk-vetch, Welsh's milkweed, Utah prairie dog, desert tortoise, and California condor.

Zion does not have the habitat components to support most of these species. Or the park has surveyed potential habitat for certain species and have not found them (southwestern willow flycatcher, yellow-

billed cuckoo). Those that are known to occur in the park are Mexican spotted owl, Shivwits milk-vetch, desert tortoise, and California condor. Impacts to Mexican spotted owl are addressed under wildlife and are analyzed in detail later in this document.

Shivwits milk-vetch and desert tortoise do not occur within any of the designated river segment boundaries. **So the preferred alternative would have no affect these species. The preferred alternative would not result in reduction or adverse modification of Shivwits milk-vetch critical habitat**.

California condor do occupy habitat within wild and scenic river boundaries. There are no actions in this plan that would adversely affect California condor. The plan identifies protective measure to protect water quality and ecological processes, which would benefit California condor. Therefore, the implementation of the preferred alternative **may affect, but is not likely to adversely affect** this species. Because there would be no measurable effects, this topic is dismissed from further analysis in this document.

Summary

Virgin River Comprehensive Management Plan / Environmental Assessment

Zion National Park and Bureau of Land Management, St. George Field Office

Utah

July 2013

This *Virgin River Comprehensive Management Plan / Environmental Assessment* describes three alternatives for managing the Virgin Wild and Scenic River segments within Zion National Park and adjacent Bureau of Land Management lands. Each alternative responds differently to the issues and concerns identified by the public and interested agencies.

Alternative A is the "no-action" alternative and would continue current management practices into the future. Its goal would be to retain the existing visitor experience and resource management strategies based on existing agency planning. Alternative A would not fully meet the requirements of the Wild and Scenic Rivers Act, whereas the action alternatives (alternatives B and C) were designed to meet the requirements of the act. Under alternative B, restoration of the Virgin River and its tributaries would take precedence over recreation activities. The Virgin River and its tributaries would be managed with an emphasis on resource stewardship—restoring and interpreting natural and cultural resources. Visitor use levels would generally remain the same in low use areas and would be reduced in some areas where impacts on the river are being observed. In alternative C, the preferred alternative, the Virgin River and its tributaries would also be managed with an emphasis on resource stewardship. A variety of recreational activities that are appropriate and compatible with resource stewardship would be available throughout the river segments. In alternative C, the National Park Service and Bureau of Land Management would actively manage visitor areas to maintain current use levels or allow a small increase while protecting river values. Additional emphasis would be placed on education and interpretation.

In this comprehensive management plan / environmental assessment, the preferred alternative is presented as the alternative that best responds to the issues and protects and enhances river values. Comments received during scoping were used to develop the alternatives.

HOW TO COMMENT ON THIS PLAN

If you wish to comment on this *Virgin River Comprehensive Management Plan / Environmental Assessment*, your comments will be most useful to us if received by September 9, 2013. You may comment using one of the following methods:

Internet Website:

Comments can be posted online using the National Park Service Planning, Environment, and Public Comment (PEPC) website http://parkplanning.nps.gov/zion.

Mail:

Kezia Nielsen
Virgin River Comprehensive Management Plan / Environmental Assessment
Zion National Park
Springdale, UT 84767

The *Zion River Comprehensive Management Plan / Environmental Assessment* will be on public review for 30 days. Before including your address, telephone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment, including your personal identifying information, could be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

CONTENTS

Chapter 1: Background 1

Introduction 5

Purpose and Need 8

Purpose of the Virgin River Plan 8
Need for the Virgin River Plan 8
Requirements of a Wild and Scenic River Comprehensive Management Plan 8
Goals and Objectives 9

Designation of the Virgin River and Its Tributaries 10

Outstandingly Remarkable Values 19

Cultural Values 19
Geologic Values 21
Recreational Values 21
Scenic Values 22
Ecological Processes Values 22
Wildlife Values 23
Fish Values 23

Section 7 of the Wild and Scenic Rivers Act: Determination Process for Water Resources Projects 25

Section 7 Evaluation Guidelines for Water Resource Projects 27

Relationship to Other Plans 31

Zion National Park General Management Plan 31
Zion National Park, Backcountry Management Plan, 2007 31
Bureau of Land Management, St. George Field Office, Resource Management Plan 31
Zion Soundscape Management Plan and Environmental Assessment (2010) 32
Washington County General Plan (2010), as amended 33
Planning Context 33
Legal Framework 33

Management Planning Process 35

Next Steps 36
Implementation of the Plan 37
Future Planning Needs 37

Issues and Opportunities 38

Kinds and Amounts of Recreational Use 38
Types and Levels of Development 38
Free-flowing Condition 39
Water Quality 39
Ecological Process 39
Issues Beyond the Scope of the Plan: Climate Change 39

Free-flowing Conditions and Floodplains 44
Water Quality 44
Ecological Processes ORV 44
Fish ORV 44
Wildlife ORV (including Threatened and Endangered Species) 44
Recreational ORV / River-related Visitor Use and Experience 44
Scenic ORV / Visual Resources / Viewsheds 44
Park Operations 45
Bureau of Land Management Operations 45
Socioeconomic Environment 45

Impact Topics Dismissed from Further Analysis 46

Wetlands 46
Soils 46
Energy Requirements and Conservation Potential 47
Air Quality 47
Night Skies 47
Natural Sounds 47
Geologic Resources (and Geologic ORV) 48
Museum Collections 48
Archeological Resources 48
Historic Structures 49
Cultural Landscapes 49
Ethnographic Resources 49
Indian Trust Resources 50
Environmental Justice 50
Prime and Unique Farmlands 51

Chapter 2: The Alternatives 53

Introduction 55

Overview 55
Boundary Delineation 55
Criteria Used for Developing Boundaries for the Virgin River 56

Development of the Alternatives 71

The Alternatives 72

Alternative Management Concepts 72
Alternative A Concept (No-action Alternative) 72
Alternative B Concept 72
Alternative C Concept (Preferred Alternative) 72

Alternative Management Strategies and Alternative Planning Process 74

Broad-based Management Strategies 76

Alternative A: Continuation of Current Management (No-action Alternative) 76
Free-flowing Condition and Water Quality 76

Ecological Processes ORV (Vegetation) 76
Fish and Wildlife ORVs (including Threatened and Endangered Species) 77
Scenic ORV / Visual Resources / Viewsheds 77
Recreational ORV / River-related Visitor Use and Experience 77
Park Operations 78
Bureau of Land Management Operations 78
Existing Types and Levels of Development 80
North Fork Virgin River above the Temple of Sinawava and Tributaries (Wild Segment) 81
North Fork Virgin River below the Temple of Sinawava and Tributaries (Wild and Recreational Segment) 81
East Fork Virgin River and Tributaries (Wild Segment) 81
North Creek and Tributaries (Wild and Scenic Segment) 82
La Verkin Creek and Tributaries (Wild Segment) 82
Taylor Creek and Tributaries (Wild and Scenic Segment) 82
Alternatives B and C: Common to Both Action Alternatives 82
Free-flowing Condition and Water Quality 82
Ecological Processes ORV (Vegetation) 83
Fish and Wildlife ORVs (including Threatened and Endangered Species) 83
Scenic ORV / Visual Resources / Viewsheds 83
Recreational ORV / River-related Visitor Use and Experience 84
Park Operations 85
Bureau of Land Management Operations 85
Types and Levels of Development 85
Visitor Use Management Capacity 86
River Segment-specific Management Strategies 116
Taylor Creek and Tributaries (Wild and Scenic Segment) 116
Alternative A (no-action alternative) 116
Alternative B 117
Alternative C 118
La Verkin Creek and Tributaries (Wild Segment) 119
Alternative A (no-action alternative) 119
Alternative B 119
Alternative C 120
North Creek and Tributaries (Wild and Scenic Segment) 122
Alternative A (no-action alternative) 122
Alternative B 123
Alternative C 124
North Fork Virgin River and Tributaries above the Temple of Sinawava (Wild Segment) 126
Alternative A (no-action alternative) 126
Alternative B 126
Alternative C 129
North Fork Virgin River–Tributaries below the Temple of Sinawava (Wild & Recreational Segment) 131
Alternative A (no-action alternative) 131
Alternative B 132
Alternative C 137
East Fork Virgin River (Wild Segment) 140
Alternative A (no-action alternative) 140
Alternative B 140
Alternative C 141
Staffing and Cost Estimates 142

Associated Costs 142

Protective Measures for the Action Alternatives 143

Cultural Resources 143

Natural Resources 143

Nonnative Plant Species 143
Soils 144
Threatened and Endangered Animal Species 144
Vegetation 144
Water Resources 145

Alternatives and Actions Considered but Dismissed from Detailed Evaluation 146

Environmentally Preferable Alternative 161

Identification of the Preferred Alternative 161

Chapter 3: Affected Environment 163

Introduction 165

Natural Resources 166

Free-flowing Condition and Floodplains 166

Instream Flows 167

Water Quality 167

Geologic ORV 169

North Fork Virgin River and Tributaries above the Temple of Sinawava, including Kolob Creek / Oak Creek, Goose Creek, Imlay Canyon, Orderville Canyon, Deep Creek, and Mystery Canyon 169
North Fork Virgin River and Tributaries below the Temple of Sinawava, including Birch Creek, Pine Creek, Behunin Canyon, Echo Canyon, Clear Creek, and Heaps Canyon 169
East Fork Virgin River 170
North Creek and Tributaries, including Right Fork of North Creek, Left Fork of North Creek, Little Creek, and Russell Gulch 170
La Verkin Creek and Tributaries, including Willis Creek, Bear Trap Canyon, Timber Creek, Hop Valley, Currant Creek, Cane Creek, and Smith Creek 170
Taylor Creek and Tributaries including North Fork of Taylor Creek, Middle Fork of Taylor Creek, and South Fork of Taylor Creek 171

Ecological Processes ORVs (including Vegetation) 171

North Fork Virgin River above the Temple of Sinawava 172
East Fork Virgin River and Shunes Creek 172

Fish ORV 173

North Fork Virgin River above the Temple of Sinawava 173
Deep Creek (Bureau of Land Management) 173
North Fork Virgin River below the Temple of Sinawava 174
East Fork Virgin River 174
Shunes Creek 174
North Creek 174

Wildlife ORVs (including Threatened and Endangered Species) 174

Mexican Spotted Owl 175
Desert Bighorn Sheep 175
Zion Snail 175

Cultural ORV 176

North Fork of the Virgin River below the Temple of Sinawava 176
East Fork of the Virgin River 177

Scenic ORV / Visual Resources / Viewsheds 178

North Fork Virgin River above the Temple of Sinawava including Tributaries Orderville Canyon, Deep Creek, and Mystery Canyon 178
North Fork Virgin River below the Temple of Sinawava including Tributaries Birch Creek, Oak Creek, and Pine Creek 178
North Creek – Tributaries Right Fork North Creek, Left Fork North Creek, and Russell Gulch 179
Taylor Creek including Tributaries North Fork Taylor Creek, Middle Fork Taylor Creek, and South Fork Taylor Creek 179
Bureau of Land Management Specific Identification of Scenic Values 179

Recreational ORV / River-related Visitor Use and Experience 181

North Fork Virgin River above the Temple of Sinawava 181
Imlay Canyon 181
Orderville Canyon 181
Deep Creek 182
Mystery Canyon 182
North Fork Virgin River below the Temple of Sinawava 182
Pine Creek 182
Left Fork North Creek 182
La Verkin Creek 182

Recreational Opportunities and Trends 183

Overall Visitor Use Levels and Trends in Zion National Park 186

Quality of Visitor Experience in Zion National Park 192

Perceived Crowding 192
Weeping Rock 193
The Lower Narrows 193
Emerald Pools 194
Trail Encounter Rates 194
Opportunities to Experience Solitude 196
Opportunities to Experience Natural Quiet 196
Satisfaction with Facilities and Services 196
Trail and Campsite Condition 197

Interpretation and Education in Zion National Park 198

Safety in Zion National Park 200

Hardware and Equipment / Climbing Safety 200
History of Flow Limits, Related Rules, and Visitor Safety 201

Types and Levels of Development 205

Introduction 205

North Fork above the Temple of Sinawava and Tributaries (Wild Segment) 205

North Fork below the Temple of Sinawava and Tributaries (Wild and Recreational Segment) 205

East Fork Virgin River and Tributary (Wild Segment) 208

North Creek and Tributaries (Wild and Scenic Segment) 208

La Verkin Creek and Tributaries (Wild Segment) 209

Taylor Creek and Tributaries (Wild and Scenic Segment) 209

Park Operations 210

Zion National Park 210

Park Operations by River Segment 210

North Fork Virgin River above Temple and Tributaries 210
North Fork Virgin River below Temple and Tributaries 210
East Fork Virgin River and Tributary 211
North Creek and Tributaries 211
La Verkin Creek and Tributaries 211
Taylor Creek and Tributaries 212
St. George Field Office Operations in General and by River Segment 212
General Management and Uses 214
River Segment-specific Management 214
La Verkin Creek North of the Park and Middle Fork of Taylor Creek 214
La Verkin Creek and Smith Creek South of the Park 215
Kolob Creek and Oak Creek 215
Deep Creek 215
Socioeconomics 217
Regional Context 217
Population 217
Economy 218
Economic Effect of Tourism at Zion National Park 219

Chapter 4: Environmental Consequences 221

Introduction 223
Methods and Assumptions for Analyzing Impacts 224
Cumulative Impact Analysis 224
Future Improvements to Infrastructure in Zion National Park 225
Kolob Terrace Road Rehabilitation 225
Flanigan Diversion Dam 225
South Entrance Reconfiguration and Rehabilitation 226
Past Projects, Existing Infrastructure, and Ongoing Maintenance in Zion National Park 226
Bureau of Land Management Actions 228
Non-Federal Management Actions 228
Washington County 228
St. George Airport 228
Water-related Resource Projects on Private Lands 229
Virgin River Resource Management and Recovery Program 229
Cultural Resources 231
Section 106 of the National Historic Preservation Act and Impacts on Cultural Resources 231
Natural Resources 232
Free-flowing Condition and Floodplains 232
Impacts of Implementing Alternative A 232
Impacts of Implementing Alternative B 234
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 234
Water Quality 235
Impacts of Implementing Alternative A 235
Impacts of Implementing Alternative B 236
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 237
Ecological Processes ORV (including vegetation) 238

Impacts of Implementing Alternative A 238
Impacts of Implementing Alternative B 239
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 240
Fish ORV 241
Impacts of Implementing Alternative A 241
Impacts of Implementing Alternative B 242
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 242
Wildlife ORV (including threatened and endangered Species) 243
Impacts of Implementing Alternative A 243
Impacts of Implementing Alternative B 244
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 245
Scenic ORV / Visual Resources / Viewsheds 246
Impacts of Implementing Alternative A 246
Impacts of Implementing Alternative B 247
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 248
Recreational ORV / River-related Visitor Use and Experience 249
Access and Opportunities 249
Quality of Experience 250
Interpretation and Education 250
Safety 250
Impacts of Implementing Alternative A 250
Impacts of Implementing Alternative B 255
Impacts of Implementing Indirect and Direct Adaptive Management Strategies 261
Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative) 264
Impacts of Implementing Indirect and Direct Adaptive Management Strategies 270
NPS and BLM Operations and Facilities 272
National Park Service Operations and Facilities 272
Impacts of Implementing Alternative A 272
Impacts of Implementing Alternative B 273
Impacts of Implementing Alternative C 274
BLM Operations and Facilities 274
Impacts of Implementing Alternative A 275
Impacts of Implementing Alternative B 276
Impacts of Implementing Alternative C 276
Socioeconomic Environment 278
Impacts of Implementing Alternative A 278
Impacts of Implementing Alternative B 280
Impacts of Implementing Alternative C 281

Chapter 5: Consultation and Coordination 283

Public Involvement 285
Internal Workshops 295
Consultation and Coordination with Other Agencies, Offices, and Associated Tribes 297
Consultation with U.S. Fish and Wildlife Service 297
Consultation with Traditionally Associated Tribes 297

Section 106 Consultation with the Utah State Historic Preservation Office 297
Environmental Assessment Review 298

Appendixes, References, Preparers, and Consultants 299

Appendix A: Legislation 301
Appendix B: Wild and Scenic Rivers Act 323
Appendix C: Outstandingly Remarkable Values Evaluations 327
Appendix D: Consultation Letters 377
Appendix E: Overview of the Upcoming Transportation and Capacity Study 387
Selected References 391
Preparers and Consultants 397
Planning Team Members 397
Preparers 398
Consultants 399
Contributors 399
Publications Services 399

MAPS

Virgin and Wild and Scenic River: Designated Wild and Scenic River Segments 12
Taylor Creek and La Verkin Creek Segments 59
North Creek Segment 61
North Fork Virgin River above Temple of Sinawava Segment 63
North Fork below Temple of Sinawava Segment 65
North Fork Virgin Below Oak Creek Segment 67
East Fork Virgin River Segment 69

TABLES

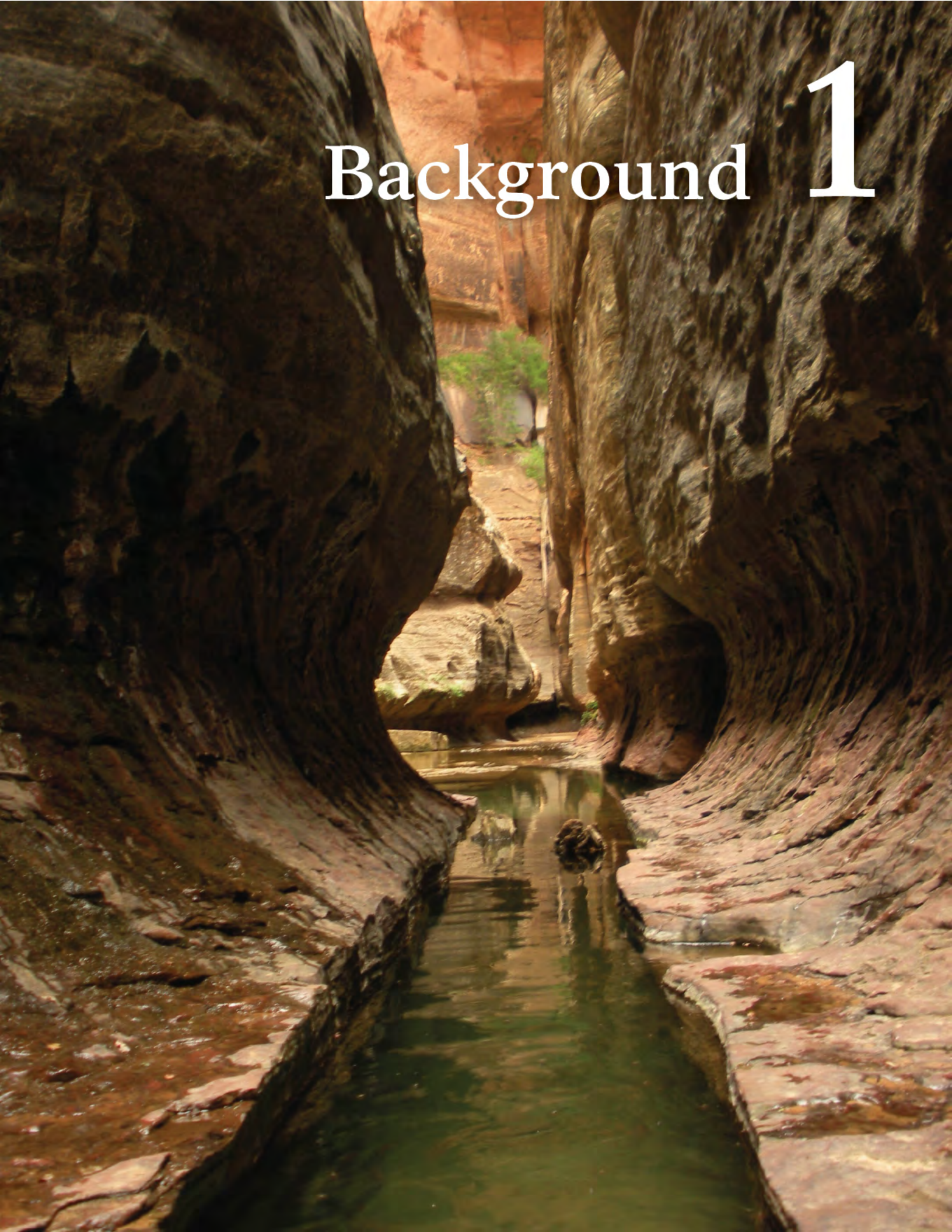
Table 1. Virgin River and Tributaries Description 13
Table 2. Outstandingly Remarkable Values Matrix 20
Table 3. Determining the Need for a Section 7 Review for Proposed Water Resource Projects (Non-FERC) under the Wild and Scenic Rivers Act 25
Table 4. Impact Topics 43
Table 5. BLM Existing Management Actions 79
Table 6. Summary Table for Kinds and Amounts of Use / Indicators and Standards 93
Table 7. The Virgin River Comprehensive Management Plan Staffing and Cost Estimates 142
Table 8. Summary of Alternative Management Concepts, Management Strategies, and Common to All Actions 147
Table 9. Summary of the Impacts of the Alternatives 157
Table 10. Canyon Shuttle Stop-by-Stop Boarding and Max Loads 190
Table 11. Summary of Visitors Reached through Interpretation and Education in 2011 199
Table 12. Zion Area Counties—Projected Population Growth 2010–2060 217
Table 13. Washington County Labor Force by Industry 218

FIGURES

Figure 1. Overview Map 7
Figure 2. Tiered Planning Approach 74
Figure 3. Virgin River Planning Process 75
Figure 4. Camping and Lodging Trends 186
Figure 5. Traffic Counts at Gates 187
Figure 6. Annual Park Visitation 187
Figure 7. Monthly Park Visitation 188
Figure 8. Shuttle Ridership 189
Figure 9. Canyon Shuttle Boarding Map 191
Figure 10. 2003 and 2011 Hiking Encounter Comparison for Weeping Rock 193
Figure 11. 2003 Survey Methodology for Obtaining Visitor Responses for People at One Time at The Lower Narrows 194
Figure 12. 2003 and 2011 Mean PAOT Comparisons for The Lower Narrows 195
Figure 13. Visitors Encountered per Minute on the Trail 195
Figure 14. Visitors Encountered per Mile on the Trail 196
Figure 15. Number of Days Mean Flows Exceed 500 cfs since 1970 203
Figure 16. Frequency of Days over 500 cfs, 1970–2010 204
Figure 17. Washington County Employment Projections 219

PHOTOS

All photos are courtesy of the National Park Service unless credit line states otherwise.



Background 1

This plan is organized as follows:

Chapter 1: Background sets the framework for the entire document. It describes why the plan is being prepared and what needs it must address. It offers guidance for management of the alternatives that are being considered—guidance that is based on Bureau of Land Management and Zion National Park legislation, its purpose, the significance of its resources, special mandates and administrative commitments, and servicewide laws and policies, and the Wild and Scenic Rivers Act.

Because many of the alternative management strategies in this plan emphasize techniques for visitor use management, this overview also emphasizes how visitor use management has been organized throughout the document.

The chapter also details the planning opportunities and issues that were raised during public scoping meetings and initial planning team efforts; the alternatives in chapter 2 address these issues and concerns. In addition, chapter 1 defines the scope of the environmental impact analysis—specifically what impact topics were or were not analyzed in detail. The chapter concludes with a description of next steps in the planning process and caveats on implementation of the plan.

The chapter provides a description of outstandingly remarkable values that are specific to each river segment. The planning team concluded that the Virgin River contains the following set of outstandingly remarkable values: cultural, geologic, recreational, scenic, ecological processes, wildlife, and native fish. In particular, recreational value has been paired with river-related visitor use and experience topics throughout the document. This organization emphasizes that recreational value represents river-related visitor use and experiences, which are dependent on the Virgin River.

Chapter 2: Alternatives, Including the Preferred Alternative, begins by describing the boundary delineation for the river corridor, as required by the Wild and Scenic Rivers Act. Next is development of the alternatives. It includes the description of the three alternatives: the continuation of current management practices and trends in the river corridor (alternative A, no action), alternative B, and alternative C (preferred). This is followed by a description of broad-based management strategies that were developed to protect and enhance river values as well as existing park and Bureau of Land Management operations within the corridor. The environmentally preferable alternative and the National Park Service preferred alternative are identified, followed by a discussion of alternatives or actions that were considered, but dismissed from detailed evaluation. The chapter also includes protective measures for the action alternative. The chapter concludes with summary tables of the alternatives and the environmental consequences of implementing those alternatives.

This chapter provides a description of the tiered approach to alternative management strategies. The first tier provides a description of broad-based strategies that apply across the entire wild and scenic river designation, and the second tier includes segment-specific management strategies for each of the designated wild and scenic river segments and associated tributaries. The tiered approach applies to all outstandingly remarkable values including the recreational value. Alternative actions that would affect Virgin River-dependent visitor use and experience have been paired with the recreational value in this chapter and throughout the document. Because the Wild and Scenic Rivers Act includes a requirement to address user capacities, the topic of visitor use management and capacity has been described under the broad-based management strategies that are common to

both action alternatives. The process used to address visitor use management and capacity is described in this chapter and includes the development of indicators, standards, adaptive management strategies, and the kinds and amounts of use each area can sustain without adverse impacts to river values. Although the process to address visitor use management and capacity is the same for all action alternatives, the actual kinds and amounts of use (including indicators, standards, and management strategies) may differ by segment. Those differences are noted under the tiered section for river segment-specific management strategies. This chapter also includes a segment-specific and alternatives-specific summary table for indicators, standards, and management strategies (including associated kinds and amounts of use) that would be protective of river values.

Chapter 3: Affected Environment describes those areas and resources that would be affected by implementing the actions contained in the alternatives. It is organized according to the following topics (including river values): free-flowing condition and floodplains, water quality, geologic value, ecological processes, fish, wildlife, cultural values, scenic values, recreational value / river-related visitor use and experience, types and levels of development, agency operation, and socioeconomics.

The recreational value has been paired with river-related visitor use and experience in this chapter. This organization emphasizes that the recreational value represents river-related visitor use and experiences that are dependent on the Virgin River.

Chapter 4: Environmental Consequences describes the methods used for assessing impacts. It then analyzes the effects of implementing the alternatives on the impact topics described in the "Affected Environment" chapter.

The recreational value has been paired with river-related visitor use and experience in this chapter. This organization emphasizes that the recreational value represents visitor use and experience, which are dependent on the Virgin River.

Chapter 5: Consultation and Coordination describes the history of public and agency coordination during the planning effort, including Native American Consultation and any future compliance requirements. It also lists agencies and organizations that will be sent copies of the document.

Appendixes, Selected References, and a list of **Preparers and Consultants** are found at the end of the document.

INTRODUCTION

The Omnibus Public Land Management Act of 2009 (Public Law [PL] 111-11), signed by President Barack Obama, designated approximately 163 miles of Virgin River and its tributaries across federal land within Zion National Park and on adjacent Bureau of Land Management (BLM) lands to be administered by the Secretary of the Interior under various classifications under the Wild and Scenic Rivers Act of 1968, as amended (PL 90-542, 16 *United States Code* (USC) 1271-1287).

The designated segments of the Virgin River and its tributaries are on the Colorado Plateau in southwestern Utah. The river segments and their boundaries cover 39,407 acres. The designated segments of the Virgin River and its tributaries begin on BLM land north and south of Zion National Park. For the most part these BLM lands are also designated wilderness. The river segments flow through the park where the wilderness designation ends at the south park boundary. The exception is La Verkin Creek, which flows south out of the park onto BLM land within the Black Ridge Wilderness area. The majority of the designated segments within Zion National Park are also in wilderness, except for the North Fork Virgin River below the Temple of Sinawava, Pine Creek, and Clear Creek (along Mount Carmel Road) and portions of Taylor Creek.



Federal agencies administering wild and scenic rivers are required to prepare a comprehensive management plan for the protection of river values, the development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of the Wild and Scenic Rivers Act (WSRA). Developing an outstandingly remarkable values (ORV) statement is the first step in developing a comprehensive management plan. Outstandingly remarkable values are river-related, contribute to the function of the ecosystem, and/or owe their location or existence to the river—they are among the resources that make the river worthy of designation. This comprehensive management plan builds on the supporting work in the *Wild and Scenic River Evaluation – Eligibility, Classification and Suitability Report*, which was completed as part of the 2001 Zion National Park General Management Plan (GMP). The *St. George Field Office Record of Decision and Resource Management Plan* (1999) and the Record of Decision for the *Wild and Scenic River Evaluation – Eligibility, Classification and Suitability Report*, which was completed as part of the 2001 Zion General Management Plan, also included an analysis of the eligibility, classification, and suitability of some river segments on BLM land. This comprehensive management plan includes both the ORV statements and the comprehensive planning actions to protect and enhance river values. Throughout this document, the *Virgin River Comprehensive Management Plan / Environmental Assessment* is referred to as the "comprehensive management plan."

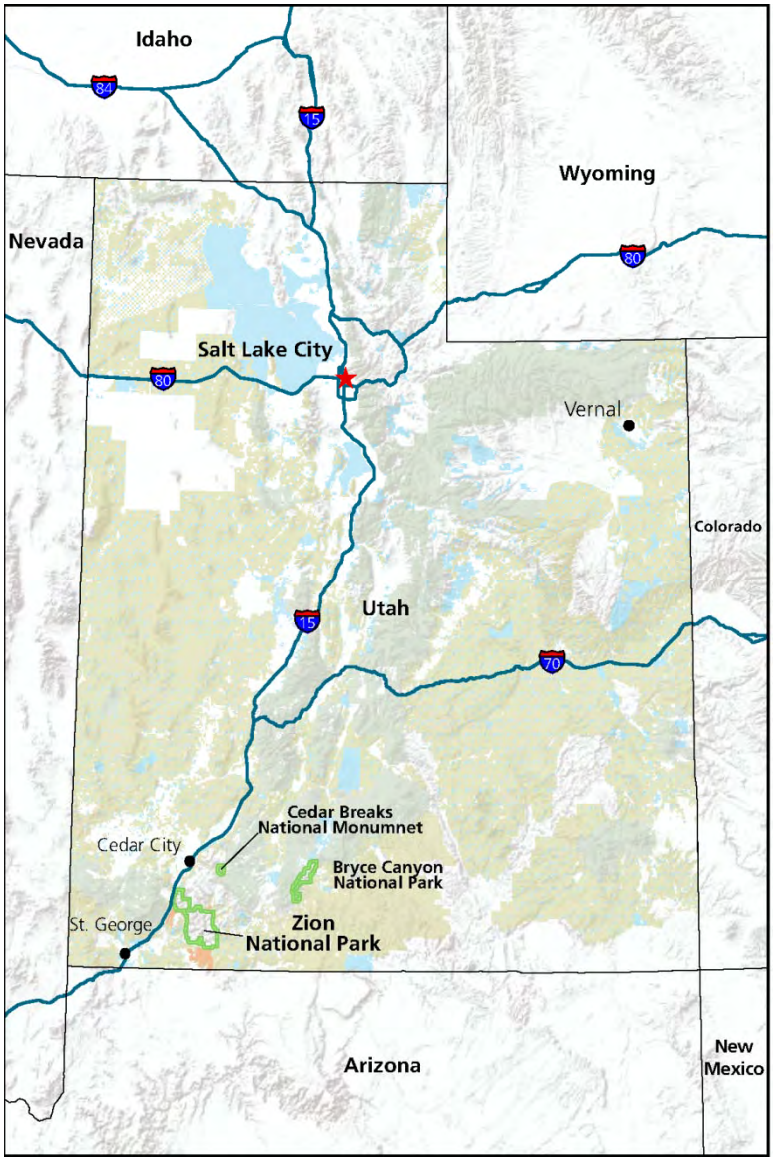


FIGURE 1. OVERVIEW MAP

PURPOSE AND NEED

PURPOSE OF THE VIRGIN RIVER PLAN

The purpose of the *Virgin River Comprehensive Management Plan / Environmental Assessment* is to meet the requirements of Wild and Scenic Rivers Act section 10 (a), which requires agencies to administer designated rivers in "such a manner as to protect and enhance the values which caused it to be included" in the Wild and Scenic Rivers System and to provide a comprehensive management plan for the protection of the free-flowing condition, water quality, and outstandingly remarkable values that make the Virgin River worthy of designation. The comprehensive management plan, as stated in the Wild and Scenic Rivers Act (as amended in 1986), "shall address resource protection, development of lands and facilities, user capacities, and other management practices needed to ensure that the river's outstandingly remarkable values are protected and enhanced (section 3[d])." The Wild and Scenic Rivers Act also states, "[t]he plan shall be prepared, after consultation with [s]tate and local governments and the interested public within 3 full fiscal years after the date of designation. Notice of the completion and availability of such plans shall be published in the Federal Register."

NEED FOR THE VIRGIN RIVER PLAN

By designating the Virgin River and its tributaries a wild and scenic river, Congress directed the National Park Service (NPS) and the Bureau of Land Management to develop comprehensive management plans for the river segments under their jurisdiction. This Virgin River comprehensive management plan / environmental assessment, if approved, would fulfill this mandate for the designated segments of the Virgin River under NPS and BLM jurisdiction.

Requirements of a Wild and Scenic River Comprehensive Management Plan

In 1982, the Secretary of the Interior and the Secretary of Agriculture jointly developed regulations implementing the Wild and Scenic Rivers Act, referred to as the "Department of the Interior and Agriculture Interagency Guidelines for Eligibility, Classification and Management of River Areas," published in the *Federal Register* (Vol. 47, No. 173; September 7, 1982, pp. 39454–39461), hereafter referred to as the Interagency Guidelines. The Interagency Guidelines direct managing agencies to include the kinds and amounts of public use the river can sustain without impacts on outstandingly remarkable values as listed in the comprehensive management plan.

The Interagency Wild and Scenic Rivers Coordinating Council (hereafter referred to as the Interagency Council) was formed in 1995 to assist federal and state agencies charged with administering designated rivers under the Wild and Scenic Rivers Act (ISWRCC 2011). The mission of the Interagency Council is to recommend actions that foster consistency in the interpretation and implementation of this act. The Interagency Council recommends that agency managers include the following components in a comprehensive management plan (ISWRCC 2010):

- a description of resource conditions, including a detailed description of river values (free flow, water quality, and outstandingly remarkable values)
- goals and desired conditions to protect free-flowing condition, water quality, and outstandingly remarkable values of the river

- direction for visitor use and capacity management
- a framework for future development and activities on federal lands in the river corridor
- a monitoring strategy specifically related to protecting the free-flowing condition, water quality, and outstandingly remarkable values of the river

GOALS AND OBJECTIVES

The overall goal of this comprehensive management plan is to protect and enhance the values for which the river was designated, leaving the river unimpaired for future generations. More specifically, the goals of this comprehensive management plan are

- To protect and enhance free flow and water quantity, promoting the river's ability to shape the geologic landscape by reducing impediments to free flow, improving hydrological function, and ensuring flows that are largely natural.

- To protect and enhance river-related natural resources and ecological processes. The natural function of riparian areas, wetlands, and floodplains of the Virgin River and its tributaries would be maintained and restored; restoration activities would strive to return habitat to natural levels of complexity and diversity; water quality would be maintained at the highest possible levels; and achievement of this goal would benefit fish, wildlife, ecological processes, geologic values, and recreation.

- To protect and enhance river-related cultural resources and manage cultural resources to ensure long-term integrity. The Virgin River basin has been inhabited for thousands of years and evidence of this history, including historical and precontact sites, remains today. River-related cultural resources are cherished and preserved as important links to the human history of the river basin.

- To protect and enhance river-related recreation, offering a diversity of appropriate recreational opportunities that allow visitors to experience the river and have a direct connection to its unique values. The recreational opportunities along the Virgin River range from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, to viewing scenery or camping, to opportunities to experience serenity, solitude, and general enjoyment along the river corridor.

- To enhance the visitor use management program, which includes addressing visitor capacity and enhancing the visitor use management tools that balance the provision of high quality, resource-related visitor use opportunities with the protection and enhancement of river values now and into the future.

- To establish land use and development practices; to establish clear direction on managing land uses and associated developments in the river corridors so that the protection and enhancement of river values and function, including scenery, are supported; and to strive to resolve conflict between development and river function.

DESIGNATION OF THE VIRGIN RIVER AND ITS TRIBUTARIES

The National Wild and Scenic Rivers System was created by Congress in 1968 with the passage of the Wild and Scenic Rivers Act. Its purpose is to preserve certain rivers with outstanding natural, cultural, or recreational features in a free-flowing condition for the enjoyment of present and future generations. Rivers may be designated by Congress (usually following a study and recommendation by a federal agency) or by the Secretary of the Interior. The river designation may include the entire river or a part (referred to as a segment) and may include tributaries. For federally administered rivers, the designated interim boundaries of the river corridor span 0.25 mile on both sides of the river, unless otherwise designated by Congress. Boundaries can be adjusted during the planning process to protect related natural, cultural, or recreational values, but cannot exceed an average of 320 acres per river mile on most rivers (e.g., a 10-mile-long river corridor cannot include more than 3,200 acres). In many cases, wild and scenic river corridors include privately owned land. Federal designations and management plan directions do not apply to or control private lands. However, through best management practices, the agencies will work cooperatively with private landowners to protect and enhance river values.

Landowners are often concerned about which lands would be included within a wild and scenic river, in part due to a fear of government land acquisition and regulation. The Wild and Scenic Rivers Act does permit fee acquisition of up to an average of 100 acres per mile and easement acquisition on any land within the boundary from willing landowners. However, the federal government cannot condemn private lands within designated wild and scenic river corridors that have more that 50% federal ownership, which is the case for all designated segments within the Virgin River corridor. Furthermore, the Wild and Scenic Rivers Act does not provide the federal administering agency the authority to regulate nonfederal lands.

The Wild and Scenic Rivers Act prohibits federal agencies from assisting in the construction of any water resources project (such as dams, diversions, channelization, or riprapping) that would have a direct and adverse effect on a designated river, and also includes a standard that governs projects below, above, or on a stream tributary to the river. Federal Energy Regulatory Commission (FERC)-licensed hydropower projects are forbidden outright within the designated area.

Designated wild and scenic rivers are further classified as *wild*, *scenic*, or *recreational* as defined in the Wild and Scenic Rivers Act as follows:

- ***Wild river areas***—those rivers or segments of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

- ***Scenic river areas***—those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

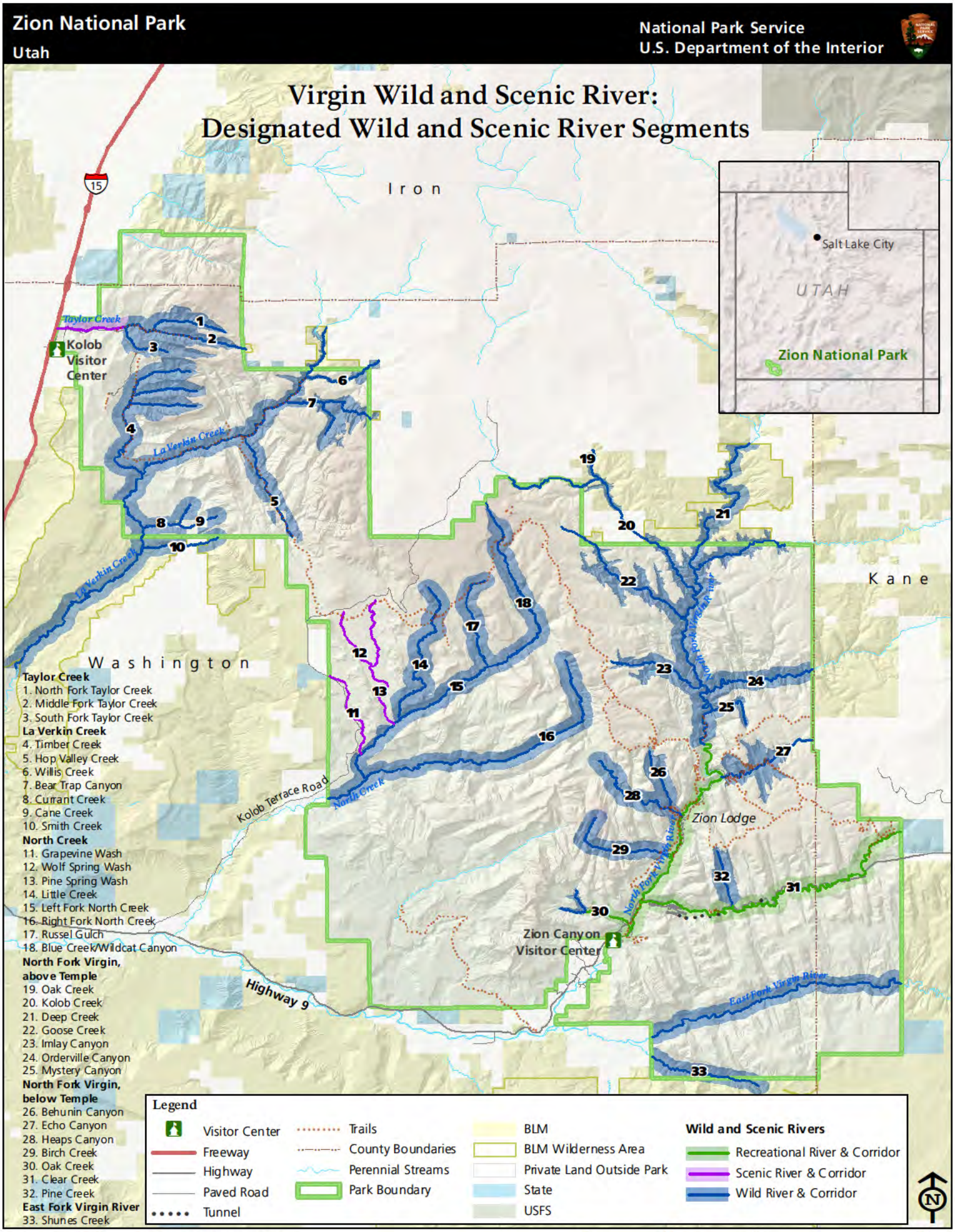
- ***Recreational river areas***—those rivers or river segments that are readily accessible by road or railroad that may have some development

along their shorelines and that may have undergone some impoundment or diversion in the past.

The Virgin River was added to the federal system by the Omnibus Public Land Management Act (2009). The act designating the rivers also designated 124,462 acres of wilderness in Zion National Park. Almost all of the wild river segments in the park are within designated wilderness. The act also designated wilderness on BLM lands managed by the St. George Field Office. River segments within BLM wilderness include La Verkin Creek, Taylor Creek, Beartrap Canyon, Deep Creek, Shunes Creek, Goose Creek, and segments of the North Fork Virgin River and Kolob Creek.

The designated segments of the Virgin River within Zion National Park and on adjacent BLM lands managed by the St. George Field Office include 39 river and tributary segments. The river segments are summarized in table 1 and illustrated on the "Virgin and Wild Scenic River: Designated Wild and Scenic River Segments" map in chapter 1.

Where private lands are involved, the federal managing agency would work with local governments and landowners to develop voluntary protective measures. Management restrictions would apply only to federal lands.



Produced by: NPS Denver Service Center Planning Division
September 2012

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
North Fork Virgin River above Temple of Sinawava		Wild	9.16	2,076.75	NPS	Yes	Beginning on BLM-administered lands at east border of S35 T39S R10W to the Temple of Sinawava and adjacent lands as shown on map ("Virgin and Wild Scenic River: Designated Wild and Scenic River Segments" in chapter 1)
			0.63	166.18	BLM	Yes	
Tributaries to the North Fork Virgin River above Temple of Sinawava	Kolob Creek	Wild	4.27	379.64	NPS	Yes	Beginning at S30 T39S R10W through BLM-administered lands, private property, and park lands to junction with the North Fork Virgin River and adjacent lands as shown on map
			2.04	310.11	BLM	Partial	
	Oak Creek	Wild	1.01	60.10	BLM	No	Beginning at S19 T39S R10W to its junction with Kolob Creek and adjacent lands as shown on map
	Goose Creek	Wild	3.45	1,076.08	NPS	Yes	From the head of Goose Creek through BLM and park lands to junction with North Fork Virgin River and adjacent lands as shown on map
			0.42	22.02	BLM	Yes	
	Imlay Creek	Wild	2.59	714.02	NPS	Yes	From head of Imlay to junction with North Fork Virgin River and adjacent lands as shown on map
	Order Ville Canyon	Wild	3.55	927.10	NPS	Yes	From east park boundary to junction with North Fork Virgin River and adjacent lands as shown on map
	Deep Creek	Wild	0.86	168.47	NPS	Yes	Beginning on BLM-administered lands at the north boundary of S 23 T39S R10W south to junction of North Fork Virgin River and adjacent lands as shown on map
			4.83	1,004.10	BLM	Yes	

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
Tributaries to the North Fork Virgin River above Temple of Sinawava	Mystery Canyon	Wild	1.52	217.84	NPS	Yes	From head of Mystery Canyon to junction with North Fork Virgin River and adjacent lands as shown on map
North Fork Virgin River—below Temple of Sinawava		Recreational	8.76	1,942.55	NPS	No	From Temple of Sinawava south to the park boundary and adjacent lands as shown on map
Tributaries to North Fork Virgin River below Temple of Sinawava	Birch Creek	Wild	3.13	988.73	NPS	Partial	From head of Birch Creek to junction with North Fork Virgin River and adjacent lands as shown on map
	Pine Creek	Wild	1.74	481.05	NPS	Yes	From the head of Pine Creek to the junction with Clear Creek and adjacent lands as shown on map
		Recreational	1.53	338.32	NPS	No	From the junction with Clear Creek to the junction with North Fork Virgin River and lands as shown on map
	Oak Creek	Wild	1.36	123.36	NPS	Yes	From heads of two forks of Oak Creek to where they join adjacent land as shown on map
		Recreational	1.03	208.29	NPS	No	From where two forks of Oak Creek join to junction with North Fork Virgin River and adjacent lands as shown on map
	Heaps Canyon, including below rim (0.4)	Wild	2.89	898.18	NPS	Partial	From head of Heaps Canyon to junction with North Fork Virgin River and adjacent lands as shown on map

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
Tributaries to North Fork Virgin River below Temple of Sinawava	Bakunin Canyon	Wild	2.61	554.36	NPS	Partial	From head of Behunin Canyon to junction with North Fork Virgin River and adjacent lands as shown on map
	Echo Canyon	Wild	3.27	981.95	NPS	Partial	From east park boundary to junction with North Fork Virgin River and adjacent lands as shown on map
	Clear Creek	Recreational	9.16	2,103.78	NPS	Partial	From east park boundary to junction with Pine Creek and adjacent lands as shown on map
East Fork Virgin River		Wild	7.53	2,232.22	NPS	Yes	From east park boundary through Parunuweap Canyon to west park boundary and adjacent lands as shown on map
Tributary to East Fork	Shunes Creek	Wild	2.24	645.74	NPS	Yes	From dry waterfall on BLM-administered lands through park to west park boundary and adjacent lands as shown on map
			0.78	331.88	BLM	Yes	
North Creek		Wild	1.25	372.10	NPS	Yes	From the junction of the Left and Right Forks southwest to the park boundary and adjacent lands as shown on map
Tributaries to North Creek	Left Fork North Creek	Wild	7.17	1,861.84	NPS	Yes	Left Fork from its junction with Wildcat Canyon to its junction with Right Fork as shown on map
	Right Fork North Creek	Wild	8.31	2,546.49	NPS	Yes	From the head of Right Fork to its junction with Left Fork as shown on map
	Wildcat Canyon	Wild	4.44	1,234.59	NPS	Yes	From the park boundary to its junction with the Right Fork of North Creek and adjacent lands as shown on map

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
Tributaries to North Creek	Grapevine Wash	Scenic	2.76	33.82	NPS	No	From the head of Grapevine Wash to junction with the Left Fork of North Creek and adjacent lands as shown on map
	Wolf Spring Wash	Scenic	1.46	17.90	NPS	No	From the head of Wolf Springs Wash to junction with Pine Spring Wash and adjacent lands as shown on map (
	Pine Spring Wash	Scenic	3.67	44.66	NPS	Partial	From the head of Pine Spring Wash to junction with North Creek and adjacent lands as shown on map
	Little Creek	Wild	5.31	1,532.16	NPS	Yes	From the head of Little Creek to junction with Left Fork of North Creek and adjacent lands as shown on map
	Russell Gulch	Wild	3.02	973.11	NPS	Yes	From the head of Russell Gulch to junction with the Left Fork of North Creek and adjacent lands as shown on map
La Verkin Creek		Wild	8.6	2,231.16	NPS	Yes	Beginning in S21 T38S R11W on BLM-administered lands, southwest through the park and ending on BLM-administered lands at the south end of S7 T40S R12W and adjacent lands as shown on map
			7.62	1,891.22	BLM	Yes	
Tributaries to La Verkin Creek	Willis Creek	Wild	1.64	179.05	NPS	Yes	Beginning on BLM-administered lands in the SWSW S27 T38S R11W to its junction with La Verkin Creek in the park and adjacent lands as shown on map
			0.3	37.89	BLM	No	

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
Tributaries to La Verkin Creek	Beartrap Canyon & tributary	Wild	3.74	882.29	NPS	Yes	Beginning on BLM-administered land in the SWNW S3 T39S R11W to its junction with La Verkin Creek and the segment from the headwaters north of Long Point to its junction with Beartrap Canyon and adjacent lands as shown on map
			0.08	31.32	BLM	Yes	
	Timber Creek & tributaries	Wild	8.71	2,478.94	NPS	Yes	From the head of Timber Creek and tributaries to junction with La Verkin Creek and adjacent lands as shown on map
	Currant Creek	Wild	1.4	486.46	NPS	Yes	From the head of Currant Creek to junction with La Verkin Creek and adjacent lands as shown on map
	Cane Creek	Wild	0.25	164.62	NPS	Yes	From the head of Cane Creek to junction with Currant Creek and adjacent lands as shown on map
	Hop Valley Creek	Wild	2.91	915.42	NPS	Yes	Beginning at the southern boundary of S20 T39S R11W to junction with La Verkin Creek and adjacent lands as shown on map
	Smith Creek[3]	Wild	1.23	400.09	BLM	Yes	From the head of Smith Creek to junction with La Verkin Creek and adjacent lands as shown on map
			0	70.38	NPS	Yes	

TABLE 1. VIRGIN RIVER AND TRIBUTARIES DESCRIPTION

River		Classification	Approx. River Miles[1]	Approx. River Acres[1]	Management Agency	Segment within Wilderness	Segment Description and Boundary[2]
Taylor Creek		Scenic	1.78	281.47	NPS	No	From junction of North, Middle, and South Forks of Taylor Creek west to park boundary and adjacent lands as shown on map
Tributaries to Taylor Creek	North	Wild	2.06	511.08	NPS	Yes	From the head of North Fork to junction with Taylor Creek and adjacent lands as shown on map
	Middle	Wild	3.26	695.16	NPS	Yes	From the head of Middle Fork on BLM-administered lands to junction with Taylor Creek and adjacent lands as shown on map
			0.1	5.97	BLM	Yes	
	South	Wild	1.57	575.00	NPS	Yes	From head of South Fork to junction with Taylor Creek and adjacent lands as shown on map

Total NPS river miles = 143.96

Total BLM river miles = 19.04

Total NPS acres = 35,146.13

Total BLM acres = 4,260.87

Some segments flow through private lands. These lands are not included in the river miles or acreage calculations. PL 111-11—Omnibus Public Land Management Act of 2009 designating the river segments states, "If the United States acquires any nonfederal land within or adjacent to Zion National Park that includes a river segment that is contiguous to a river segment of the Virgin River designated as a wild, scenic, or recreational river by paragraph (204) of section 3(a) of the Wild and Scenic Rivers Act (16 USC 1274[a]) (as added by subsection (a)), the acquired river segment shall be incorporated in, and be administered as part of, the applicable wild, scenic, or recreational river."

[1]River mileage and acreage are from NPS GIS data calculated in 2012; these numbers vary from those in the legislation, but are considered more accurate because of the improvements in the accuracy of the data analysis.

[2]Segment descriptions from PL 111-11—Omnibus Public Land Management Act of 2009; segment boundaries were adjusted to better protect river values, free-flowing conditions, and water quality and provide better manageability.

[3]The 0.25-mile boundary crosses onto NPS lands, although the entire "stream segment" is on BLM lands.

OUTSTANDINGLY REMA KABLE VALUES

The fo ndation for preparing a compr hensive ma agement plan is to clearly articulate outstandi gly remarkable values that are specific to each river segment and water quality and fr e-flowing condition of the entire designated river so that these values can be prote ted and enhanced in accord nce with th mandate of the Wild and Scenic Rivers Act.

Outsta dingly remarkable values are defined by the Wild and Scenic Rivers Act as the characteristics that nake a river worthy of special protection. The Interagency Council has iss ed criteria f r identifying and defining these values—the values must be river-related and th y must be rare, unique, or exe plary in a regional or national contex . Staff from he National Park Service and the Bureau of Land Management used these c iteria to develop the following set of broad ORV statements for the entire Virgin River a nd for individually designated river segments within Zi n National Park or on adjace t BLM land.

The planning team concluded that the Virgin River c ntains the following set of outstandingly rema kable values: cultural, geologic, recreational, scenic, ecological processes, wildlife, and native fish. An evaluation process based on criteria for each outstandingly rema kable value was used to determine which ri er segments contain these d fferent outs andingly remarkable values (appendix B). Table 2 summarizes the evaluation results a nd provides an organization to the statements that follow. The co ridor-wide ORV statements are included herein an detailed statements for the various river se ments can be found in appendix B. Throu h the evaluation process, it was determined t at there were no specific O V-related v lues associated with Grapevine Wash, Wolf Springs Wash, or Pine Sp ings Wash. These segments are tributaries to North Creek and are important co nponents of that river system.



Cultural Val es

The continuum of human occupation along the Virgin Rive and its tributaries en ompasses t ousands of years and diverse pe ple, culture , and uses. In the arid so thwest land cape, the occurrence of plentiful water, accompanying vegetation, animal diversit , arable land, and other res ources foun d along the Virgin River and its ributaries p ovided ideal conditions for co nmunities to flourish. Not surprisingly, the Virgin River sy tem contains some of the best examples in the region of pre-contact A erican Indian sites that provide a tangible co nection bet ween culturally affiliated tri es and their ancestors. Furthermore, the Virgin River corridor contains places and res ources important to the cultural traditions of contempora y American Indian tribes.

TABLE 2. OUTSTANDINGLY REMARKABLE VALUES MATRIX

River Segment Main Segment or Tributary Segment	ORV Category						
	Cultural	Geologic	Recreational	Scenic	Ecological Processes	Wildlife	Fish
North Fork Virgin River above Temple (wild)		•	•	•	•	•	•
Kolob /Oak Creek (BLM) (wild)		•					
Goose Creek (wild)		•				•	
Imlay Canyon (wild)		•	•			•	
Orderville Canyon (wild)		•	•	•	•	•	
Deep Creek (wild)		•	•	•			•
Mystery Canyon (wild)		•	•	•			
North Fork Virgin River below Temple (recreational)	•	•	•	•			•
Birch Creek (wild)		•		•			
Pine Creek (wild and recreational)		•	•	•		•	
Oak Creek (wild and recreational)				•		•	
Heaps Canyon (wild)		•				•	
Behunin Canyon (wild)		•				•	
Echo Canyon (wild)		•				•	
Clear Creek (recreational)		•					
East Fork Virgin River (wild)	•	•			•	•	•
Shunes Creek (wild)					•		•
North Creek (wild)		•	•	•			•
Wildcat Canyon / Blue Creek (wild)						•	
Right Fork North Creek (wild)		•		•		•	
Left Fork North Creek (wild)		•	•	•		•	
Grapevine Wash (scenic)							
Wolf Springs Wash (scenic)							
Pine Springs Wash (scenic)							
Little Creek (wild)		•					
Russell Gulch (wild)		•		•		•	
La Verkin Creek (wild)		•	•			•	
Willis Creek (wild)		•				•	
Beartrap Canyon (wild)		•				•	
Timber Creek (wild)		•					
Current Creek (wild)		•				•	
Cane Creek (wild)		•					
Hop Valley Creek (wild)		•					
Smith Creek - BLM (wild)		•					
Taylor Creek (scenic)		•		•			
North Fork Taylor Creek (wild)		•		•			
Middle Fork Taylor Creek (wild)		•		•			
South Fork Taylor Creek (wild)		•		•		•	

Source: Outstandingly Remarkable Values, Virgin Wild and Scenic River (Zion National Park and and BLM St. George Field Office) (see appendix B for the more detailed report)

Geologic Values

The Virgin River and its tributaries are uniquely situated along the western margin of the Colorado Plateau where the recent history of tectonic activity and erosional downcutting has resulted in a labyrinth of deep sandstone canyons, volcanic phenomena, and widespread exposures of brilliantly colored sedimentary deposits. Unique geologic features include Navajo sandstone exposures; a remnant of the world's largest sand dune desert; river-carved canyons forming the world's tallest sandstone cliffs; narrow slot canyons; hanging waterfalls, springs, and seeps, and accelerated erosion processes. This dynamic geologic system creates a diverse landscape of channels, canyons, and springs that support a variety of ecological communities, including hanging gardens, desert fish, and other aquatic species. The geology of the Virgin River and its tributaries offer world-class opportunities for canyoneering, rock climbing, hiking, and wilderness experiences. The region of comparison for geology is the plateau and canyon area that includes Zion National Park and extends westward to Glen Canyon National Recreation Area.

A number of factors were used in determining whether a river segment had an outstandingly remarkable geologic value. The factors included the presence of high cliffs of Navajo sandstone, known to be the world's highest sandstone cliffs; slot canyons, which are deep and exceptionally narrow vertical-walled canyons; and springs discharging from the Navajo sandstone aquifer, which are extensive in these canyons, are unusual in this arid setting and are known to support a large number of rare and endemic species. Other features include the landforms that indicate an exceptionally fast rate of erosion, e.g., deep canyons, cliffs, expanses of exposed bedrock, and extensive landslide deposits; high waterfalls and hanging valleys resulting from the exceptionally high runoff from slickrock and differential rates of erosion resulting in channels with large vertical drops; river channels dammed by landslides or lava dams in the recent geologic past; and inverted valleys, resulting from lava flowing down canyon bottoms followed by rapid erosion of surrounding rock layers and resulting in lava flow as elevated sinuous ridgelines. Each of these factors contributes to the unique and exemplary geologic values of the Virgin River and its tributaries.



Recreational Values

Exceptional recreational opportunities exist along the Virgin River and its tributaries, providing visitors from around the world with a chance to develop personal and lasting connections with the river within some of the most unique water-carved desert canyons in the region. The dramatic setting, dominated by scenic grandeur, contributes to a spectrum of river-related uses and experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels; to enjoying photography and other artistic pursuits; to viewing scenery or camping; to opportunities to experience serenity, solitude, and general enjoyment along the river corridor. For generations, the striking contrast of heat and water, stone and gardens have drawn people to this unique desert river and its tributaries.

To qualify as having an outstandingly remarkable recreational value, a segment must have river-related or river-dependent recreational activities. The activity must occur within the river or immediate shore lands within the corridor or owe its existence to the river and its various characteristics. The recreational experience must be rare,

unique, or exemplary such as the hike through The Narrows. The region of comparison for the recreational outstandingly remarkable value is the portion of the Colorado Plateau that lies in southwestern Utah.

Scenic Values

The Virgin River and its tributaries create diverse opportunities for views of the river's unparalleled scenery, which can be both dramatic and subtle. The river creates a landscape of cross-bedded sandstone cliffs towering thousands of feet above the canyon floor. The geologic tapestry of contrasting colors and textures —red, white, and pink cliffs; slivers of blue sky; and lush green ribbons of riparian vegetation and hanging gardens—encompass the sculpted and undulating canyons. Seasonal waterfalls flow over slickrock from hanging canyons over 100 feet above the canyon floor.

The region of comparison for scenic value is the plateau and canyon area that includes Zion National Park and extends westward to Glen Canyon National Recreation Area.

River and tributary canyons offer a pleasing contrast in soil, rock, vegetation, and water; and views that greatly enhance the visual quality, with still or cascading water dominating the landscape. Light changes in the canyon depending on the time of day and the season. Rocks can appear fiery red, golden, bright white, gray, or black. Even the absence of water in some ephemeral tributaries or "phantom channels" creates dramatic visual interest.

These elements combine to offer a landscape character that is unique and unforgettable on a scale that draws visitors from all over the world. To qualify as having an outstandingly remarkable scenic value, a segment must contain river-related or river-dependent scenery, be one of the most significant areas in the region for diversity of views, and have special features.

Ecological Processes Values

Ecological processes supporting vegetation is an outstandingly remarkable value in some of the Virgin River designated segments due to the presence of exemplary riparian corridors and rare plant communities. The region of comparison for ecological processes is the Colorado Plateau physiographic region.





The cottonwood galleries along the East Fork Virgin River and Shunes Creek provide rare

examples of relatively intact, properly functioning riparian systems. Natural river processes proceed unimpeded, allowing seasonal flooding and meander migration, vegetation recruitment, and plant succession. Riparian vegetation is abundant and diverse. The Virgin River and its tributaries have created unique habitats for rare plant communities in a desert southwest ecosystem. Steep-walled canyons, carved over time by the rivers, create cool, moist microclimates that support hanging gardens, which are rare and exemplary in the region. These gardens, occurring at seeps along the vertical sandstone walls, support a complex biotic community including several plant and animal species found only in the Virgin River system. The hanging gardens in Zion National Park are more numerous and larger than gardens found elsewhere and are sought out by researchers due to their rareness in the region.

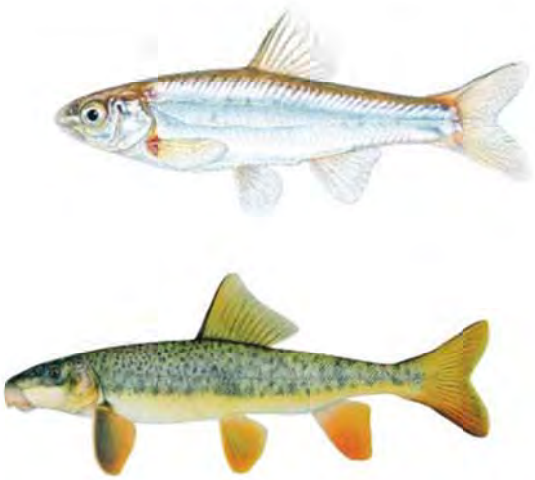
Experts included rare species and communities, riparian habitat quality, and scientific importance in the outstandingly remarkable ecological processes value.

Wildlife Values

Wildlife is an outstandingly remarkable value in the Virgin River and its tributaries due to the habitat for and populations of desert bighorn sheep, Mexican spotted owl, and the endemic Zion snail. The region of comparison for this value was generally southwestern Utah, northwestern Arizona, and southeastern Nevada. The criteria for the wildlife value included river-related and river-dependent wildlife, current population, habitat needs, and scientific importance.

Fish Values

The Virgin River and its tributaries provide a unique and intact habitat for four native species including the Virgin spinedace, flannelmouth sucker, desert sucker, and speckled dace. The Virgin spinedace is nationally significant and only exists in the Virgin River system. Both the Virgin



Source: Utah Division of Wildlife Resources

Virgin River Spinedace and Flannelmouth Sucker

spinedace and the flannelmouth sucker are managed under conservation agreements. The Virgin River and several of its tributaries support regionally significant levels of natural and sustainable reproduction for all four native fish species. The North and East Forks Virgin River provide the most productive habitat for these fish in the Virgin River basin. The geologic setting and flow regime leads to floods and large sediment loads, unique water quality, and frequent disturbance, which are effective deterrents to nonnative species. Other factors contributing to the productivity for native fish are connectivity to tributary systems and habitat diversity for spawning, rearing, and supporting adult fish. Additionally, the Zion stonefly, an important component of the food web, is found along the Virgin River and its tributaries. The type specimen for this species was identified in Zion National Park in 1949.

To determine if fish contributed to the outstandingly remarkable value of a stream segment, the following criteria were used. The first criterion included the presence of native species and species of concern. There are four native species: (1) speckled dace, (2) desert sucker, (3) Virgin spinedace, and

(4) flannelmouth sucker. The latter two species are species of concern and are managed under conservation agreements with other agencies. The second criterion included natural and sustaining populations and habitat quality and diversity. Habitat quality and diversity included such elements as connectivity, water quality (including sediment), food availability (including Zion stonefly), cover, stream diversity (pools, riffles, runs), spring inflows/nurseries, and natural hydrology.

The area of comparison for this value included the remainder of the Virgin River watershed, the Colorado River basin, and the United States. The remainder of the Virgin River watershed was included because native fish abundance is greatest in the park portion of the watershed. The Colorado River basin was included because some of the fish are more widely distributed within its streams. Because the native fish in the Virgin River system are unique to this system, they reach the level of national significance.

SECTION 7 OF THE WILD AND SCENIC RIVERS ACT: DETERMINATION PROCESS FOR WATER RESOURCES PROJECTS

Congress enacted the Wild and Scenic Rivers Act in 1968 to end decades of damming, dredging, and diversion of some of the nation's most spectacular waterways. Section 7 of the Wild and Scenic Rivers Act specifies restrictions on water resources development projects and directs managing agencies to protect wild and scenic river values by reviewing proposed water resources projects on designated rivers. This section describes the process used to protect the free-flowing condition of the Virgin River and its tributaries when a proposed water resources project triggers a review and determination under section 7 of the Wild and Scenic Rivers Act.

Water resources projects include structures such as dams, reservoirs, water diversion projects, fisheries habitat and ecological restoration projects, bridges, roadway construction, bank stabilization, channelization, levee construction, and construction of recreation facilities such as boat ramps or fishing piers. In general, activities that require a Clean Water Act section 404 permit from the U.S. Army Corps of Engineers (USACE) and that are along a designated river, or in some cases, upstream, downstream, or on a tributary of the river, require review under section 7.

The National Park Service or Bureau of Land Management may propose water resources projects along the Virgin River or its tributaries, including projects to improve the free-flowing condition of the river or enhance a particular outstandingly remarkable value. The agencies would conduct a section 7 review, as specified in the table below, for any project that triggers a review using section 7 of the Wild and Scenic Rivers Act. Table 3 describes the conditions that would trigger a section 7 review. For more details on the section 7 process, see appendix B.

TABLE 3. DETERMINING THE NEED FOR A SECTION 7 REVIEW FOR PROPOSED WATER RESOURCE PROJECTS (NON-FERC) UNDER THE WILD AND SCENIC RIVERS ACT

When is a Determination under Section 7 of the Wild and Scenic Rivers Act Required?	
IF Project is proposed in the bed or banks of a designated river	**IF** Project is proposed in the bed or banks of a river below, above, or on a stream tributary to a designated river
AND Project is proposed by a federal agency or requires some type of federal assistance such as a permit, license, grant, or loan	**AND** Project is proposed by a federal agency or requires some type of federal assistance such as a permit, license, grant, or loan **AND** The project is likely to affect the river's fish, wildlife, scenic, or recreational values
THEN ↓ When both of the above conditions exist, a determination is required under section 7	**THEN** ↓ When all of the above conditions exist, a determination is required under section 7

Federally Assisted Projects on Wild and Scenic Rivers. The Wild and Scenic Rivers Act prohibits federal assistance for any water resources projects that would have a direct and adverse effect on the values for which a river was added to the National Wild and Scenic Rivers System. For the portion of the Virgin River and its tributaries within Zion National Park, the National Park Service is responsible for making the final determination as to whether a proposed water resources project would have a direct and adverse impact on river values. Similarly, for the portion of the Virgin River and its tributaries on BLM land, the Bureau of Land Management would have this responsibility. The responsible agency coordinates its evaluation process with other agencies that are required to review and comment on the project. Depending on the type and location of the project, such agencies might include the U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), U.S. Forest Service (USFS), Bureau of Land Management, and U.S. Army Corps of Engineers. Reviews of Wild and Scenic Rivers Act section 7 projects are also coordinated with other environmental review processes such as those required by the National Environmental Policy Act of 1969, as amended (NEPA) and the National Historic Preservation Act of 1966, as amended (NHPA), as appropriate. In accordance with the Wild and Scenic Rivers Act, potential water resources projects that could have a direct and adverse effect on the values of a designated river must be (1) redesigned to avoid or eliminate direct and adverse impacts on river values and resubmitted for a subsequent section 7 determination, (2) abandoned, or (3) reported to the Secretary of the Interior and request authorization or approval from Congress.

Federally Assisted Projects Below, Above, or on Tributaries of a Wild and Scenic River. For federally assisted projects below, above, or on tributaries of a wild and scenic river, the river-administering agency evaluates project proposals under the section 7 "invade the area or unreasonably diminish" standard (i.e., would the project invade the area or unreasonably diminish the river's scenic, recreational, fish, or wildlife values). Typical projects that meet this definition are water resources projects that would be visible from the designated river, dams, and upstream diversion structures because such projects have the potential to affect scenic, recreational, fish, and wildlife values in the designated river. To meet this standard, projects could not unreasonably diminish the scenic, recreational, fish, or wildlife values present at the date of designation.

Determination Process. The description of the Wild and Scenic Rivers Act section 7 determination process contained in this section is adapted from the *Wild and Scenic Rivers Act, Section 7 Technical Report* (Interagency Council section 7 technical report) (IWSRCC 2004). In conformance with the guidance contained in that report, the National Park Service or the Bureau of Land Management would undertake the following steps as part of its section 7 determination process for nonemergency projects:

- Describe the purpose and need of the proposed project and its location, duration, magnitude, and relationship to past and future management activities.
- Analyze the potential impacts of the proposed project on the values for which the river was designated wild and scenic. This analysis would follow the guidelines provided by the *Wild and Scenic Rivers Act: Section 7 Technical Report* (IWSRCC 2004) and other applicable guidance.
- Define the likely duration of the projected impacts.
- Assess the effects of the projected impacts on the achievement or timing of achievement of the management objectives of the comprehensive management plan (based on the Wild and Scenic Rivers Act).

- Use this analysis to make a Wild and Scenic Rivers Act section 7 determination. This determination would document the effects of the proposed activity, including any direct and adverse effects on the values for which the river was designated wild and scenic.
- Redesign and resubmit any NPS- or BLM-sponsored water resources projects found to have a direct and adverse effect on the values of this designated river for a subsequent section 7 determination. In the event that a NPS or BLM project cannot be redesigned to avoid direct and adverse effects on the values for which the river was designated, the National Park Service or the Bureau of Land Management would either abandon the project or advise the Secretary of the Interior in writing and report to Congress in writing in accordance with section 7(a) of the act.
- Follow Wild and Scenic Rivers Act section 7 procedures to determine if projects above or below the designated river or on its tributary streams would invade the area or unreasonably diminish the scenic, recreational, fish, and wildlife values present in the designated corridor. If the project is found to have a direct and adverse effect on the values of this designated river, redesign and resubmit any water resources projects for a subsequent section 7 determination. In the event that a project cannot be redesigned to avoid direct and adverse effects on the values for which the river was designated, the National Park Service or the Bureau of Land Management would either abandon the project or advise the Secretary of the Interior in writing and report to Congress in writing in accordance with section 7(a) of the act.

Emergency projects (such as repairing a broken sewerline in or near the river) may temporarily proceed without a section 7 determination. However, a section 7 determination must be completed in a timely manner upon completion of the project. Emergency water resources projects that are later determined to have a direct and adverse effect on river values would be mitigated based on the findings of the section 7 determination.

The latest information on section 7 determinations can be found on the Interagency Wild and Scenic Rivers Coordinating Council website at: http://www.rivers.gov/rivers/publications.php.

SECTION 7 EVALUATION GUIDELINES FOR WATER RESOURCE PROJECTS

The degree of analysis required under section 7 directly relates to the magnitude and complexity of a proposed project. Less complex projects may require a brief review to evaluate the effects and to support a determination. However every determination must be based on the best available science, professional judgment, and be consistent with the Wild and Scenic Rivers Act and agency policies.

The following evaluation procedures have been adapted from the Interagency Wild and Scenic Rivers Council (2004) and would be used by the National Park Service and Bureau of Land Management when evaluating proposed projects to make a section 7 determination. The following steps also provide useful information for those interested in seeking approval of a proposed water resource project.

Step 1. Define the proposed activity

Describe the proposed activity in terms of the

- project proponent(s)

- purpose and need for the project
- geographic location of the project (include a map)
- duration of the proposed activities
- magnitude and extent of the proposed activities
- relationship to past and future management activities

Step 2. Describe how the proposed activity would directly alter in-channel conditions

Address the magnitude and spatial extent of any potential effects, giving special attention to changes in features that would affect the outstandingly remarkable values. Describe

- the position of the proposed activity relative to the streambed and streambanks
- any likely changes in
  - active channel location
  - channel geometry (cross-sectional shape, width/depth characteristics)
  - channel slope (rate or nature of vertical drop)
  - channel form (straight, meandering, or braided)
  - relevant water quality parameters (turbidity, temperature, nutrient availability)
  - navigation of the river

Step 3. Describe how the proposed activity would directly alter riparian and floodplain conditions

Address the magnitude and spatial extent of any potential effects, giving special attention to changes in features that would affect the outstandingly remarkable values. Describe

- the position of the proposed activity relative to the riparian area and floodplain
- any likely resulting changes in
  - vegetation composition, age structure, quantity, or vigor
  - relevant soil properties such as compaction or percent bare ground
  - relevant floodplain properties such as width, roughness, bank stability
  - susceptibility to erosion

Step 4. Describe how the proposed activity would directly alter upland conditions

Address the magnitude and spatial extent of any potential effects, giving special attention to changes in features that would affect the outstandingly remarkable values. Describe

- the position of the proposed activity relative to the uplands
- any likely changes in
  - vegetation composition, age structure, quantity, or vigor
  - relevant soil properties such as compaction or percent bare ground
  - relevant hydrologic properties such as drainage patterns or the character of surface and subsurface flows
- potential changes in upland conditions that would influence archeological, cultural, or other identified significant resource values

Step 5. Evaluate and describe how specific changes in on-site conditions would alter existing hydrologic and biologic processes

Evaluate potential changes by quantifying, qualifying, and/or modeling the likely effects of the proposed activity on

- the ability of the channel to change course, reoccupy former segments, or inundate its floodplain

- streambank erosion potential, sediment routing and deposition, or debris loading
- the amount or timing of flow in the channel
- existing flow patterns
- surface and subsurface flow characteristics
- flood storage (detention storage)
- aggradation/degradation of the channel
- biological processes such as
  - reproduction, vigor, growth and/or succession of streamside vegetation
  - nutrient cycling
  - fish spawning and/or rearing success
  - riparian dependent avian species needs
  - amphibian/mollusk needs
  - species composition (diversity)

Step 6. Estimate the magnitude and spatial extent of potential off-site changes

Address potential off-site or indirect effects of the proposed activity, acknowledging any uncertainties.

- Consider and document
  - changes that influence other parts of the river system
  - the range of circumstances under which off-site changes might occur (for example, as may be related to flow frequency)
  - the likelihood that predicted changes would be realized
- Specify processes involved, such as water and sediment, and the movement of nutrients

Step 7. Define the duration of effects of the proposed project

Define and document the duration of effects to in-channel conditions, riparian and floodplain conditions, upland conditions, hydrologic and biologic processes, and off-site changes.

Step 8. Evaluate and describe potential impacts on outstandingly remarkable values that may not be addressed in steps 2–7

Using a comprehensive perspective, assess and describe any other possible effects to outstandingly remarkable values that may not be captured by the evaluations conducted in the previous specific analysis steps.

Step 9. Compare project analyses to management goals

Based on the analysis, identify and document project effects on the achievement of management goals relative to free-flow condition, water quality, outstandingly remarkable values, and the river's wild and scenic classification.

Step 10. Make the section 7 determination

Based on the analysis, document

- the effects of the proposed activity on the river's free-flowing condition, including identification of any proposed measures to minimize those effects
- the effects of the proposed activity on the river's water quality, including identification of any proposed measures to minimize those effects
- any effects on the outstandingly remarkable values, including identification of any proposed measures to minimize those effects
- the responsible official should make a conclusion as to whether the project

as proposed would result in "direct and adverse effects" to the values for which the river was designated as a wild and scenic river

RELATIONSHIP TO OTHER PLANS

ZION NATIONAL PARK GENERAL MANAGEMENT PLAN

In 2001, Zion National Park completed its current general management plan, *Zion National Park General Management Plan*. The general management plan is comprehensive and establishes standards, guidelines, and broad management direction for activities within the park, including management of the Virgin River and its tributaries. The general management plan process included a wild and scenic river eligibility/suitability study for all the drainages in the park. Several drainages on adjacent lands managed by the Bureau of Land Management were included in the NPS study (refer to description below). The general management plan found five drainages and their tributaries within the park and six river segments on BLM lands eligible and suitable for inclusion in the National Wild and Scenic Rivers System. It should also be noted that section 10 (c) of the Wild and Scenic Rivers Act provides that when the Wild and Scenic Rivers Act and other NPS land management authorities conflict, the more restrictive provisions apply. In this case, the more restrictive of the General Management Plan and the Virgin River Comprehensive Management Plan would apply.

ZION NATIONAL PARK, BACKCOUNTRY MANAGEMENT PLAN, 2007

The 2007 Backcountry Management Plan identified opportunities for a variety of wilderness recreational activities and experiences while managing to protect wilderness resources in Zion National Park. This Comprehensive Management Plan identifies indicators to monitor and standards to be met and management options that were protective of wilderness character. Permits are required for overnight use and day use in some areas, group sizes are limited, and other actions are taken to minimize potential impacts of visitor use to cultural and natural resources. The Backcountry Management Plan covers 90% of Zion (designated and proposed Wilderness) but excludes portions of the park in the main canyon (along the North Fork Virgin River below the Temple of Sinawava), along the Mount Carmel Highway (adjacent to Pine Creek / Clear Creek) and along the Kolob Scenic Byway (adjacent to Taylor Creek). The majority of the river segments and miles in Zion are also covered by the Backcountry Management Plan. As part of the visitor capacity analysis, the number of permits, group sizes, and other aspects of the Backcountry Management Plan were found to be protective of river values and were adopted as part of the Virgin River Comprehensive Management Plan. Further, section 10(b) of the Wild and Scenic Rivers Act provides that the more restrictive provisions of either the Backcountry Management Plan or the Virgin River Comprehensive Management Plan would apply.

BUREAU OF LAND MANAGEMENT, ST. GEORGE FIELD OFFICE, RESOURCE MANAGEMENT PLAN

The 1999 *St. George Field Office Record of Decision and Resource Management Plan* provides the vision, objectives, and land use prescriptions for the management of public lands and associated resources in Washington County, Utah.

The resource management plan process included an analysis of several river segments to determine if they were eligible and suitable for inclusion in the National Wild and Scenic River System. The St. George Field Office

resource management plan found the following eligible and suitable for wild and scenic river designation: Deep Creek / Crystal Creek, North Fork Virgin River, Oak Creek / Kolob Creek, and La Verkin Creek / Smith Creek, all adjacent to Zion National Park (RMP Decision WR-05).

In 1998, the Bureau of Land Management and National Park Service signed a memorandum of understanding concerning wild and scenic river studies of isolated tracts of public lands bordering Zion National Park to the north. Later in the year, Shunes Creek, south of Zion, was added to the memorandum of understanding. The National Park Service and Bureau of Land Management agreed to cooperatively study river segments within Zion National Park and on BLM-administered lands contiguous to the park boundary as part of the analysis for the Zion National Park General Management Plan. The BLM study segments included Middle Fork Taylor Creek, Beartrap Canyon, Goose Creek, Willis Creek, Shunes Creek, and a portion of Kolob Creek. Once the analysis was completed and the Zion National Park General Management Plan was approved, the Bureau of Land Management adopted the eligibility and suitability decision for the BLM segments through a plan amendment. The record of decision for the wild and scenic rivers eligibility plan amendment for the St. George Field Office resource management plan was signed by the BLM Utah state director in September 2001.

As part of the resource management plan, the Bureau of Land Management implemented protective management on recommended segments to ensure that eligibility and tentative classification would not be adversely affected. These protective measures include maintaining free-flowing character by excluding new impoundments, diversions, channelization, or riprapping on public land segments; protecting or enhancing outstandingly remarkable values; and allowing no developments on public land within the river corridors that alter the tentative classifications (RMP Decision WR-06). The resource management plan also supported the Zion National Park Water Rights Settlement Agreement, and concluded that the water rights quantification established for Zion National Park in the agreement was sufficient to satisfy flow requirements needed to maintain those values on public lands above the park in Washington County, Utah (RMP Decision WR-10). The resource management plan notes that if the river segments are added to the National Wild and Scenic River System, a river management plan would be required (RMP Decision WR-14); the Bureau of Land Management is meeting this requirement through collaboration with the National Park Service on this comprehensive management plan.

ZION SOUNDSCAPE MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT (2010)

This plan is intended to protect the acoustic experience of park visitors and ensure that natural sounds continue to play an important role in the enjoyment of park resources and values, protect acoustic conditions for wildlife and the role of soundscape in ensuring healthy and dynamic ecosystems, and provide an approach to managing the acoustic environment that is consistent with NPS policy. The plan describes soundscape objectives tiered off the GMP desired condition for natural sounds, appropriate and inappropriate sound sources, soundscape objectives, soundscape indicators and standards, and monitoring approaches and protocols.

The Virgin River is among the most important acoustic resources in the park. A healthy acoustic environment and preservation of natural sounds appropriate to the Virgin River and its tributaries supports the preservation of outstandingly remarkable values of the river corridors including the ecological processes, wildlife, cultural, and recreational values. The Soundscape Management Plan complements and is

consistent with the management concepts and strategies in the Virgin River Comprehensive Management Plan.

WASHINGTON COUNTY GENERAL PLAN (2010), AS AMENDED

The Washington County General Plan is a guide for orderly development. It attempts to organize and coordinate relationship between land, resources, people, and facilities to protect the health, safety, and welfare of the residents of the county.

The plan recognizes Zion National Park as "one of the most important economic and ecological assets in Washington County." The Bureau of Land Management is the largest single property owner in Washington County. It is the goal of the county to work closely with all of the public agencies in the management of their areas of responsibility for the overall good of the county.

PLANNING CONTEXT

Legal Framework

Federal management decisions made by the National Park Service and Bureau of Land Management must be consistent with federal laws, including the National Environmental Policy Act, Wild and Scenic Rivers Act, Clean Water Act, National Historic Preservation Act, Endangered Species Act, Wilderness Act, Public Law 111-11 – Omnibus Public Land Management Act, and others.

In addition, other laws and executive orders are applicable solely or primarily to units of the national park system. These include the NPS Organic Act of 1916 (16 USC 1), which established the National Park Service; the National Park System General Authorities Act of 1970; the act of March 27, 1978 (also called the Redwood National Park Expansion Act), and the National Parks Omnibus Management Act of 1998. The Organic Act provides the fundamental management direction for all national park system units:

> [P]romote and regulate the use of the Federal areas known as national parks, monuments, and reservations . . . by such means and measure as conform to the fundamental purpose of said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

The General Authorities Act (16 USC 1a-1 et seq.) affirms that while all national park system units remain "distinct in character," they are "united through their interrelated purposes and resources into one national park system as cumulative expressions of a single national heritage." The General Authorities Act clarifies that the NPS Organic Act and other protective mandates apply equally to all units of the national park system. Further, amendments state that NPS management of park units should not "derogat[e] . . . the purposes and values for which these various areas have been established." The National Park Service also has established policies for all units under its stewardship in a guidance manual titled NPS *Management Policies 2006*.

The Bureau of Land Management also has laws, regulations, and policies specific to planning for and management of BLM lands. The Federal Land Policy and Management Act of 1976, as amended (43 USC 1701 et seq.) was enacted:

> to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development, and enhancement of the public lands; and for other purposes.

The act states in the Declaration of Policy, section 102 (1) (8) "the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmosphere, water resource, and archeological values; that, where appropriate, will preserve and protect certain lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use . . . ."

Further, section 302 (a) of the Federal Land Policy and Management Act of 1976 (FLPMA) directs that public lands are to be managed under the principles of multiple use and sustained yield, "except that where a tract of public land has been dedicated to specific uses according to other provisions of law, it will be managed in accordance with such law." The Wilderness Act, the Wild and Scenic Rivers Act, and Public Law 111-11 (through its designations) modify FLPMA principles for the public lands within and immediately adjacent to the river corridors. Management of units that have been included by Congress in the National Wilderness System (under the authority of the Wilderness Act of 1964 and the specific acts of Congress that designate these units) must preserve wilderness character and provide for the public purposes of recreational, scenic, scientific, educational, conservation, and historic use.

The Wild and Scenic Rivers Act, section 10 (b and c) provides that the more restrictive provisions of either the existing wilderness plans or other management or the Virgin River Comprehensive Management Plan would apply.

MANAGEMENT PLANNING PROCESS

The National Park Service has taken the lead in writing the *Virgin River Comprehensive Management Plan / Environmental Assessment* because most of the designated river and its tributaries lie within Zion National Park. The Bureau of Land Management has actively participated in all aspects of this wild and scenic river planning process.

The Wild and Scenic Rivers Act under section 3 requires that the federal agency charged with administration of a wild and scenic river to "prepare a comprehensive management plan for the river to provide for the protection of river values. The plan shall address resource protection, development of lands and facilities, user capacities, and other management practices. . .The plan shall be coordinated with and may be incorporated into resource management planning for the adjacent Federal lands." Later in section 10 (a) the Wild and Scenic Rivers Act states that wild and scenic rivers shall be administered in a manner as to protect and enhance the values that caused it to be included in the system. . .primary emphasis shall be given to protecting its esthetic, scenic, historic, archaeologic and scientific features."

The National Environmental Policy Act requires an environmental analysis to evaluate the effects on the human environment of any proposed management plan and the effects of a reasonable range of alternative methods for accomplishing goals. The planning team has determined that such a management plan may have an impact on the human environment, so this environmental assessment has been prepared to document those effects.

Based on the Wild and Scenic Rivers Act and NPS and BLM policy, the following was the process used to develop this Comprehensive Management Plan:

1. **Project Scoping and Public Involvement**—Project initiation letters, public meetings, open house events, and newsletters were used to introduce the public to the planning effort and to identify issues and concerns. Public involvement for Virgin River and its tributaries has been ongoing and the public continues to reflect interest in the comprehensive management plan.

2. **Resource Evaluation**—The planning team identified and evaluated river-related resources and determined outstandingly remarkable values. As part of the Zion National Park general management plan and the St. George Field Office resource management plan, an initial assessment of the potential classification and outstandingly remarkable values was performed. This assessment was followed by a joint workshop with the park and Bureau of Land Management in June 2010 to refine outstandingly remarkable values. The assessment identified seven outstandingly remarkable values for Virgin River and its tributaries—cultural, geologic, scenic, recreational, ecological processes, wildlife, and fish (see table 2 for segment-by-segment analysis).

3. **Identification of Issues**—Issues are generated by the public and agencies to reflect their interests and their concerns about current resource and management activities. Issues typically begin as site-specific or incident-specific

items, which are then combined with other issues into broader statements or questions. Issues were identified as part of the ORV workshop, through public scoping (meetings and comments), and during the visitor use management and capacity workshop held in May 2011.

4. **Develop Management Alternatives**—A range of reasonable alternatives is developed to respond to the issues. Alternatives should reflect the full spectrum of feasible possibilities, but need not display incremental changes or "differences in degree" between alternatives. Action alternatives must be legal and implementable.

5. **Determine the Consequences of the Alternatives**—Each alternative poses different consequences to individual resources and the environment in general. The consequences must be assessed as they apply to the river corridor and its individual river values. Additionally, the cumulative effects must be assessed in two ways: (1) how actions in the corridor affect the rest of the watershed, park, Bureau of Land Management, and region; and (2) how actions outside the wild and scenic river corridor may affect river values.

6. **Identify a Preferred Alternative**—As the alternatives are reviewed for their relative merits and environmental consequences, the agencies and public begin to identify common components to meet their interests. These components or alternative actions may be contained thematically in one of the developed alternatives or they may be combined in portions of several alternatives. The preferred alternative may even contain new elements that arise from discussion and input. The preferred alternative, as recommended herein, is the action the agencies believe best addresses the issues identified in the Virgin River comprehensive management plan.

7. **Comprehensive Management Plan / Environmental Assessment**—When the comprehensive management plan / environmental assessment (including the preferred alternative) is released for review, the public and other interested agencies have an opportunity (usually 30 days) to comment, recommend changes to the preferred alternative, or to identify where they believe the analysis is incomplete or incorrect. Either a finding of no significant impact or notice of intent to prepare an environmental impact statement would be issued following the analysis of the public comments and associated revisions to the document. The Bureau of Land Management and National Park Service would each have their own decision document.

NEXT STEPS

After the 30-day comment period for the *Virgin River Comprehensive Management Plan / Environmental Assessment,* the planning team will evaluate comments from other federal, state, and local agencies; organizations; businesses; and individuals regarding the plan. If appropriate, changes would then be incorporated into two findings of no significant impact (FONSI), which would document the selected alternative for

implementation. In addition, the finding of no significant impact would include any necessary errata sheet(s) for factual changes required in the document, as well as responses to substantive comments by agencies, organizations, or the public. Once each of the FONSI documents are signed by the NPS regional director or the St. George Field Office manager, and following a 30-day waiting period, the plan could then be implemented. If a finding of no significant impact is found not to be appropriate, a notice of intent would be published in the *Federal Register* to prepare an environmental impact statement.

IMPLEMENTATION OF THE PLAN

Once the decision document is signed by either agency, that agency would begin implementing their portion of the plan. While it is anticipated that the National Park Service and Bureau of Land Management would work cooperatively on implementing the plan, either agency could go forward with their actions if the other did not sign their respective decision document. The approval of a comprehensive management plan does not guarantee that the funding and staffing needed to implement the plan would be forthcoming. The implementation of the approved plan would depend on future funding, and it could be affected by factors such as changes in staffing, visitor use patterns, and unanticipated environmental changes. Full implementation could extend many years into the future. Once the plan has been approved, additional feasibility studies and more detailed planning, environmental documentation, and consultations would be completed, as appropriate, before certain actions in the selected alternative can be implemented.

FUTURE PLANNING NEEDS

In the development of this plan, the need for additional planning has been identified for Zion National Park. These needs include a visual assessment study to establish baseline conditions of the impact of development within the corridor and to help guide any future development in the corridor. Also, a study of the transportation system as it relates to visitor experience in the frontcountry is needed. This study would inform a future visitor use management plan for the frontcountry. The outcomes of this study would give park managers a higher level of certainty to make informed decisions about visitor capacities in the frontcountry.

ISSUES AND OPPORTUNITIES

Issues defines opportunities, conflicts, or problems regarding the use or management of public lands—in this case, the designation of Virgin River and its tributaries as a wild and scenic river. The public; NPS and BLM staff; local, state, and federal agencies; and organizations identified several issues during scoping (early information gathering). These issues generally involve protection of significant resources, public access and opportunities, development, and use.

The planning issues helped focus the plan alternatives. The following section describes the issues that were identified during scoping, as well as how the plan seeks to address these issues.

KINDS AND AMOUNTS OF RECREATIONAL USE

A wide range of river-related recreational activities and experiences were identified as being part of the recreational ORV during scoping. In order for segments to qualify as having recreational ORVs, they needed to have river-related or river-dependent recreational activities. Visitors of the Virgin River and tributaries identified a variety of important river-related or river-dependent activities including hiking, canyoneering, climbing, backpacking, kayaking, photographing, wildlife viewing, bird watching, camping, and sight-seeing. Others noted the importance of solitude, enjoying scenic beauty, and quiet.

Of these recreational activities and experiences, many public comments encouraged opening the North Fork Virgin River to kayaking at a wider range of flow. Other comments addressed amounts of use generally and supported current use levels or lower use levels and some specifically suggested permitting systems. It should be noted that the opportunities and experiences that are listed as part of the recreational ORV were based on river-related use at the time of the designation, and those uses must be protected and enhanced. Other use, including new uses, can be provided within the corridor only if it can be achieved without degrading any of river values.

This comprehensive management plan explores different options for providing a range of recreational use opportunities along the river corridors, including preserving traditional uses, reducing uses, and modifying existing recreational use opportunities and/or use limitations. This comprehensive management plan also determines the kinds and amounts of use for the river consistent with the protection and enhancement of river values. All options would ensure the protection and enhancement of river values while avoiding conflicts and crowding among visitors.

TYPES AND LEVELS OF DEVELOPMENT

Several comments emphasized that the types and levels of development within the river corridor should minimize extractive use and keep the river free of impoundments. Several specific developments (including diversions on private land) were also identified as facilities that are not appropriate.

This comprehensive management plan determines what types of facilities are needed and where they should be sited within the river corridors, including access. It also determines which areas should be free of developments. The plan evaluates the compatibility of existing and/or new developments to protect and enhance river values and determines appropriate

management strategies to achieve river management goals.

FREE-FLOWING CONDITION

During the scoping period, few comments were received regarding how the plan should address free-flowing condition. Suggestions included minimizing development and upstream impoundments and keeping the river in the current free-flowing condition.

This plan identifies strategies to protect and enhance the free-flowing condition of the river.

WATER QUALITY

Many comments received during scoping emphasized that water quality should be protected and enhanced. Livestock grazing, nonpoint source runoff, development, and human use were all identified as having an influence on water quality.

This plan identifies management strategies to protect and improve water quality.

ECOLOGICAL PROCESS

Scoping comments related to ecological processes consistently mentioned an emphasis on native plant species, removal of nonnative/invasive plant species, and protection and restoration of critical habitats. This comprehensive management plan determines appropriate management strategies to protect and enhance ecological processes within the river corridors, particularly the maintenance and restoration of native plant species and the processes that sustain them. This Comprehensive Management Plan explores ways to mitigate human-caused impacts on river-related natural resources.

ISSUES BEYOND THE SCOPE OF THE PLAN: CLIMATE CHANGE

Climate change refers to any substantial changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality and storm frequency) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change (IPCC 2007) provide clear evidence that climate change is occurring and would accelerate in the coming decades. The effects of climate change on national parks are emerging as both science and impact measurements become clearer; however, it is difficult to predict the full extent of the changes that are expected under an altered climate regime.

The National Park Service recognizes that the major drivers of climate change are outside the control of the agency. However, climate change is a phenomenon and those impacts throughout the national park system cannot be discounted. The National Park Service consequently has identified climate change as one of the major threats to national park units and has developed a Climate Change Response Strategy (NPS 2010a) that focuses on science, adaptation, mitigation, and communication. A *Green Parks Plan* (April 2012) has been published, which calls for the National Park Service to reduce greenhouse gas emissions and adapt facilities at risk from climate change (NPS 2012).

The National Park Service has also adopted the concept of sustainable design as a guiding principle of facility planning and development (NPS *Management Policies 2006*, 9.1.1.7). The objectives of sustainability are to design facilities to minimize adverse effects on natural and cultural values, reflect their environmental setting, and maintain and encourage biodiversity; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices

through sustainable design and ecologically sensitive use. (Sustainability is the concept of living within the environment with the least impact on it.)

There are two different issues to consider with respect to climate change: (1) what is the contribution of the proposed action to climate change such as greenhouse gas emissions and the "carbon footprint?" and (2) what are the anticipated effects of climate change on the wild and scenic rivers' outstandingly remarkable values, and the park's resources and visitors that are affected by the management alternatives?

Implementing any of the alternatives described in this river comprehensive management plan would have no effect on the total level of greenhouse gas emissions or other climate change factors (e.g., carbon footprint) in the region, and more generally on the rate and magnitude of climate change. The National Park Service and Bureau of Land Management endeavor to reduce or mitigate greenhouse gas emissions associated with operations and visitor use. The National Park Service has taken many actions to reduce the park's contribution to climate change factors, including using alternative fuel shuttle buses, developing an environmentally sustainable visitor center, increasing on-site power generation, introducing enhanced recycling for park residents and visitors, reducing the use of disposable water bottles, supporting such efforts in the community, and visitor education. As part of a servicewide initiative, the public would receive educational messages about reducing human impact on the climate. These programs and others would be common to all alternatives and would help to reduce current contributions to climate change (e.g., greenhouse gas emissions). Therefore, the first issue has been dismissed as a NEPA impact topic in this plan. This plan primarily focuses on the second issue, addressing the anticipated effects of climate change on the park's resources and visitors.

Although climate change is a global phenomenon, it manifests differently depending on regional and local factors. Climate change is expected to result in many changes to the Colorado Plateau region and Zion National Park in particular. The combination of high elevation and semi-arid climate makes the Colorado Plateau, including the park, particularly vulnerable to climate change. Climate models predict that over the next 100 years, the Southwest will become warmer and even more arid, with more extreme droughts (Loehman 2010). Based on weather observations taken between 1928 and 2010, warming related changes that have been documented at the park include:

- an increase in annual mean temperature in the decade 2000 to 2009 of 1.8°F (1.0°C) above the average for 1928 to 1990
- the average number of days over 100° has increased from 30 per year to 56 per year
- the average number of days below freezing has decreased from 77 per year to 69 per year
- the centroid of spring runoff is about 8 days earlier than it was 80 years ago

(D. Sharrow, Zion National Park, pers. comm., 5-13-2013).

Projected changes in the park include mean temperature increases of 3.0°–4.7°C by the year 2100 or four to six times the amount of historical 20th century warming. Projections also suggest potential changes in the frequency of extreme temperature and precipitation events, while expectations for average precipitation are uncertain (Gonzalez 2013). These changes suggest an overall dryer landscape, which likely will affect the Virgin River and its tributaries, as well as the wild and scenic river ORVs.

Climate change is a far-reaching and long-term issue that would affect the park, its

resources, visitors, and management beyond the scope of this plan and its timeframe. Although some effects of climate change are considered known or likely to occur, many potential impacts are unknown. Much depends on the rate at which temperature would continue to rise and whether global emissions of greenhouse gases can be mitigated before serious ecological thresholds are reached.

Climate change science is a rapidly advancing field, and new information is being collected and released continually. The full extent of climate change impacts to resources and the river-related visitor experience is not known, nor do managers and policy makers yet agree on the most effective response mechanisms for minimizing impacts and adapting to change. Thus, unlike the other issues noted above, this plan does not provide definitive solutions or directions to resolving the issue of controlling impacts of climate change on Zion National Park.

Adaptation to climate change refers to adjustments in natural or human systems in response to climate change or impacts (IPCC 2001). Adaptive management is defined by the National Research Council (2004) as a process that:

> . . .promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.

The feedback between learning and decision making is a defining feature of adaptive management (Williams and Brown 2012). It is not a "trial and error" process, but rather emphasizes learning while doing (National Research Council 2004).

Climate change adaptation planning and implementation requires collaboration and coordinated actions among and across many jurisdictions. The NPS approach to climate change adaptation and planning emphasizes steps and activities that are multidisciplinary and cross institutional boundaries (NPS 2010a).

The National Park Service also recognizes that the management actions being proposed in all of the alternatives need to be adopted with future climate change and impacts in mind because past conditions are not necessarily useful guides for future planning. There will be a need for continued monitoring of the effect of climate change on river-related resources, including effects on fish, stream geomorphology, water quality and quantity, and vegetation communities. Climate change will need to be considered in implementing some of the broad-based management strategies discussed in chapter 2. Partnerships will also need to be established with other land management agencies, including the Bureau of Land Management and the State of Utah, to monitor the impacts of climate change and collaboratively plan for appropriate adaptive strategies.

The impacts of climate change on the park are not expected to differ among the alternatives, and the lack of qualitative and quantitative information about climate change effects adds to the difficulty of predicting how these impacts would be realized in the park. Additionally, management actions that are inherently part of each alternative, such as allowing natural processes to dominate or managing nonnative plants to prevent spreading, would not fundamentally change with the anticipated added effects of climate change. It is conceivable, however, that climate may become so altered and the changes in species range so great, that the definition of what constitutes natural will have to be modified. Also, the range of variability in the potential effects of climate change is large in comparison to what is known about the

future under an altered climate regime in the park. Therefore, the potential effects of this dynamic climate on national park resources were included in "Chapter 3: Affected Environment." However, these effects are not analyzed in "Chapter 4: Environmental Consequences" in general with respect to each alternative because of the uncertainty and variability of outcomes, and because these outcomes or management are not expected to differ among the alternatives.

IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS

Impact topics were identified on the basis of federal laws, regulations, policy and staff knowledge of park and BLM resources, as well as public input. The environmental impacts analyzed in this comprehensive management plan include the majority of the outstandingly remarkable values identified for Virgin River and its tributaries. In addition to the impact topics identified below, this comprehensive management plan would identify and analyze the kinds and amounts of recreational use and the types and levels of development. Table 4 identifies the impact topics that would be analyzed in this plan and those that would be dismissed from further analysis.

TABLE 4. IMPACT TOPICS

Impact Topics Analyzed in Detail	Impact Topics Eliminated from Detailed Analysis
Alternatives in this plan could affect these resources or topics:	**These resources or topics are important, but alternatives in this plan would have negligible and/or possibly minor impacts:**
Free-flowing Conditions and Floodplains	Wetlands
Water Quality	Soils
Ecological Processes ORV (includes vegetation)	Energy Requirements and Conservation Potential
Fish ORV	Air Quality
Wildlife ORV (including threatened and endangered wildlife species)	Night Skies
Recreational ORV / River-related Visitor Use and Experience	Geologic Resources (and geologic ORV)
Scenic ORV / Visual Resources / Viewsheds	Natural Sounds
Park Operations	Museum Collections
BLM Operations	Archeological Resources
Socioeconomic Environment	Historic Structures
	Cultural Landscapes
	Ethnographic Resources
	Indian Trust Resources
	Environmental Justice
	Prime and Unique Farmlands

FREE-FLOWING CONDITIONS AND FLOODPLAINS

This comprehensive management plan determines appropriate strategies to protect and enhance free-flowing conditions, including necessary flows and ways to address existing impediments to free-flowing conditions. So, this topic is retained for further analysis.

Actions in this plan's alternatives could affect floodplains, either beneficially or adversely. This topic is retained and included in the discussion on free-flowing character.

WATER QUALITY

This comprehensive management plan addresses factors that have the potential to affect the water quality of designated river segments, in particular ongoing visitor and administrative uses and existing infrastructure. Management strategies include ways to protect and enhance water quality and mitigate for existing and/or potential impacts. Therefore, this topic is retained for further analysis.

ECOLOGICAL PROCESSES ORV

This comprehensive management plan determines appropriate management strategies to protect and enhance ecological processes within the river corridors, particularly the maintenance and restoration of native plant species and the processes that sustain them. This comprehensive management plan explores ways to mitigate human-caused impacts on river-related natural resources. Therefore, this topic is retained for further analysis.

FISH ORV

The Virgin River and its tributaries provide habitat for several native fish species. This comprehensive management plan includes management strategies intended to protect or enhance native fish and fish habitat in the rivers. Therefore, this topic is retained for further analysis.

WILDLIFE ORV (INCLUDING THREATENED AND ENDANGERED SPECIES)

This comprehensive management plan determines appropriate management strategies to protect and enhance ecological processes within the river corridors, particularly the maintenance and restoration of native wildlife habitats. Threatened and endangered species habitat is included. This comprehensive management plan also explores ways to mitigate human-caused impacts on river-related natural resources. Therefore, this topic is retained for further analysis.

RECREATIONAL ORV / RIVER-RELATED VISITOR USE AND EXPERIENCE

This comprehensive management plan determines appropriate management strategies to protect and enhance recreational values within the river corridor. In particular, this document evaluates aspects of the recreational ORV / river-related visitor use and experiences including access and opportunities, quality of experience, interpretation and education, and safety. Therefore, this topic has been retained for further analysis.

SCENIC ORV / VISUAL RESOURCES / VIEWSHEDS

Corridors along the Virgin River and its tributaries contain unparalleled scenery, which can be both dramatic and subtle. Certain park development could affect visual resources. This comprehensive management

plan includes potential strategies that would be applied to proposed projects that could affect the river's scenery. Therefore, this topic will be retained for further analysis.

PARK OPERATIONS

The majority of the park infrastructure is within the boundaries of designated river segments. This plan identifies and evaluates ways for the park to continue to maintain the existing infrastructure and potentially develop new infrastructure, as needed. The plan identifies strategies to protect and enhance river values, while ensuring that the park provide adequate and safe infrastructure for staff and visitors. For these reasons, this topic will be retained for further analysis.

BUREAU OF LAND MANAGEMENT OPERATIONS

Most of the designated river segments on BLM-managed lands are within designated wilderness and will be managed as such. The plan identifies strategies to ensure that river values are protected and enhanced, while adhering to the BLM multiple-use policy; for these reasons, this topic will be retained for further analysis.

SOCIOECONOMIC ENVIRONMENT

The Bureau of Land Management and the National Park Service manage almost 50% of the lands within Washington County, Utah. Thus, any decision the agencies make could potentially affect the socioeconomic environment in the county. Therefore, this topic will be retained for further analysis.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

In this section, the planning team scrutinized all potential impacts by considering the direct, indirect, and cumulative effects of the proposed actions on the environment, as well as the connected and cumulative actions.

A limited evaluation and explanation as to why some impact topics are not evaluated in more detail are provided below. Impact topics are dismissed from further evaluation in this environmental assessment if

- they do not exist in the analysis area, or
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- with the application of mitigation measures, there would be minor or less effects (i.e., no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there would be either no contribution toward cumulative effects or the contribution would be low. For each following issue or topic presented, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct, indirect, and cumulative effects is presented.

WETLANDS

Executive Order 11990: "Protection of Wetlands," NPS *Management Policies 2006*, and Director's Order 77: *Wetland Protection* direct that wetlands be protected and that wetlands and wetland functions and values be preserved. The designated segments of the Virgin River and its tributaries contain few wetlands primarily because of the narrow canyon bottoms that are often scoured by high flows. According to the National Wetlands Inventory, there are some riverine and freshwater forested/shrub wetlands associated with North Fork Virgin River in the main canyon near the Temple of Sinawava. Overall, these wetlands appear to be in a healthy state.

There are no actions identified in this document that would affect wetlands more than negligibly. The actions that will take place in areas with potential wetlands are revegetation of social trails (generally the trails are not in wetlands) and construction of a natural surface trail from Zion Lodge to the Temple of Sinawava. This trail would follow existing informal and game trails, which are across the road from the river and away from wetlands. Therefore, this topic is dismissed from further consideration in this document.

SOILS

Soils within the planning corridors are young and made up of soil and colluvium derived from erosion of the cliffs above and river deposits of gravel, sand, and silt. The soils can be productive for native plants, but due to their recent origin, the soils consist of slightly weathered parent material with little or no development of soil horizons. Many segments of the rivers flow through slot canyons in solid rock and therefore do not have streambanks.

The actions proposed in the alternatives that could affect soils are the eventual loss of the levees, formalizing some visitor-created trails through the addition of natural surfaces (such as crushed gravel, compacted soil, rerouting across sandstone, etc.); the installation of fencing; and revegetation of visitor-created trails that would not be

formalized. All of these actions would take place in previously disturbed areas and would have only negligible to minor impacts, adverse impacts from formalizing, and beneficial impacts from revegetation. Therefore, this topic is dismissed from further consideration in this document.

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

The National Park Service would continue to implement its policies of reducing costs, eliminating waste, and conserving resources by using energy-efficient and cost effective technology (NPS *Management Policies 2006*). The National Park Service would continue to look for energy-saving opportunities in all aspects of park operations. Because the National Park Service would promote energy efficiency in an equal manner under any alternative, this topic was dismissed from further consideration in this document.

AIR QUALITY

The Clean Air Act (42 USC 85) states that federal land managers have an affirmative responsibility to protect air quality-related values from adverse air pollution impacts. The park is a class I airshed according to guidelines in the Clean Air Act 1977 and amendments. Under class I, there are stringent restrictions on any increases in air pollution beyond baseline levels for particulate matter, sulfur dioxide, nitrogen, and nitrogen dioxide. The adjacent BLM lands are class II.

There are no major air pollution sources within or near the river segments. Engine exhaust is the most common pollutant in the region and is heaviest around the roads and agricultural or commercial operations. Airborne particulates (e.g., dust or smoke) are occasionally generated from high winds, construction activities, and wildland fires (natural and prescribed).

For these reasons, this topic is dismissed from further consideration in this document.

NIGHT SKIES

NPS *Management Policies 2006* state that the National Park Service will preserve, to the greatest extent possible, the natural lightscapes of parks, including natural darkness. The park's General Management Plan (NPS 2001) further notes that the night sky at Zion National Park significantly contributes to visitor experience. The desired condition is that excellent opportunities to view the sky night are available in the park. There are no actions in this plan that would affect the night sky or viewing opportunities. Thus, this topic is dismissed from further consideration in this document.

NATURAL SOUNDS

NPS *Management Policies 2006* and Director's Order 47: *Soundscape Preservation and Noise Management* recognize that natural soundscapes are a park resource and require the National Park Service to preserve, to the greatest extent possible, the natural soundscapes of parks. The policies and director's order further state that the National Park Service will restore degraded soundscapes to the natural condition whenever possible and will protect natural soundscapes from degradation due to noise (undesirable human-caused sound). The park's Soundscape Management Plan (NPS 2010b) further identifies strategies to protect the park's natural sounds. A healthy acoustic environment and preservation of natural sounds appropriate to Zion National Park and the Virgin River supports the preservation of outstandingly remarkable values of the river corridors, including the cultural, recreational, and ecological processes values. The Virgin River is among the most important acoustic resources in the park. Visitors enjoy the sounds of flowing water and the peaceful atmosphere created by the river flowing through the canyons.

None of the alternatives being considered are proposing developments or actions that would noticeably affect natural sounds in the wild and scenic river corridors. Trail construction would have a negligible short-term adverse effect on natural sounds in a few localized areas.

GEOLOGIC RESOURCES (AND GEOLOGIC ORV)

In accordance with NPS *Management Policies 2006*, the National Park Service strives to preserve and protect geologic resources and features from adverse effects of human activity while allowing natural processes to continue. The formations exposed along the wild and scenic river segments were deposited as sediment in several different environments, including shallow seas, streams, and sand dunes. These resulted in the deposition of alternating layers of limestone, siltstone, claystone, and sandstone. Subsequent uplift and erosion led to many of the geologic formations seen today. There are no actions in this comprehensive management plan that would affect the outstanding remarkable geologic value that currently exists. The creation of trails or upgrading hiking routes are the main management action in this plan that is relevant to the geologic ORV and given the scale of the geology (1,500-foot sandstone cliffs, high rates of natural erosion, hanging gardens in the canyons), the actions included in this plan will not impact geology. Therefore, the topic geologic resources is dismissed from further consideration in this document.

MUSEUM COLLECTIONS

Museum collections include historic artifacts, natural specimens, and archival and manuscript material. They may be threatened by fire, vandalism, natural disasters, and careless acts. The preservation of museum collections is an ongoing process of preventative conservation, supplemented by conservation treatment, when necessary. The primary goal is preservation of artifacts in as stable condition as possible to prevent damage and minimize deterioration.

The Zion National Park museum collection preserves and protects over 290,000 objects that represent the natural and cultural history of the park. Since the park's establishment in 1909, rangers have gathered objects for the museum collection. Some of these are on display at the Zion Human History Museum; however, most are stored in a facility at park headquarters. These objects are firsthand evidence of U.S. history, stories of human struggles and triumphs, and the amazing and dynamic natural world. It is a dynamic and accessible collection used by scientists and educators and is always expanding with new research and discoveries.

Zion Canyon, all of Taylor Creek, La Verkin Creek, East Fork Virgin, Timber Creek, and Hop Valley have all been surveyed for cultural resources, including artifacts and other specimens that would be retained in museum collections. Because this survey work has been completed, additional artifacts or specimens collected from future projects associated with this plan would be minimal and would pose negligible impacts to the museum collections of Zion National Park. Therefore, the topic of museum collections is dismissed from further consideration in this document.

ARCHEOLOGICAL RESOURCES

The National Historic Preservation Act and Director's Order 28A: *Archeology* affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the national park system. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities reflect a commitment to the conservation of

archeological resources as elements of our national heritage.

Zion Canyon, all of Taylor Creek, La Verkin Creek, East Fork Virgin, Timber Creek, and Hop Valley have all been surveyed for archeological resources. Because the locations of archeological resources are known, the park will avoid all archeological resources if any surface disturbance is proposed by the projects described in this plan. The actions in this plan would not alter NPS management decisions or the park's standard approach to protecting and managing known archeological resources and areas with the potential for cultural resources. Impact analysis indicates that the actions of this plan would result in no impact or only negligible impacts to archeological resources. Therefore, no actions in this comprehensive management plan would affect archeological resources and thus this topic is dismissed from further consideration in this document.

HISTORIC STRUCTURES

Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470 et seq.), and its implementing regulations under 36 *Code of Federal Regulations* (CFR) 800 require all federal agencies to consider the effects of federal actions on historic properties, including historic structures eligible or listed in the National Register of Historic Places (NRHP). In order for a structure to be listed in the national register, it must be associated with an important historical event, person(s), or that embodies distinctive characteristics or qualities of workmanship. Zion Canyon, all of Taylor Creek, La Verkin Creek, East Fork Virgin, Timber Creek, and Hop Valley have all been surveyed for historic structures, and as a result, there are listed and eligible structures within the boundaries of some of the river segments. The majority of the historic structures in the park are along the North Fork Virgin River in Zion Canyon. Impact analysis indicates that the actions of this plan would result in no impact or only negligible impacts to historic structures. There are no actions in this comprehensive management plan that would affect any historic structures. Therefore, this topic is dismissed from further consideration in this document.

CULTURAL LANDSCAPES

According to NPS Director's Order 28: *Cultural Resource Management*, a cultural landscape is a reflection of human adaptation and use of natural resources and is often expressed in a way land is organized and divided, patterns of settlement, land use, systems of circulation, and types of structures that are built. Zion Canyon, all of Taylor Creek, La Verkin Creek, East Fork Virgin, Timber Creek, and Hop Valley have all been surveyed for cultural landscapes. Two cultural landscapes have been identified—Zion Canyon Historic District and Zion Lodge-Birch Creek Historic District. Both of the cultural landscapes occur in Zion Canyon along the North Fork Virgin River. Impact analysis indicates that the actions of this plan would result in no impact or only negligible impacts to cultural landscapes. There are no actions in this comprehensive management plan that would affect the cultural landscape or any features therein. Therefore, this topic is dismissed from further consideration in this document.

ETHNOGRAPHIC RESOURCES

The National Park Service defines ethnographic resources as any

> . . . site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (Director's Order 28).

Eleven affiliated American Indian tribes are traditionally associated with Zion. All of the tribal contacts were sent an informational letter on October 12, 2010. The letter described the wild and scenic river planning process and asked for any issues that the tribe would like us to address through the planning process. No scoping comments were received from any of the tribes. This environmental assessment will also be available for review by the affiliated tribes. If subsequent issues or concerns are identified, appropriate consultation would be undertaken.

Because it is unlikely that the activities proposed in this comprehensive management plan would affect ethnographic resources, this topic has been dismissed from further consideration in this document.

INDIAN TRUST RESOURCES

The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. Secretarial Order 3175 requires that any anticipated impacts on Indian trust resources from a proposed project or action by Department of the Interior (USDI) agencies be explicitly addressed in environmental documents. There are no Indian trust resources at Zion National Park or on the wild and scenic river segments adjacent to the park and managed by the Bureau of Land Management. Therefore, this topic was dismissed from further consideration in this document.

ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

According to the U.S. Environmental Protection Agency, *environmental justice* is

> fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

None of the alternatives being considered would have a disproportionately high or adverse effect on any minority or low-income population or community. This conclusion is based on the following information:

- The proposals in the alternatives would not result in any identifiable adverse human health effects. Therefore, there would be no direct, indirect, or cumulative adverse effects on any minority or low-income population or community.
- No natural resource adverse impacts due to the alternatives were identified that would significantly and adversely affect minority or low-income populations or communities.
- The alternatives would not result in any identified effects that would be specific to any minority or low-income community.

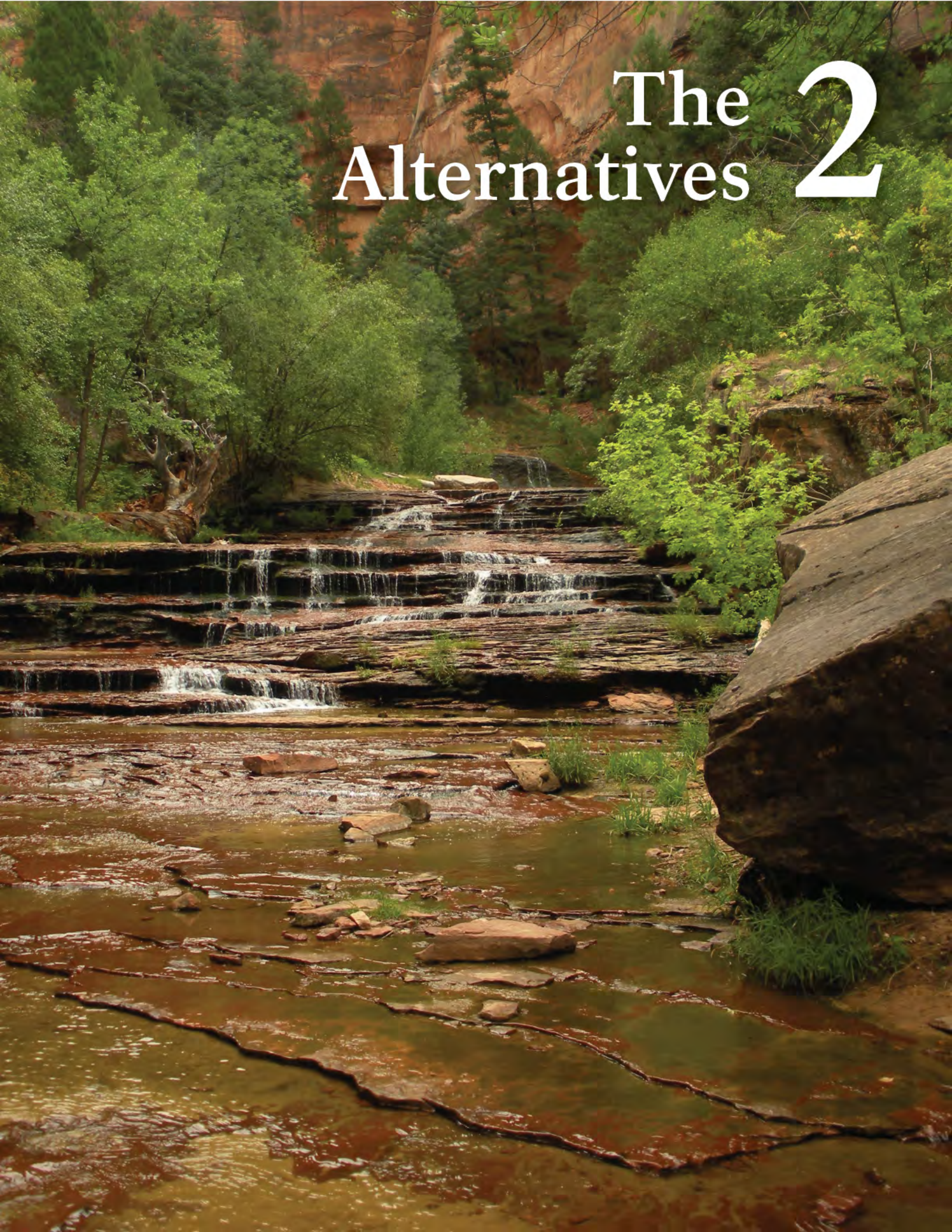
- The planning team actively solicited public comments during development of the general management plan and gave equal consideration to all input from persons, regardless of age, race, sex, income status, or other socioeconomic or demographic factors.
- No impacts were identified that would substantially alter the physical and social structure of the nearby communities.

Therefore, this topic was dismissed from further consideration in this document.

PRIME AND UNIQUE FARMLANDS

In 1980, the Council on Environmental Quality (CEQ) directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conservation of these nonagricultural uses. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; and unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS maps, there are no prime or unique farmlands within the park or on adjacent BLM lands within the analysis area. Therefore, this topic was dismissed from further consideration in this document.

2 The Alternatives



INTRODUCTION

OVERVIEW

The Wild and Scenic Rivers Act requires that a comprehensive management plan be developed for the newly designated wild and scenic river segments to provide for the protection of river values. Because there are different approaches to protecting and managing these river segments, the planning team investigated a full range of reasonable management alternatives. NEPA, BLM, and NPS policies require that managers consider a full range of reasonable alternatives, including a no-action alternative and an environmentally preferred alternative. The alternatives must also be consistent with the Wild and Scenic Rivers Act, the Wilderness Act, enabling legislation, reflect a full range of stakeholder interests, the desirability of providing for a variety of river-related visitor experience, and fully consider the potential for environmental impacts. This chapter describes how these alternatives were developed and identifies the alternative preferred by the National Park Service and the Bureau of Land Management.

The impacts of each alternative are summarized in table 8 (at the end of this chapter) from the information presented in "Chapter 4: Environmental Consequences" pursuant to the National Environmental Policy Act.

Under all alternatives, the Virgin River wild and scenic river system would be managed according to the segment classifications. Segments classified as wild would be managed to maintain primitive shorelines in an undisturbed state. Segments classified as scenic would be managed to maintain the largely primitive and natural-appearing shorelines while providing some user accessibility. More development may exist in segments classified as recreational, but those segments would be managed to offer high-quality recreational opportunities. For all three classes—wild, scenic, and recreational—river segments would be managed to protect and enhance all wild and scenic river values.

BOUNDARY DELINEATION

Establishing a boundary for a newly designated wild and scenic river is an important step in delineating the area that would receive the greatest effort in resource protection. The Wild and Scenic Rivers Act provides guidance on delineating the boundary. It states that the river corridor cannot exceed an average of 320 acres per mile or an average of 0.25 mile from the ordinary high water mark on each side of the river. Land below the ordinary high water mark (such as islands) does not count against the acreage limitation. The identified boundary delineation is the same for all alternatives.

The Omnibus Public Land Management Act of 2009 designating the rivers, states in section 1976(b), Incorporation of Acquired Nonfederal Land:

> If the United States acquires any nonfederal land within or adjacent to Zion National Park that includes a river segment that is contiguous to a river segment of the Virgin River designated as a wild, scenic, or recreational river by paragraph (204) of section 3(a) of the Wild and Scenic Rivers Act (16 USC 1274(a)) (as added by subsection [a]), the acquired river segment shall be incorporated in, and be administered as part of, the applicable wild, scenic, or recreational river.

Private lands were not included in the boundary delineation and are not included in the miles of river or the acreage calculations.

As a practical matter in delineating the boundary, some form of on-the-ground identification—either physical features (canyon rims, roads, etc.) or legally identifiable lines (survey or property lines)—may be used so that the boundary can be easily identified on the landscape or accurately described legally. These boundary lines must conform closely to the identified river values for each river segment.

Criteria Used for Developing Boundaries for the Virgin River

Where private lands are involved, the boundary delineates the area within which the National Park Service would focus work with local landowners in developing effective strategies for protection. The boundary also defines the area in which the National Park Service has land acquisition authority (there are no private lands along the river segments within the BLM boundary). Landowners are often concerned about which lands would be included, in part due to a fear of government land acquisition and regulation. The Wild and Scenic Rivers Act does permit fee acquisition of up to an average of 100 acres per mile and easement acquisition on any land within the boundary from willing landowners. However, the federal government cannot condemn private lands within designated wild and scenic river corridors that have more that 50% federal ownership—which is the case for all designated segments along the designated portions of the Virgin River. Furthermore, the Wild and Scenic Rivers Act does not provide the federal administering agency the authority to regulate private lands. As a practical matter in delineating the boundary, easily identifiable features, such as physical features (canyon rims, roads), may be used so the boundary can be more easily identified on the landscape or accurately described legally. These boundaries must conform closely to the identified river values for each river segment.

The river corridor boundary for the Virgin River was created using geographic information system (GIS) technology to delineate canyon rims and various major geologic layers. To establish the river corridor boundary, the slot canyons were identified and the boundary was established from one rim of the slot canyon to the other rim (rim-to-rim). Based on the depth of these canyons, river values would not extend past the canyon rim in these areas. For wider canyons, washes or more gently sloping portions of the designated segments, the river was buffered to 0.25 mile. Then the 0.25-mile buffer was subsequently modified to follow the Navajo sandstone layer. The boundary was further modified to include areas only within Zion National Park and BLM boundaries. Finally, the river corridors were evaluated to ensure that all of the identified outstandingly remarkable values are encompassed within their delineated boundary.

In summary, park and BLM staff worked closely with Denver Service Center (DSC) staff and the GIS specialist to establish criteria for river boundaries. In accordance with the criteria, the boundary should

- protect outstandingly remarkable values, free-flowing condition, and water quality
- be identifiable on the ground (where possible, for example: canyon bottom)
- be described (where possible, for example: base of Navajo sandstone)

Boundaries could

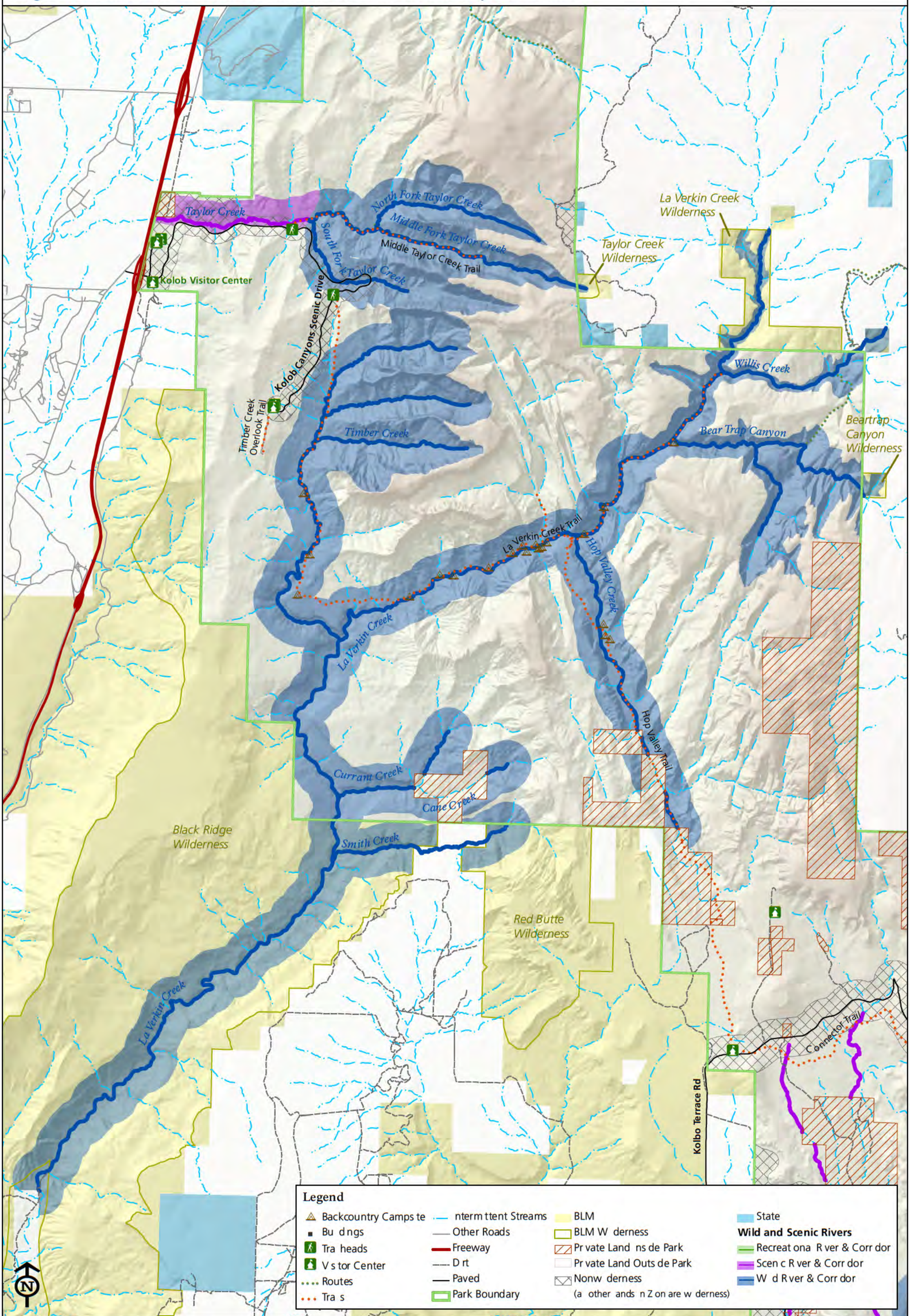
- follow geologic layers OR
- follow hydrographic boundaries OR
- be an average of 0.25 mile either side of the river

The preceding factors were used to delineate the boundary of the wild and scenic river designation, and are reflected in the maps presented in this plan for each river segment. Table 1 in chapter 1 provides a summary of miles and acres by river segment. The total river miles by segment differ slightly from the amounts described in the Omnibus Public Land Management Act of 2009; this is because more accurate calculations from GIS mapping data have been obtained. If private lands within Zion National Park adjacent to the existing designated segments are acquired, the maps would be revised according to the legislation.

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

Virgin Wild and Scenic River: La Verkin Creek and Taylor Creek



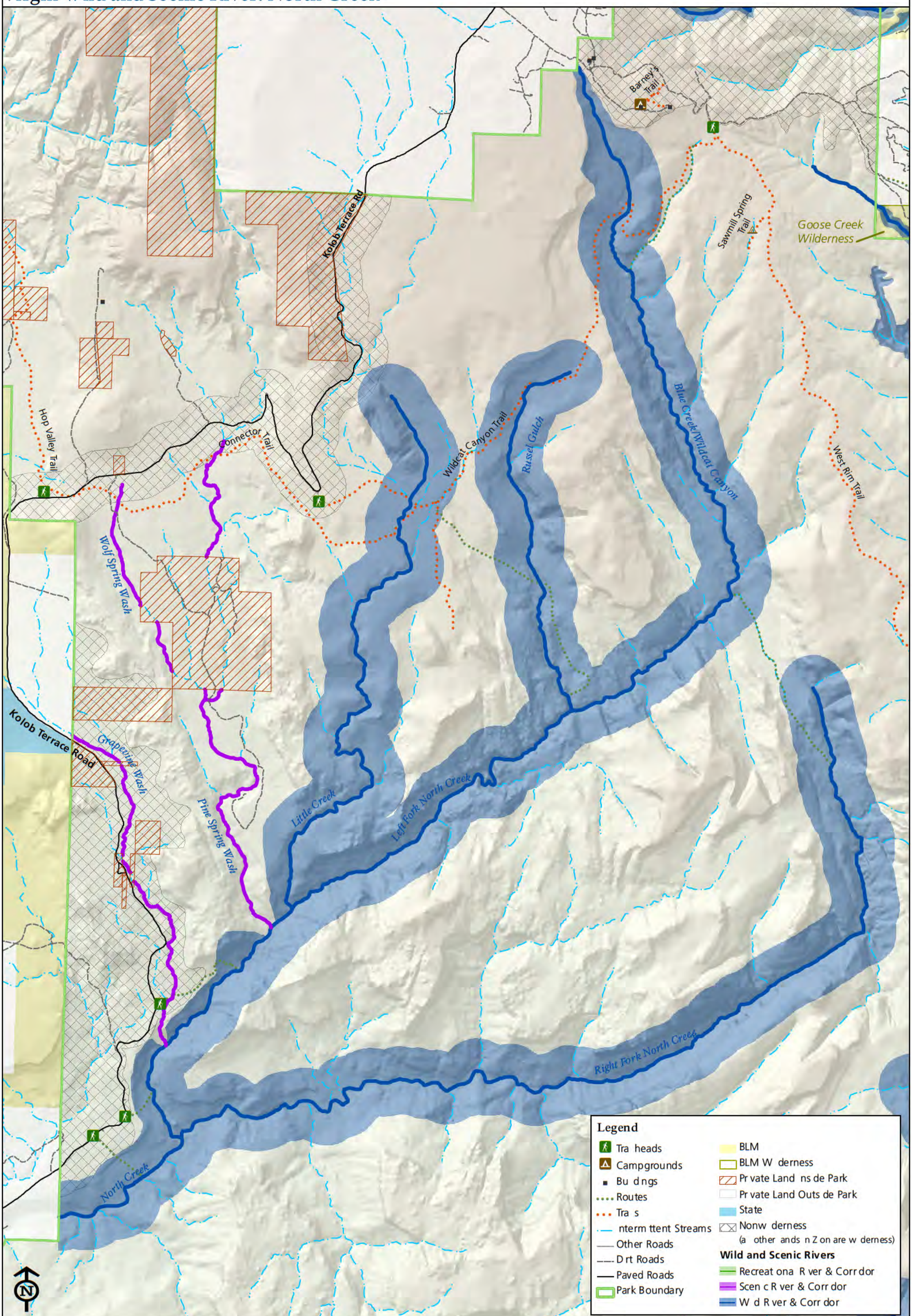
Produced by: NPS Denver Service Center Planning Division
September 2012

0 0.5 1 2 3 Miles

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

Virgin Wild and Scenic River: North Creek



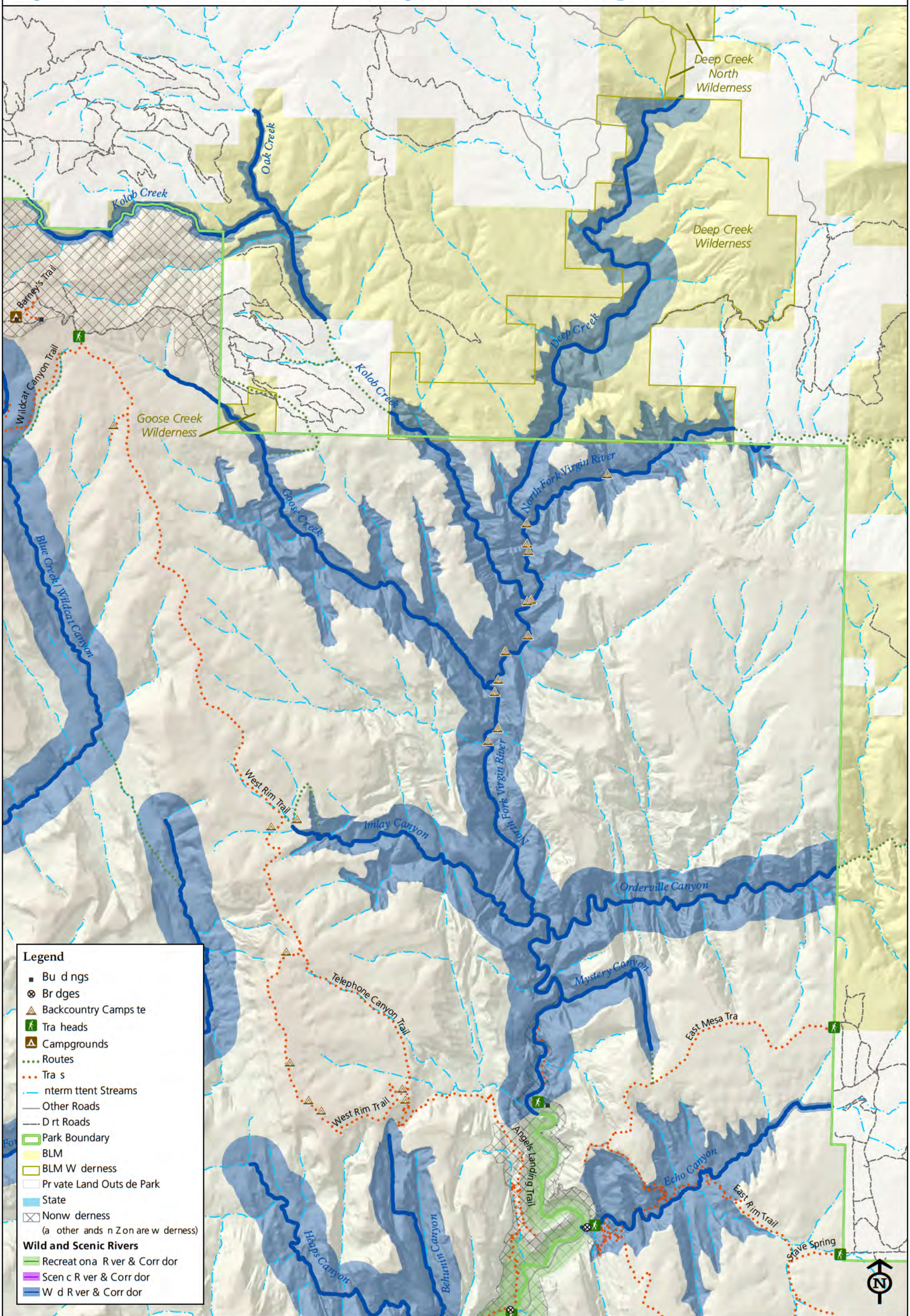
Produced by: NPS Denver Service Center Planning Division
September 2012

0 0.5 1 2 Miles

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

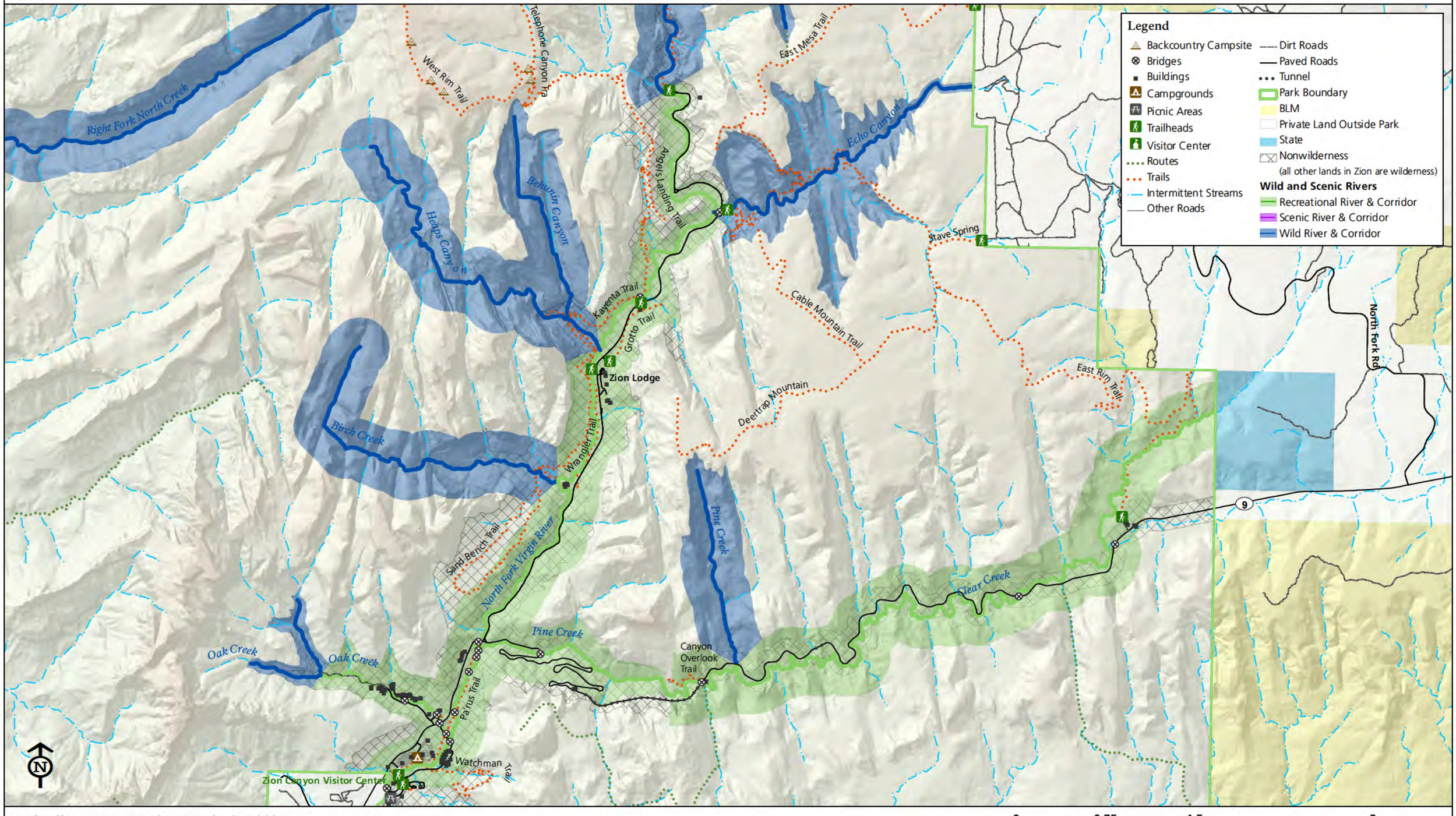
Virgin Wild and Scenic River: North Fork Virgin River above the Temple of Sinawava



Produced by: NPS Denver Service Center Planning Division
October 2012

0 0.75 1.5 3 Miles

Virgin Wild and Scenic River: North Fork Virgin River below Temple of Sinawava

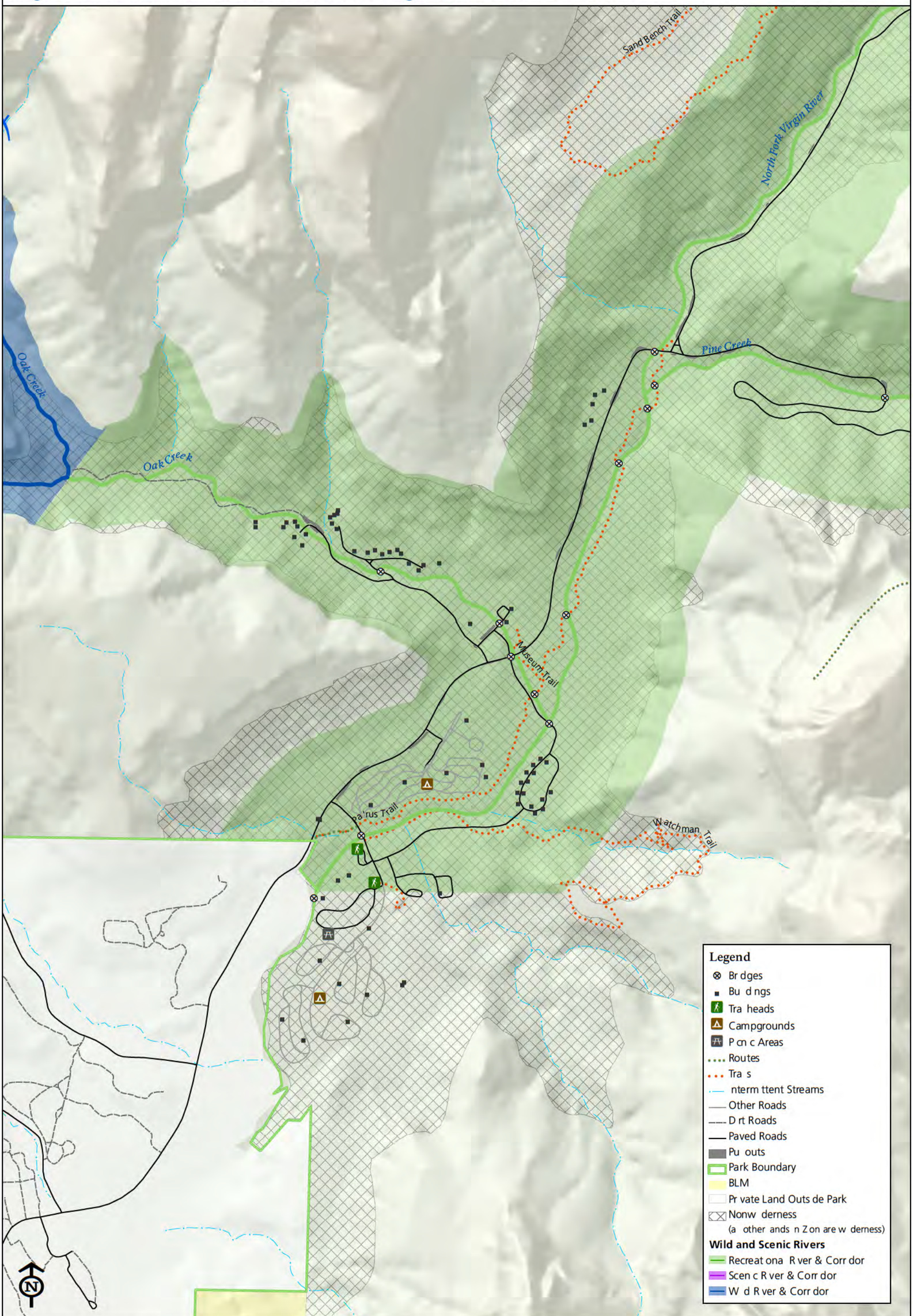


Produced by: NPS Denver Service Center Planning Division
September 2012

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

Virgin Wild and Scenic River: North Fork Virgin River below Oak Creek



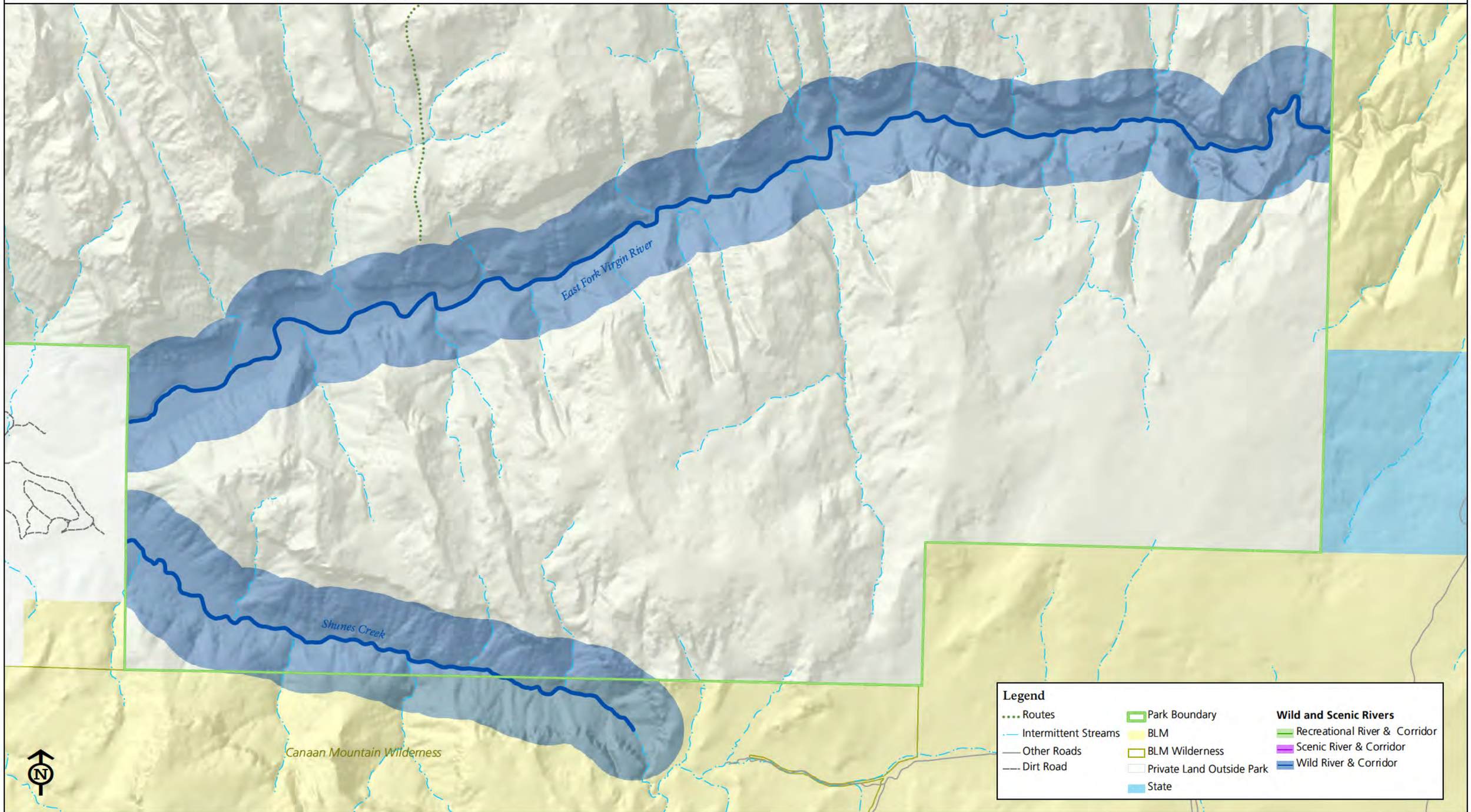
Produced by: NPS Denver Service Center Planning Division
September 2012

0 0.25 0.5 1 Miles

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

Virgin Wild and Scenic River: East Fork Virgin River



Produced by: NPS Denver Service Center Planning Division
September 2012

0 0.5 1 2 Miles

DEVELOPMENT OF THE ALTERNATIVES

This comprehensive management plan / environmental assessment presents three alternatives, including the required no-action alternative and the agencies' preferred alternative, for future management of the Virgin Wild and Scenic River.

The planning team developed a set of preliminary alternatives during a three-day workshop held at Zion National Park in March 2011. Input received during public scoping was fundamental to developing the range of alternatives; public comments were referenced extensively throughout the workshop. A summary of public comments received can be found in chapter 5. An important aspect of alternative development is considering various ways to address identified issues within the context of the Wild and Scenic Rivers Act.

After the workshop, the alternatives were further developed and refined through a series of meetings and conference calls, as well as researching comparable river systems and visitor use of the rivers. The final set of alternatives presented in this chapter represent a range of ideas designed to best achieve the purpose of the plan—to protect and enhance the river values that make Virgin River and its tributaries worthy of inclusion in the National Wild and Scenic Rivers System. Figure 3 illustrates the planning process that resulted from this iterative process and provides an organization to the alternatives presented in this chapter.

THE ALTERNATIVES

ALTERNATIVE MANAGEMENT CONCEPTS

Three alternative management concepts were developed for the Virgin River planning effort. These alternatives include alternative A, also referred to as the no-action alternative, which represents a continuation of current management practices. Alternative B emphasizes resource protection and interpretation. Alternative C focuses on resource protection as well as recreational activities that are compatible with resource protection. Alternative C has been identified as the preferred alternative.

A comparison of the management actions in each alternative can be found in table 8 at the end of this chapter, along with a summary of impacts in table 9.

The following describes the management concepts for each of these alternatives.

Alternative A Concept (No-action Alternative)

Alternative A would continue current management practices into the future. Its goal would be to retain the existing river-related visitor experience and resource management strategies based on existing agency planning. Ongoing coordination with other agencies would continue. *No action* does not imply discontinuing the present uses or management actions nor does it mean removing the existing wild and scenic river designation.

Because there would be no approved comprehensive management plan as required by section 3(d)(1) of the Wild and Scenic Rivers Act, this alternative would not be in compliance with this section of the act. The agencies would strive to protect and manage the free-flowing condition, water quality, and the outstandingly remarkable values for which the rivers were designated through other management actions.

Alternative B Concept

Under alternative B, the Virgin River and its tributaries would be managed with an emphasis on resource protection, including interpreting natural and cultural resources and restoring natural resources. Restoration of natural river processes would take precedence over recreational activities. A variety of appropriate recreational activities would be available throughout the park and on BLM-managed lands, which are compatible with resource protection. Visitor use levels would generally remain the same in low use areas where use is not impacting river values, but would be reduced in areas experiencing impacts on river values. The monitoring program and adaptive management would ensure that recreation or other actions do not negatively impact river values.

Alternative C Concept (Preferred Alternative)

Under alternative C, the Virgin River and its tributaries would be managed with an emphasis on resource protection. Recreational activities that are compatible with resource protection strategies would be available throughout the park and on BLM-managed lands. The Virgin River and its tributaries would be managed to maintain or enhance recreational opportunities—public uses would continue to be allowed unless there is a clear need to limit use. Educational and interpretive opportunities would also be enhanced for both natural and cultural resources. The agency staff would develop

new connections through education and would build advocacy. Relevance would be maintained through use of new technology for media and outreach. The National Park Service and Bureau of Land Management would continue to be open to new recreation experiences compatible with protection of river values and provide a diversity of experiences for a variety of abilities, interests, and cultures. The National Park Service and Bureau of Land Management would actively manage visitor areas to maintain use levels or allow a small increase in use while protecting river values. A monitoring program and adaptive management would ensure that recreation or other uses do not negatively impact river values.

ALTERNATIVE MANAGEMENT STRATEGIES AND ALTERNATIVE PLANNING PROCESS

The alternative management strategies, which have been organized into distinct levels, are shown in figure 2, and the alternative planning process is shown in figure 3. The first level includes broad-based management strategies that would be applied across the entire wild and scenic river designation. These comprehensive strategies vary by the no-action alternative (alternative A) and those strategies that are common to both action alternatives (alternatives B and C). The development of indicator variables is described under the broad-based tier because the indicator variables were not developed to vary by alternative, but were developed to protect all river values that occur across the wild and scenic river designation. However, since standards may vary due to alternative or segment-specific issues, they are described under the second tier of management strategies.

The second level includes segment-specific management strategies for each of the designated wild and scenic river segments and associated tributaries. When necessary, this plan elaborates on strategies for high use areas within certain river segments. Strategies may vary across all three alternatives (A, B, and C) for water quality and free-flowing condition, the outstandingly remarkable values for which the river was designated, types and levels of development, and kinds and amounts of use.

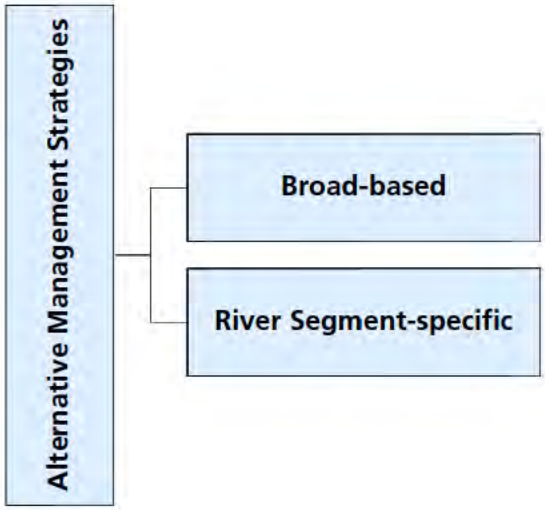


FIGURE 2. TIERED PLANNING APPROACH

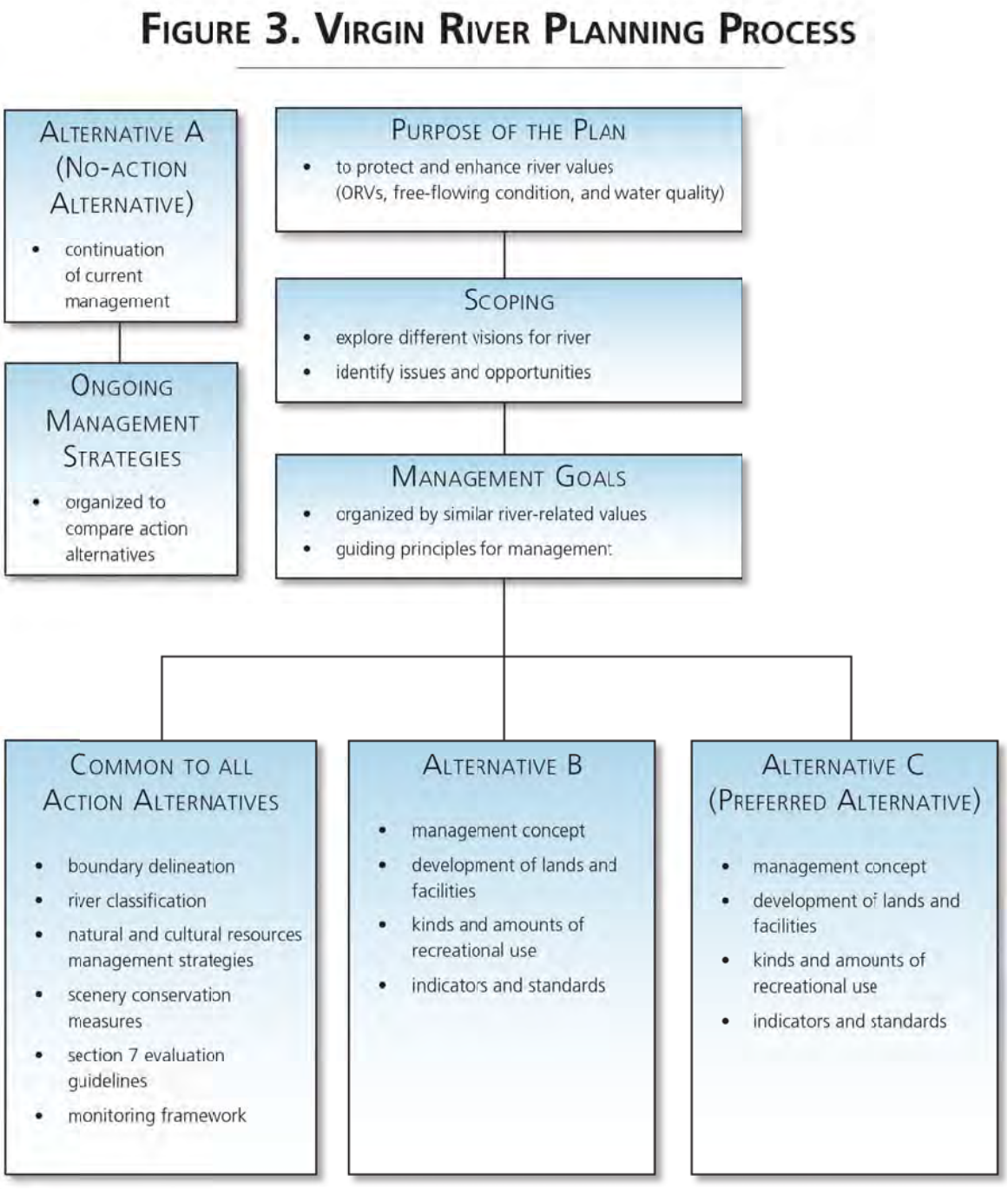


FIGURE 3. VIRGIN RIVER PLANNING PROCESS

BROAD-BASED MANAGEMENT STRATEGIES

The first tier of this comprehensive management plan includes broad-based management strategies that would be applied across the entire wild and scenic river designation (administered by either the National Park Service or Bureau of Land Management). These comprehensive strategies vary by the no-action alternative (A) and by those strategies that are common to both action alternatives (B and C).

ALTERNATIVE A: CONTINUATION OF CURRENT MANAGEMENT (NO-ACTION ALTERNATIVE)

Under alternative A, the designated river segments within the park would continue to be managed according to the Zion National Park General Management Plan, the park backcountry management plan, other pertinent park plans, NPS *Management Policies 2006*, the Wilderness Act, and the Wild and Scenic Rivers Act. The BLM segments would continue to be managed under the St. George Field Office resource management plan (as amended), BLM policies and regulations, the Wilderness Act, and the Wild and Scenic Rivers Act.

Alternative A includes the following management strategies that apply to all river segments.

Free-flowing Condition and Water Quality

Under alternative A, Zion National Park and the Bureau of Land Management would continue to manage lands for the protection of water resources. The provisions of section 7 of the Wild and Scenic Rivers Act would continue to be followed to ensure protection of free-flowing conditions. The strategies also include complying with Clean Water Act section 404 permitting and state stream alteration permitting; managing water quantity and for park management consistent with the provisions of the Zion National Park Water Rights Settlement Agreement. This document recognizes existing non-NPS water rights on Pine Spring Wash and Wolf Spring Wash and a number of off-channel water rights on the larger basin that probably cause a small unquantified reduction in groundwater discharge. The amount of reservoir storage in the basin is very small, so patterns of flooding and spring runoff are largely natural. In addition to the agreement, the state manages the Virgin River basin as if it were fully appropriated, providing a level of protection to flows that is generally greater than by the agreement.

The U.S. Geological Survey (USGS) maintains river gauges on North Fork Virgin River and East Fork Virgin River—these data are available to park staff. The National Park Service would continue to conduct water quality monitoring on the North Fork Virgin River, East Fork Virgin River, North Creek, and La Verkin Creek inside the park.

Ecological Processes ORV (Vegetation)

Under alternative A, the park and Bureau of Land Management would continue to work with others to control tamarisk and Russian olive to promote native riparian vegetation. The National Park Service would continue to monitor channel morphology, riparian vegetation, and groundwater on East Fork Virgin River (integrated riparian monitoring).

Fish and Wildlife ORVs (including Threatened and Endangered Species)

Under alternative A, the park would continue to implement seasonal visitor use closures for nesting peregrine falcons. The National Park Service and Utah Division of Wildlife Resources would continue to monitor native fish populations yearly and respond to threats to those populations.

Desert bighorn sheep are currently monitored outside the park every two years by the Utah Division of Wildlife Resources. It is likely this would continue into the future. The National Park Service would continue to monitor the Mexican spotted owl, peregrine falcon, and California condor.

There is currently no monitoring of aquatic invertebrates, but baseline data exist for East Fork Virgin River, La Verkin Creek, North Creek, and part of North Fork Virgin River.

Scenic ORV / Visual Resources / Viewsheds

Under alternative A, the park would continue to use facilities such as designated trails and directional fencing to route people away from sensitive natural and cultural resources, while permitting access to important areas. The park would also consider scenic resources as part of all planning and compliance documents. The park would implement a new standard for climbing bolts in tributaries with scenic ORVs. NPS Director's Order 41: *Wilderness Stewardship* clarifies how climbing activities should be managed for wilderness, and this direction would apply to segments of the river corridor that overlap with wilderness designations. Director's Order 41 specifies that "climbing management strategies will address ways to control, and in some cases reduce, the number of fixed anchors to protect park wilderness resources or to preserve the 'untrammeled,' 'undeveloped,' and 'outstanding opportunities for solitude' qualities of the park's wilderness character." Removing bolts within the river corridor would also enhance the scenic ORV.

Under alternative A, all wild and scenic river segments within designated wilderness are designated class I under BLM visual resources classification (BLM Manual Handbook 8410-1).

Oak Creek and segments of Kolob Creek and Willis Creek are outside designated wilderness. These segments would retain their class II VRM classification.

Recreational ORV / River-related Visitor Use and Experience

Under alternative A, visitor use management would continue according to agency plans, NPS policies and regulations, BLM policies and regulations, the Wilderness Act, and the Wild and Scenic Rivers Act. Although the general management plan provides general direction for protection of resources and visitor experience, this direction is not specific to the protection of river values. Under alternative A, the park would continue to monitor for effects to wilderness character as identified in the *Zion National Park Backcountry Management Plan* (2007). The monitoring would be carried forward for segments that overlap with wilderness zones to maintain consistency in monitoring and management efforts across plans. Education and outreach would continue across all segments without a special focus on river values.

There is a need to create indicators and standards for Zion Canyon and other areas outside wilderness. Zion National Park is currently monitoring various aspects of visitation numbers and types of use, including overall visitation, lodge occupancy, shuttle boarding, horseback riding concession users (1-hour and 3-hour rides), boating permits (44 permits in 12 years), and wilderness permits (overnight and day use for canyoneering).

Although specific visitor use numbers are not available for the BLM segments, professional assessment of the existing monitoring data for other resources, including wilderness character, demonstrate that visitor use is low. The Bureau of Land Management would continue to monitor for wilderness character.

Park Operations

Under alternative A, the National Park Service would continue to provide operations and support for administrative services, resource management, interpretation of park resources, park facilities maintenance, visitor protection, and emergency services throughout the park as outlined in the park's general management plan. The park would continue the minimum requirement program to evaluate park management actions that could adversely affect wilderness character.

Maintenance operations would continue with maintenance of buildings, entrance stations, employee housing, campgrounds, water and sewage systems, road maintenance, garbage collection, NPS vehicle fleet, and more than 90 miles of trails. Many of these activities directly or indirectly affect water quality, free-flowing condition, or other river values. Water quality monitoring would continue as part of water supply and wastewater treatment operations. Visitor protection operations would continue to include frontcountry and backcountry rangers, a communications center, fee operations, and the fire program. Rangers would continue to conduct regular patrols of the park and be responsible for protection, emergency services, and structural fire response. Visitor protection directly relates to the enjoyment of the recreation outstandingly remarkable values and the safety of visitors within the wild and scenic river corridor as well as monitoring visitor use patterns to ensure indicators are within standards. The resource management division would continue with the protection of cultural and natural resources in the park through management of wildlife, vegetation, cultural resources, hydrology, geology, and providing support for GIS, planning, and environmental compliance. These efforts support protection and enhancement of fish and wildlife, ecological processes, and cultural river values. The division of interpretation would continue to provide the public with educational and recreational experiences within the park, including education on wild and scenic rivers and how visitors can help protect river values. Administrative services would continue to be responsible for budget and finance, payroll, computer support, human resources, NPS mail, procurement, property, and telecommunications.

Concession and other commercial use would continue to operate. The lodging, dining, and gift shop would continue to operate in Zion Canyon. Horseback rides would continue to be offered seasonally, and the current shuttle service would continue in the park and the adjacent town of Springdale from April through October.

Bureau of Land Management Operations

Under alternative A, the Bureau of Land Management would continue managing areas within river segment boundaries as identified in existing plans, policy, regulations, and laws. Most of the designated wild and scenic rivers are within designated wilderness. Refer to table 5 for a summary of existing management actions. These management actions would be the same for all alternatives. "Chapter 3: Affected Environment" provides additional information on these management actions.

All BLM actions for all alternatives would comply with policies outlined in *BLM Manual 6340—Management of Designated Wilderness Areas* (July 2012) and *BLM Manual 6400—Wild and Scenic Rivers—Policy and Program Direction for Identification, Evaluation, Planning, and Management* (July 2012). Wilderness designation of the adjacent

public lands confers a high level of protection from human-caused impacts for the ORV values of these river segments. Management of wilderness would generally eliminate motorized and mechanized vehicle and equipment usage, lessening the potential for water quality impacts, soil erosion, vegetation loss, impacts on ecological values, and wildlife species. Developments, structures, and facilities could not be authorized that would impair wilderness values, thereby protecting the naturalness, scenic qualities, and cultural values. Recreational, scenic, scientific, education, conservation, and historic uses must be conducted so as not to impair wilderness values. While livestock grazing may continue in designated wilderness on public lands, management actions must be conducted by the operators, using nonmotorized and nonmechanized methods, unless specifically authorized through an approved wilderness management plan or on a case-by-case basis. These restrictions on land uses and activities will benefit long- and short-term protection of various river values.

TABLE 5. BLM EXISTING MANAGEMENT ACTIONS

WSR Segment	OHV and Mountain Bike Designation	Fluid Mineral Management	Locatable Mineral Management	Mineral Materials Management	Rights-of-Way	Visual Resource Management
Deep Creek—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
Oak Creek—nonwilderness	Closed	Category 3—no surface occupancy	Open—with plan of operation	Closed	Avoidance Area	Class II
Kolob Creek—within wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
Kolob Creek—nonwilderness	Closed	Category 3—no surface occupancy	Open—with plan of operation	Closed	Avoidance Area	Class II
Goose Creek—within wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class I
Goose Creek—nonwilderness	Closed	Category 3—no surface occupancy	Open—with plan of operation	Closed	Avoidance Area	Class II

TABLE 5. BLM EXISTING MANAGEMENT ACTIONS

WSR Segment	OHV and Mountain Bike Designation	Fluid Mineral Management	Locatable Mineral Management	Mineral Materials Management	Rights-of-Way	Visual Resource Management
North Fork Virgin River—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
La Verkin Creek—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
Beartrap Canyon—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
Middle Fork Taylor Creek—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1
Willis Creek—nonwilderness	Closed	Category 3—no surface occupancy	Open – with plan of operation	Closed	Avoidance Area	Class II
Smith Creek—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class I
Shunes Creek—wilderness	Closed	Closed	Withdrawn	Closed	Exclusion Area	Class 1

EXISTING TYPES AND LEVELS OF DEVELOPMENT

The types and levels of development varies from almost no development on the wild segments of La Verkin Creek, North Creek, and East and North Forks Virgin River (above the Temple of Sinawava) to more substantial development on the recreational segment of North Fork Virgin River. The following segment-by-segment description provides a summary of existing types and levels of development for the various designated segments. This narrative description of the development reflects existing conditions. Changes to the facilities are not expected under alternative A. Existing maintenance and repairs would continue, but subject to WSRA section 7 analysis.

North Fork Virgin River above the Temple of Sinawava and Tributaries (Wild Segment)

The wild segment of North Fork Virgin River and its tributaries includes undeveloped routes leading visitors through narrow slot canyons. Although no formal trail system exists, these routes provide visitors access to the upper reaches of the Virgin River. Development in this segment is limited to 12 designated wilderness campsites for overnight visitors. The only developments in Goose Creek, Deep Creek, Kolob Creek, Orderville Canyon, Imlay Canyon, Mystery Canyon, and Oak Creek are informal routes and bolts for canyoneering. The flow through Kolob Creek is controlled by the Washington County Water Conservancy District. When water is needed downstream, the Washington County Water Conservancy District releases water from Kolob Reservoir, which flows through Kolob Creek into the North Fork Virgin River. There is no development on BLM lands within the boundaries of the designated river segments.

North Fork Virgin River below the Temple of Sinawava and Tributaries (Wild and Recreational Segment)

The recreational segment of the river in Zion Canyon is the most developed section of the wild and scenic river in the park. Major development within the segment includes the park visitor center, administrative facilities, maintenance facilities, Zion Lodge, shuttle, facilities, and housing for park and concession employees. Associated with these structures are water pipelines, sewerlines, underground telecommunication lines, underground electric power, spring developments, small dams in the river, river diversion structures, irrigation ditches, and water storage tanks. This segment also contains much of the park's transportation infrastructure including the Zion Canyon Scenic Drive and the Zion-Mount Carmel Highway covering nearly 24 miles of roads.

There are 9 shuttle stops, 21 bridges, and 19 miles of developed trails. Overnight visitor accommodations include 320 campsites at the Watchman and South campgrounds, as well as 82 rooms at Zion Lodge. Other visitor services include horse stable facilities for the horseback riding concession, two restaurants in Zion Lodge, three picnic areas, and nine trailheads. Bolts for climbing and canyoneering can be found at Oak Creek, Birch Creek, Behunin Canyon, Echo Canyon, Heaps Canyon, Pine Creek, and on cliffs along the main stem of the North Fork below the Temple of Sinawava.

Administrative facilities in the segment are clustered near the mouth of Oak Creek Canyon. This area includes an administrative building and museum, emergency operations building, maintenance buildings clustered around a storage yard, park housing, and additional office space.

Additional structures in this segment include historic levees and rock-filled gabions (wire containers), which are preventing the river from infiltrating the floodplain. These structures, which date to the 1920s, are primarily in place near Zion Lodge. Other structures in this segment having an impact on stream hydrology include pipeline crossings and cemented boulders.

East Fork Virgin River and Tributaries (Wild Segment)

The East Fork Virgin River and Shunes Creek were designated as a Research Natural Area in 2001. The area has been set aside for research purposes and is closed to recreation. The only development in the canyon is a stream gauge. There are no developments on the BLM portion of Shunes Creek.

North Creek and Tributaries (Wild and Scenic Segment)

The wild segments of North Creek and its tributaries remain relatively undeveloped. While the segment contains no facilities, it is crossed by 5 miles of visitor-created routes that are managed to prevent erosion and loss of vegetation. Bolts for canyoneering are on the Left Fork of North Creek, the Right Fork of North Creek, Russell Gulch, and Wildcat Canyon / Blue Creek.

There are various developments associated with the scenic segments. These include dirt roads to private property, water pipelines to private property, fences, stock pond, culverts, and abandoned rock dam (reservoir behind dam filled with sand).

La Verkin Creek and Tributaries (Wild Segment)

La Verkin Creek and the tributaries in the park contain limited development including 11 miles of developed trails along La Verkin Creek, 6.5 miles of trails in Hop Valley, 13 designated campsites along La Verkin Creek, and 2 designated campsites in Hop Valley—one that accommodates horses. The area is accessed from two trailheads, both outside the river corridor.

The BLM segments of La Verkin Creek north and south of the park (Smith Creek, and Willis Creek) have no developed trails or designated campsites. There are no livestock grazing developments within any of the wild and scenic river boundaries.

Taylor Creek and Tributaries (Wild and Scenic Segment)

The Taylor Creek segment is accessed via Kolob Canyons Road, which runs for about 1.5 miles alongside the segments. Other development in the river corridor includes less than 2 miles of developed trails, two trailheads, and three historic cabins. Bolts for climbing and canyoneering are located at North Fork Taylor Creek and South Fork Taylor Creek. There are no developments on the BLM segment.

ALTERNATIVES B AND C: COMMON TO BOTH ACTION ALTERNATIVES

All the management actions in alternative A that are protective of river values would continue in alternatives B and C. The following broad-based management strategies are common to both action alternatives. The reason for this is wild and scenic river management requirements permit only a narrow range of alternative approaches, similar to the range of approaches permitted under the Wilderness Act. Some differences in the alternatives occur where public comments suggested varying approaches. Best management practices for both alternatives are listed together to avoid redundancy.

Free-flowing Condition and Water Quality

In the action alternatives, the National Park Service and Bureau of Land Management would protect and enhance water resources, including free-flow through a variety of actions and goals. This would include, but not be limited to,

- continue to evaluate projects and activities to ensure consistency with wild and scenic river designation (see section 7 evaluation guideline)
- reducing fecal contamination in rivers from external and internal sources so that waters meet standards and can be enjoyed by the public with normal precautions
- reducing cattle trespasses
- managing irrigation practices in the park so that the quantity of water

diverted from the river can be reduced, while protecting federal water rights

- exploring the possibility of changing the configuration of irrigation water delivery systems so that one diversion dam can be removed
- seeking funding and state support to expand the number of river segments that are monitored for water quality
- maintaining natural patterns of water quality while meeting standards in all wild and scenic river segments and where needed develop strategies to bring deficient segments into compliance
- complying with the Clean Water Act section 404 permitting process plus state stream alteration permitting
- managing stormwater runoff to reduce water contamination
- planning and installing bioretention basins to capture runoff from roads and other hardened areas
- taking inventory of stormwater discharge locations (from roads and parking areas) and evaluating opportunities to reduce impact
- allowing blockage by natural rockfall and landslide dams to remain in place until removed by natural erosion unless they present a significant safety hazard

Ecological Processes ORV (Vegetation)

In the action alternatives, the agencies would protect and enhance ecological processes through the following actions:

- identifying and implementing restoration opportunities
- limiting access to hanging gardens to reduce invasion of nonnative plants and to minimize trampling
- restoring natural cottonwood and riparian recruitment through promotion of natural floodplain function
- designating public access to river and eradicating visitor-created trails (social trails) to limit erosion and vegetation loss
- restoring natural habitat where opportunities exist
- allowing blockage by natural rockfall and landslide dams to remain; if there were a need to remove natural dams, a section 7 determination would be made prior to removal of the dam unless an emergency exists

Fish and Wildlife ORVs (including Threatened and Endangered Species)

Fish and wildlife have been identified in the action alternatives. Zion National Park and the Bureau of Land Management would protect and enhance these values through the following actions:

- monitoring fish populations and identifying threats (e.g., maintaining channels free of artificial barriers for fish movement)
- maintaining the configuration of diversion dams so that they are passable by native fish in both directions during high flows

Scenic ORV / Visual Resources / Viewsheds

The unparalleled scenery of the Virgin River and its tributaries has been identified as an outstandingly remarkable value—an important characteristic that makes this river system worthy of protection under the Wild and Scenic Rivers Act. To ensure the protection of this iconic scenic landscape, the following set of scenery conservation

measures would be implemented under all action alternatives:

- evaluating the compatibility of existing and any newly proposed developments to protect scenic river values; facilities would be designed, sited, and constructed to avoid visual intrusion; facilities for water resource projects would be designed, sited, and constructed to eliminate any visual intrusion
- minimizing use of signs within the designated river corridors; when signs are necessary, maintaining a consistent theme and placing them in areas that minimize visual impacts
- utilizing vegetation treatments to screen and blend structures with the natural landscape
- designing and maintaining developed and dispersed recreation sites to reduce visibility from designated rivers
- emphasizing the use of natural materials (e.g., vegetation, rocks, and wood) for erosion control and bank stabilization efforts to maintain the natural appearance of the river corridor; structures would be designed to minimize visual intrusions to the maximum extent possible
- using facilities, where appropriate, such as designated trails and directional fencing to route people away from sensitive natural and cultural resources, while permitting access to important visitor use areas

In addition to the above measures, the Bureau of Land Management would manage the river segments to reflect their visual resource class objectives. These include: (1) class I—to preserve the existing character of the landscape (the level of change to the characteristic landscape should be very low and must not attract attention); and (2) class II—to retain the existing character of the landscape (the level of change to the characteristic landscape should be low). Class I includes all segments within designated wilderness. Class II includes segments not in wilderness.

Recreational ORV / River-related Visitor Use and Experience

In the action alternatives, the National Park Service and Bureau of Land Management would emphasize efforts that enhance river-related visitor use and experience (recreational values) and interpretation as well as provide education to reduce impacts from visitor use to river values. This would include:

- incorporating good visitor use and management practices
- emphasizing Leave No Trace principles and practices with increased education and enforcement, especially in The Narrows
- increasing efforts to remove trash
- increasing educational opportunities for cultural resources (i.e., human history, land use) pertaining to water use and river environments
- incorporating wild and scenic rivers / outstandingly remarkable values in interpretative themes to increase educational and interpretive emphasis and opportunities to allow visitors to better understand and appreciate the experience
- formalizing approved process for flow limits for hikers, canyoneers, and boaters
- considering removal of horse use from the park, which would decrease trail erosion and improve water quality
- ensuring future visitors would have the same wilderness and wild and scenic river experience as those today
- issuing wilderness permits to manage use in the wilderness; wilderness

character monitoring program to track and improve condition over time

- maintaining types and levels of public access where protective of river values and implementing visitor use management tools to reduce visitor caused impacts to river values when necessary
- continuing to monitor impact of visitor use
- considering expanded permit system to manage capacity
- maintaining relevance through technology/media/outreach
- providing greater diversity of experience for a variety of abilities, interests, and cultures
- building advocacy by increasing opportunities and education

Park Operations

In the action alternatives, the park staff would consider actions to protect river values. This would include working cooperatively with adjacent landowners, federal agencies, and the State of Utah toward

- empowering and encouraging park staff to make recommendations to improve outstandingly remarkable values
- ensuring natural channel design is incorporated in planning processes
- removing river levees or other human–made structures in some locations to return river to a more natural flow
- avoiding construction of new buildings, bridges, roads, or similar facilities in the floodplain; if bridges are proposed they should be designed and built to span the waterway and not impede free-flowing condition
- keeping bank stabilization to the minimum necessary to protect life and facilities (linear feet of bank stabilization would not increase above baseline at time of designation and opportunities to reduce bank stabilization would be explored)
- designing bank stabilization to use natural materials when possible
- allowing natural obstacles (e.g., large woody debris), to remain and only removing them if they create a safety issue and if such action would not have a "direct and adverse" of river values
- identifying flood hazard areas and the character of the risk and manage to minimize conflict
- informing project planners of wild and scenic river guidelines for development in river corridor
- continuing the minimum requirement program to evaluate actions impacting wild character and/or prohibited uses (motorized, mechanized)
- evaluating activities for compliance with sections 7 and 10 of the Wild and Scenic Rivers Act

Bureau of Land Management Operations

BLM operations for alternatives B and C would be the same as those identified in alternative A.

Types and Levels of Development

As required by the Wild and Scenic Rivers Act, the National Park Service and Bureau of Land Management would ensure future development, if any, is compatible with the river classification and protection of river values. The park and Bureau of Land Management would use the following practices:

- Protecting the scenic outstandingly remarkable value by reducing glare from climbing bolts and creating an authorization process for climbing bolts according to Director's Order 41: *Wilderness Stewardship*, which could be programmatic approval (for National Park Service only). NPS Director's Order 41 clarifies how climbing activities should be managed for wilderness, and this direction would apply to segments of the river corridor that overlap with wilderness designations. Director's Order 41 specifies that "climbing management strategies will address ways to control, and in some cases reduce, the number of fixed anchors to protect the park's wilderness resources or to preserve the 'untrammeled,' 'undeveloped,' and 'outstanding opportunities for solitude' qualities of the park's wilderness character." Removing bolts within the river corridor would also enhance the scenic ORV.
- Maintaining access through private property by increasing involvement with other land managers within the watershed.
- Designing future developments so that they protect and enhance water quality, free-flowing condition, and the outstandingly remarkable values for which the river was designated.
- Focusing development of trails in areas with durable tread, i.e., slickrock, basalt.
- Ceasing development within river corridors.
- Evaluating projects for compliance with sections 7 and 10 of the Wild and Scenic Rivers Act.

Visitor Use Management Capacity

Directive for Addressing Capacity on Wild and Scenic Rivers. Federal agencies administering wild and scenic rivers are required to prepare a comprehensive river management plan for the protection of river values, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of the Wild and Scenic Rivers Act. Specifically, the agencies are required to address user capacities in comprehensive river management plans to protect river values including outstandingly remarkable values, free-flowing condition, and water quality. This section of the comprehensive management plan addresses the user capacity requirement of the Wild and Scenic Rivers Act.

Requirements of the Wild and Scenic Rivers Act and Interagency Guidelines. The Wild and Scenic Rivers Act, section 3(d)(1), requires all comprehensive management plans to address user capacity. The *Department of the Interior and Agriculture Interagency Guidelines for Eligibility, Classification, and Management of River Areas* define capacity as

> . . . the quantity of recreation use which an area can sustain without adverse impact on the outstandingly remarkable values and free-flowing character of the river area, the quality of recreation experience, and public health and safety.

The guidelines for river areas direct that wild and scenic river plans would state the kinds and amounts of use the river can sustain without impact on the values for which it was designated. The guidelines further elaborate on the capacity mandate by requiring the managing agency to implement the following:

- **User Capacity.** Studies would be made during preparation of the management plan and periodically thereafter to determine the quantity and mixture of recreation and other public use that can be permitted without adverse impact on the resource values of the river area.

- **Public Use and Access.** Public use would be regulated and distributed where necessary to protect and enhance (by allowing natural recovery where natural resources have been damaged) the resource values of the river area. Public use may be controlled by limiting public access to the river, by issuing permits, or by other means available to the managing agency through its general statutory authorities.

A recent lawsuit has provided further guidance on how to address user capacity in a wild and scenic rivers comprehensive river management plan. In March 2008, the United States Court of Appeals for the Ninth Circuit rendered a judgment stating

> [t]he plain meaning of the phrase "address. . .user capacities," is simply that the CRMP [comprehensive river management plan] must deal with or discuss the maximum number of people that can be received at a WSR [wild and scenic river].

The National Park Service and Bureau of Land Management are required to establish capacities consistent with both the Wild and Scenic Rivers Act and the Interagency Guidelines. The plan must describe the actual levels of visitor use that would not degrade the river values.

Process for Addressing Visitor Use Management and Capacity. It is important to note that this plan uses the term "visitor capacity" to be synonymous with the term "user capacity" (a required component for comprehensive river management plans per the Wild and Scenic Rivers Act and Interagency Guidelines). This comprehensive management plan used a visitor use management process that is defined as a proactive and adaptive process of planning for and managing characteristics of visitor use and its physical and social setting using a variety of strategies and tools to sustain desired conditions for river values. Visitor use characteristics include the amount, type, timing, and distribution of visitor use, including visitor activities and behaviors. Visitor capacity is a component of visitor use management consisting of the maximum amounts and types of visitor use that an area can accommodate while sustaining desired resource conditions and visitor experience, consistent with the purpose for which the area was established. In short, visitor use management strives to maximize the benefits of visitor use while meeting resource and experiential protection goals. This planning and management process provides the framework within which visitor capacity should be addressed when necessary. This process included the development of indicators, standards, and management strategies and specified the kinds and amounts of use each segment could sustain without impact on river values. Indicators are measurable variables that are monitored to track changes to river values caused by human activity. Standards are the minimum acceptable condition for the indicators and are protective of river values. The comprehensive management plan also identifies management actions that would be taken to achieve management goals and objectives and therefore protect river values. Indicators are monitored and management actions are taken as appropriate. As monitoring of conditions continues, managers may decide to modify or add indicators if better ways are found to measure important changes in river conditions. There are also a variety of reasons in which changes to visitor capacity may be necessary, including results of monitoring, identification of more appropriate indicators and standards for river values, clarification of the relationship between the level of use and river values, changes in visitor use patterns that could affect river values, and changes in original assumptions such as management actions to be taken. Information on monitoring efforts, related visitor capacity management actions, and any changes to the indicators and standards would be available to the public.

The specific visitor use management process used for the development of indicators, standards, management strategies, and visitor capacities for the Virgin River segments is described as follows:

- Review and understand the outstandingly remarkable values of the Virgin River and related management goals and objectives (see chapter 1 for an overview of the plan's goals and objectives).
- Understand the existing state of knowledge related to visitor influences on the outstandingly remarkable values, free-flowing condition, and water quality.
- Identify the critical elements of river-related visitor experience and resource conditions that may serve as visitor capacity indicators and that would inform the potential kinds and amounts of visitor use to be considered in the plan.
- Prioritize the list of potential visitor capacity indicators within the corridor and develop a range of standards for inclusion in the plan.
- Identify management strategies that could be applied for each priority visitor capacity indicator.
- Determine the kinds and amounts of use that can be accommodated for each river segment.
- Establish a capacity for the river area to receive visitors.

Indicators, Standards, Monitoring, and Adaptive Management Strategies. The condition of river values and resources is already being monitored and managed in various ways; however, the following indicators would help the agency staff monitor specific visitor use influences on river values. Table 6 includes the indicators, standards, monitoring schedules, and potential management strategies. The planning team considered many potential issues and related indicators that would identify impacts of concern, but those described below were considered the most significant, given the importance and vulnerability of river values associated with and affected by visitor use. All river values were considered when developing indicators; however, only indicator topics with visitor-related issues or impacts were carried forward. For example, visitors do not cause impacts to geologic processes in the river corridor; therefore, there is not an indicator related to geologic values. Standards were also assigned, taking into consideration the qualitative descriptions of the management goals and objectives, data on existing conditions, relevant research studies, staff management experience, and scoping on public preferences. For each of the seven indicators used in this comprehensive management plan, a summary of the indicator and the rationale for applying it are described herein.

Table 6 summarizes the indicators, standards, management strategies, and appropriate kinds and amounts of use for the Virgin River corridor, as developed using the visitor use management and capacity process (described above). Although there are currently no use limits or numerical capacities for some areas of the Virgin River corridor, park managers discussed appropriate levels of use by evaluating and then articulating the following: (1) management goals and objectives; (2) major concerns related to kinds and amounts of use/impacts to river values; (3) possible indicators, standards, and management strategies related to use; (4) whether current conditions are being maintained within standard; and (5) the indicator that would be most protective of all river values while also serving as proxy for determining appropriate kinds and amounts of use.

Indicators are measureable variables that are monitored to track changes to river values caused by human activity. Standards are the minimum acceptable condition for the indicators and are protective of river values.

The comprehensive management plan also identifies management actions that would be taken to achieve management goals and objectives and therefore protect river values. A problem analysis would occur to determine most effective management strategies depending on context, and strategies would be implemented using a phased approach from least stringent (indirect actions) to most stringent actions, as listed in table 6. The target for appropriate kinds and amounts of use (as described after table 6) was determined by clarifying whether use levels could increase, should decrease, or if current levels should be maintained in order to protect all river values (including the recreational ORV).

Even if an indicator variable for a river segment is currently below the standard that would trigger management action, it is still included in the table and would be monitored because future visitor use could increase, management policies and actions could change, or new technologies could emerge. Any of these and other unknown actions could cause the standard for an indicator variable to be exceeded. This would not necessarily be known if monitoring was not performed.

The priority indicators for the Virgin River and its tributaries would be monitored within the corridor and are associated with the following issues:

- crowding
- human waste
- visitor-created trails
- evidence of adverse effect of human visitation
- campsite damage
- wildlife presence
- unhealthful *Escherichia coli* (*E. coli*) levels

Crowding—

- The indicator of crowding and its related standards is protective of the recreational outstandingly remarkable value.

- Crowding is one of the most frequently studied topics related to visitor use (Manning 1999) and has been evaluated extensively to better understand user capacity. Crowding is defined as "the negative and subjective evaluation of a use level" (Manning 1999). Crowding may occur when use levels increase to the point at which they interfere with visitors' chosen activities and intentions (Manning 2007).

- Aspects of crowding within the Virgin River corridor can be evaluated in several ways, depending on the type of activities and recreational setting each of the river segments provide. The indicators of crowding vary depending on river segment and alternative, but generally address the number of encounters visitors have with other visitors. Standards for these indicators can include how many people at one time (PAOT) are present in an area, how many people per day are present in an area, or the number of people a visitor encounters along a trail.

- The presence of crowding at specific sites or along trails within the Virgin River corridor can influence recreational ORVs / river-related visitor use and experience in a variety of ways. High numbers of people in the same area can lead to elevated noise levels, competition for sites, and even safety issues. By monitoring and implementing standards associated with crowding, the opportunity to experience serenity, solitude, and general enjoyment are safeguarded.

- Monitoring efforts for these crowding-related indicators vary by river segment and alternative, but may include sampling of visitors and visitor counts. Management strategies can include expanding education and interpretation efforts, modifying infrastructure such as route and trail improvements, closing excess or visitor-created trails, limiting access with permitting quotas, or managing use by varying shuttle bus schedules.

Human Waste—

- The indicator of the presence of human waste and its related standards is protective of the recreation outstandingly remarkable value.

- The presence of human waste can have an effect on visitors, the environment, and agency staff (Ketcham 2001). The topography of the canyons does not allow pit or other varieties of toilets to be readily available to visitors. The resulting presence of human waste is therefore highest during peak visitation times.

- Standards relating to this indicator vary by river segment. The State of Utah does not apply water quality standards to ephemeral streams. Implementation of these standards is needed to protect the recreation outstandingly remarkable value and the water quality of this water system. Recreational experiences as well as the health and safety of managers would be safeguarded by these standards.

- Management strategies for all affected river segments would first include education on the importance of human waste removal. Human waste removal requirements could be implemented if additional management strategies are needed.

Visitor-created Trails—

- The indicator of visitor-created trails and its related standards is protective of the recreation, scenic, ecological processes, and wildlife outstandingly remarkable values within the river corridor.

- *Visitor-created trails* are defined as trails where more than one visitor has visibly deviated from the maintained (formal) trail and trampled more than 50% of the existing vegetation (USGS 2008). These trails can lead to impacts on areas adjacent to the trail, such as erosion, compaction of soils, loss of vegetation, and the creation of disturbed areas that are prime habitat for invasive species.

- Monitoring the number of visitor-created trails would allow agency staff to ensure that resources adjacent to designated trails are not being adversely impacted. Standards for this indicator vary by river segment and alternative.

- Management strategies related to this indicator can include visitor education (such as Leave No Trace) and physical trail barriers. A further management strategy, if the previous actions are insufficient, can include limiting visitor use.

Evidence of Adverse Effect of Human Visitation—

- The indicator of evidence of adverse effect of human visitation and its related standards is protective of the cultural outstandingly remarkable value within the river corridor.

- Evidence of adverse effect of human visitation can result from both intended and unintended actions. The protection of cultural resources along designated river segments would be ensured with the implementation of this indicator.

- For all river segments and alternatives, the standard relating to this indicator would be for no evidence of adverse effects of human visitation to be present. The first management strategy to achieve this standard could be visitor education. Further strategies, if needed, could include limiting access to sites, limiting access to a larger area, placement of physical barriers around the site, and development and placement of signs.

Campsite Damage—

- The indicator of campsite damage, and its related standards, is protective of the ecological processes and recreation outstandingly remarkable values within the river corridor.

- Human activities associated with camping have the potential to influence the ecological processes of the Virgin River and tributaries. There are four indicators associated with campsite damage: (1) area of campsite disturbance, (2) number of trails that connect to the campsite boundary, (3) human waste, and (4) the number of identifiable campsites by trail system (nondesignated camp areas).

- Standards related to this indicator vary by river segments.

- Management strategies associated with campsite damage could begin with education. If further actions are needed, strategies could include the delineation of sites, reduction of group size, requirements of visitors concerning human waste removal, campsite relocation, temporary campsite closure, and permanent campsite closure.

Wildlife Presence—

- The indicator of the presence and productivity of wildlife and its related standard is protective of the wildlife outstandingly remarkable value within the river corridor.

- Important species such as the Mexican spotted owl, peregrine falcon, desert bighorn sheep, and California condor are found along the Virgin River and tributaries.

- Standards pertaining to wildlife presence and productivity vary by river segment. In segments where this indicator applies, the standard of no evidence of adverse effect from human activity would be implemented.

- Management strategies for this indicator can include education, reduction of group size, limits on the number of day hikers, limits of day use beyond a certain location, and closure of the canyon during critical wildlife periods, i.e., nesting, breeding, and migration.

Unhealthful E. coli Levels—

- The indicator of unhealthful *E. coli* levels and its related standards is protective of the water quality river value.

- *Water quality* is the combined chemical, physical, and biologic conditions of a body of water. Water quality is important for the function of aquatic life forms and for human

recreation use (USEPA 2011). The Clean Water Act and the Water Quality Act of 1987 authorize the U.S. Environmental Protection Agency to regulate water quality standards. Water quality can be established through sets of water quality criteria. One such criterion, which is influenced by human activity and therefore visitor use, is the level of fecal coliform contamination indicative of *E. coli* concentration.

- Indicator bacteria are widely accepted as an indicator of fecal contamination and of the risk of contracting enteric diseases from exposure to contaminated water. *E. coli* and other fecal bacteria are found in the gut of warm-blooded animals, including humans. Millions of these bacteria are expelled each time the animal defecates, and once expelled into the environment, they begin to die off at a rate similar to that of many disease-causing bacteria. Because *E. coli* can also be easily enumerated through standard laboratory methods, they become the accepted indicator of fecal contamination for which the U.S. Environmental Protection Agency and the State of Utah have established standards. The park and state would take actions to identify contamination sources and correct the problems when *E. coli* levels are found to regularly exceed the standard (occasionally exceeding the standard during flood events—which is considered a normal occurrence on these watersheds—and while unhealthful during the short period that they occur, do not reflect a condition of chronic contamination).

- Standards relating to this indicator vary by river segment and the type of human contact (wading or full-body swimming). Specific monitoring requirements as well as numeric standards relating to *E. coli* are established by the Utah Department of Environmental Quality, Division of Water Quality. The state standards do not apply to ephemeral waters.

- Management strategies related to protecting water quality would be supported by following established monitoring protocols and continuation of routine observations and documentation of improper disposal of human waste and incidents of livestock and wildlife feces near water. Management strategies can include informational signage, education concerning proper disposal of human waste (pack it out), provision of sanitary facilities where possible, and expansion of the current monitoring framework and area.

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Taylor Creek		
Taylor Creek (main segment), North Fork Taylor Creek, and Middle Fork of Taylor Creek (most protective indicator for all river values: crowding) South Fork Taylor Creek (most protective indicator for all river values: presence of wildlife)		
Crowding	All alternatives: 90% of visitors would not see more than 10 other hiker groups per day, group size limited to 12	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about the best times to visit popular areas ▪ Educate visitors about alternative park attractions and sites (disperse use) ▪ Educate visitors on Leave No Trace ethics ▪ Rehabilitate social trails ▪ Provide sign and maps to educate public on hiking routes in North and South Forks of Taylor Creek and increase visitor awareness of hiking opportunities ▪ Reduce the size of the Middle Fork of Taylor Creek parking area ▪ Disperse visitor use to less crowded areas ▪ Reduce group size limit ▪ Limit the number of day hikers on trails (permit system)
Human waste	All alternatives: 50% of the area would have no visible human waste; 90% would have no more than two visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Visitor-created trails	All alternatives: Number of parallel routes: no more than two instances along 90% of route Number of visitor-created routes: no more than four route s per mile Number of access routes to climbing areas: no more than one for each climbing route	Monitoring: Count and document number of routes Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Provide directional trail signs and signs encouraging visitors to stay on trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: No evidence of adverse effect from human visitation	Monitoring: No defined schedule for monitoring. Staff visit and assess site as part of regular wilderness patrols. Adaptive Management Strategies: ▪ Educate visitors about the importance of cultural sites ▪ Increase patrols in problem areas ▪ Limit visitor access to area ▪ Build physical barrier around site ▪ Enact temporary or permanent closure of site / area
Campsite damage	N/A; camping is not permitted in Taylor Creek or tributaries	N/A
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Limit number of day hikers ▪ Limit day use beyond a certain point ▪ Close area during critical wildlife periods
Water quality (unhealthful levels of *E. coli*)	All alternatives: Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of 5 samples not to exceed 206 most probable number (MPN)/100 mL	Monitoring: Observational assessments Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal Investigate for the source of contamination if standard is exceeded

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
AMOUNT OF USE All segments, All alternatives: 40 people per day		
La Verkin Creek		
La Verkin Creek, Timber Creek, Willis Creek, Bear Trap Canyon, Currant Creek, Cane Creek, and Smith Creek (most protective indicator for all river values: crowding) **Hop Valley Creek (most protective indicator for all river values: unhealthful levels of *E. coli*)**		
Crowding	All alternatives: 90% of visitors would not see or hear more than 10 groups per day	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about the best times to visit popular areas ▪ Educate visitors about alternative park attractions and sites ▪ Educate visitors on Leave No Trace ethics ▪ Rehabilitate social trails ▪ Continue monitoring visitor use levels ▪ Reduce group size limits ▪ Limit the number of permits for overnight use ▪ Limit number of day hikers (e.g., permit system)
Human waste	All alternatives: 50% of the area would have no visible human waste; 90% would have no more than two visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Visitor-created trails	All alternatives: Concerning soil loss on route/trail: CSA ≤ 140 square inch Number of parallel routes: no more than two instances along 90% of route Number of visitor-created trails: no more than four per trail mile Number of access routes to climbing areas: no more than one for each climbing route	Monitoring: For designated trails: trail monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 For nondesignated trails / routes, count and document number of obvious campsites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Provide directional trail signs and signs encouraging visitors to stay on trail ▪ Improve route/trail ▪ Close route/trail
Evidence of adverse effects of human visitation to cultural sites	N/A	N/A
Campsite damage	***La Verkin Creek (NPS), Timber Creek, Willis Creek, Bear Trap Canyon, Currant Creek, Cane Creek, and Hop Valley Creek:*** All alternatives: Camping in designated sites only Area of campsite disturbance: area should not increase by more than 3% Number of visitor-created trails connecting to campsite: no more than four trails at 90% of the campsites within camping area Presence of human waste: 50% of campsites within camping area would have no visible human waste; 90% of campsites within camping area would have no more than two visible human waste sites ***La Verkin Creek (BLM) and Smith Creek (BLM):*** No obvious permanent campsites present	Monitoring: For designated campsites: campsite monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 For nondesignated campsites count and document number of obvious campsites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Add natural barriers to delineate designated campsite ▪ Reduce group size for campsite ▪ Relocate campsite ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
		the route or trail ▪ Close area during critical wildlife periods
Water quality (unhealthful levels of *E. coli*)	All alternatives: Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of five samples not to exceed 206 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE ***La Verkin Creek (NPS), Timber Creek, Willis Creek, Bear Trap Canyon, Currant Creek, and Cane Creek:*** All alternatives: 73 people overnight, 40 people per day ***Hop Valley Creek:*** All alternatives: 19 people per night, 6 horses and 20 people per day **La Verkin Creek (BLM) and Smith Creek (BLM):** All alternatives: 73 people overnight, 40 people per day		
North Creek		
Right Fork North Creek (above Barrier Falls) and Wildcat Canyon / Blue Creek (most protective indicator for all river values: crowding)		
Crowding	All alternatives: 90% of visitors would not see or hear more than two groups per day; 90% of visitors hiking will not encounter groups larger than six; group size six	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors ▪ Reduce group size limit ▪ Limit number of hikers on route
Human waste	All alternatives: No visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Visitor-created trails	All alternatives: Concerning soil loss on route/trail: CSA ≤ 140 square inch Number of parallel routes: no more than two instances along 90% of route Number of visitor-created trails: no more than four per trail mile	Monitoring: For routes: monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 Count and document number of routes Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Improve trail / route ▪ Provide directional trail signs and signs encouraging visitors to stay on trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: N/A	N/A
Campsite damage	All alternatives: No obvious permanent campsites present	Monitoring: For nondesignated campsites count and document number of obvious campsites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Designate campsite in at-large camping area ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Water quality (unhealthful levels of *E. coli*)	All alternatives: Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of five samples not to exceed 206 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE 20 people per day		
North Creek (main segment), Right Fork North Creek (below Barrier Falls), Left Fork North Creek, Grapevine Wash, Pine Springs Wash, Wolf Spring Wash, Little Creek, and Russell Gulch		
Crowding	All alternatives: 90% of visitors would not see or hear more than 10 groups per day; group size limit 12	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about alternative areas to visit ▪ Reduce group size limit ▪ Limit number of hikers on route
Human waste	All alternatives: 50% of the area will have no visible human waste. 90% will have no more than two visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste
Visitor-created trails	All alternatives: Concerning soil loss on route: CSA ≤ 140 square inch Number of parallel routes: no more than two instances along 90% of route	Monitoring: For routes: monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 Count and document number of routes Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
		▪ Provide directional trail signs and signs encouraging visitors to stay on trail ▪ Improve route/trail ▪ Close route/trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: No evidence of adverse effect from human visitation	Monitoring: No defined schedule for monitoring. Staff visit and assess site as part of regular wilderness patrols. Adaptive Management Strategies: ▪ Educate visitors about the importance of cultural sites ▪ Increase patrols in problem areas ▪ Limit visitor access to area ▪ Build physical barrier around site ▪ Enact temporary or permanent closure of site/area
Campsite damage	Camping is not allowed on Left Fork North Creek (below Russell Gulch junction) to junction with the Right Fork North Creek; camping along Grapevine, Wolf Springs Wash, Pine Springs Wash, and Little Creek is not allowed Camping is allowed along the Right Fork North Creek All alternatives: No obvious permanent campsite present	Monitoring: For nondesignated campsites count and document number of obvious campsites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Designate campsite in at-large camping area ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods
Water quality (unhealthful levels of *E. coli*)	All alternatives: Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of five samples not to exceed 206 MPN/100 mL	Monitoring: Continue monthly water monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
AMOUNT OF USE ***Right Fork North Creek (below Barrier Falls), North Creek (main segment):*** Alternative B: 26 people per day Alternative C: 30 people per day ***Left Fork North Creek, and Russell Gulch:*** Alternative B: 80 people per day or less Alternative C: 80 people per day ***Grapevine Wash, Wolf Springs, and Little Creek:*** All alternatives: 40 people per day		
North Fork Virgin River above the Temple of Sinawava		
North Fork Virgin River (above the Temple of Sinawava and below Orderville Canyon)		
Crowding	Alternative B: No more than 24 people at one time 75% of the time more than a half mile from shuttle stop Alternative C: No more than 36 people at one time 75% of the time more than a half mile from shuttle stop	Monitoring: Staff will document all visitor encounters at popular visitor sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the best times to visit popular areas ▪ Educate visitors about alternative park attractions and sites (disperse visitor use) ▪ Educate visitors on Leave No Trace ethics ▪ Rehabilitate social trails ▪ Adjust shuttle timing ▪ Adjust commercial use authorization (CUA) tours numbers
Human waste	All alternatives: No more than two visible human waste piles	Monitoring: Count and document number of human waste sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Visitor-created trails	All alternatives: From the end of the Riverside Walk to Orderville Canyon: No more than a 2-foot maximum incision depth Number of visitor-created trails: no more than two over 90% of the route; no increase in the number of visitor-created trails Along the Riverside Walk: no more than 10 visitor-created trails per mile	Monitoring: Count and document the number of routes On one route segment, measure the deepest point on the segment Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Improve route/trail ▪ Close route/trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: N/A	N/A
Campsite damage	N/A – no camping allowed along this section of river	N/A
Presence of wildlife	N/A	N/A
Water quality (unhealthful levels of *E. coli*)	All alternatives: Primary Contact Recreation Class 2A: 30-day geometric mean of a minimum of five samples not to exceed 126 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE Alternative B: 24 people at one time Alternative C: 36 people at one time		
North Fork Virgin (above the Temple of Sinawava and above Orderville Canyon) and Deep Creek (most protective indicator for all river values: crowding) **Orderville Canyon (most protective indicator for all river values: presence of wildlife)**		
Crowding	All alternatives: 90% of visitors would not see or hear more than 10 groups per day Deep Creek:	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about alternative areas to visit

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
	90% of visitors will not see more than two other groups	▪ Reduce group size limit ▪ Limit number of hikers on route
Human waste	50% of the area would have no visible human waste; 90% would have no more than two visible human waste sites	Monitoring: Count and document number of human waste sites Monitor 3-year interval
		Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste
Visitor-created trails	All alternatives: Number of parallel routes: no more than two instances along 90% of route Number of visitor-created routes: no more than four per route mile	Monitoring: Count and document number of routes Monitor on 3-year interval
		Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate visitor-created trails
Evidence of adverse effects of human visitation to cultural site	N/A	N/A
Campsite damage	***North Fork Virgin (above Temple of Sinawava, above Orderville Canyon):*** All alternatives: Camp in designated sites only Area of campsite disturbance: area should not increase by more than 3% Number of visitor-created trails connecting to campsite: no more than four trails at 90% of the campsites within camping area	Monitoring: For designated campsites: campsite monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 For nondesignated campsites count and document number of obvious campsites Monitor on 3-year interval

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
	Presence of human waste: 50% of campsites within camping area would have no visible human waste; 90% of campsites within camping area would have no more than two visible human waste sites. **Deep Creek (BLM):** All alternatives: No obvious permanent campsite present ***Orderville Canyon and Deep Creek (NPS):*** All alternatives: Camping is not permitted on these segments	Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Add natural barriers to delineate designated campsite ▪ Reduce group size for campsite ▪ Relocate campsite ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods
Water quality (unhealthful levels of *E. coli*)	All alternatives: Primary Contact Recreation Class 2A: 30-day geometric mean of a minimum of five samples not to exceed 126 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE ***North Fork Virgin (above Temple of Sinawava, above Orderville Canyon) and Deep Creek:*** All alternatives: 114 people per day ***Orderville Canyon:*** All alternatives: March through August: 50 people per day September through February: 80 people per day		

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Kolob Creek (NPS and BLM), Oak Creek (BLM), and Mystery Canyon (most protective indicator for all river values: eroded access trail) **Imlay Canyon (most protective indicator for all river values: presence of wildlife)**		
Crowding	All alternatives: 90% of visitors would not see or hear more than two groups per day; 90% of visitors would not encounter groups larger than six	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about alternative areas to visit ▪ Reduce group size limit ▪ Limit number of hikers on route
Human waste	All alternatives: No visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste
Visitor-created trails	All alternatives: Concerning soil loss on route/trail: CSA ≤ 140 square inch Number of parallel routes: no more than two instances along 90% of route Number of visitor-created trails: no more than four per trail mile	Monitoring: For designated trails: trail monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 For nondesignated trails / routes, count and document number of obvious campsites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Improve route/trail ▪ Close route/trail

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Evidence of adverse effects of human visitation to cultural sites	All alternatives: NA	N/A
Campsite damage	***Mystery Canyon:*** All alternatives: Camping is not permitted on this segment ***Kolob Creek, Imlay Canyon, and Oak Creek (BLM):*** All alternatives: No obvious permanent campsite present	Monitoring: Count and document number of obvious campsites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Designate campsite in at-large camping area ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods
Water quality (unhealthful levels of *E. coli*)	All alternatives: Primary Contact Recreation Class 2A: 30-day geometric mean of a minimum of five samples not to exceed 126 MPN/100 mL Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of five samples not to exceed 206 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE ***Kolob Creek, Oak Creek (BLM), and Imlay Canyon:*** All alternatives: 20 people per day ***Mystery Canyon:*** All alternatives: 12 people per day		

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
North Fork Virgin River below the Temple of Sinawava		
North Fork Virgin (below the Temple of Sinawava), Echo Canyon (Weeping Rock & Observation Point Trail), Heaps Canyon (Emerald Pools Trail), and Pine Creek (recreational) (most protective indicator for all river values: crowding) **Birch Creek and Clear Creek (most protective indicator for all river values: visitor-created trails)** **Oak Creek (recreational) (NPS) (administrative area, closed to recreation) [NOTE: all segments not in wilderness]**		
Crowding	***North Fork Virgin (below Temple):*** Alternative B: 16,400 people per day and 1,200 people per night Alternative C: 17,100 people per day and 1,200 people per night ***Emerald Pools:*** Alternative B: Visitors would not have more than 115 encounters with others on the way to or at the lower pools and no more than 81 encounters with others on the way to or at the upper pools Alternative C: Visitors would not have more than 135 encounters with others on the way to or at the lower pools and no more than 95 encounters with others on the way to or at the upper pools ***Pine Creek:*** All alternatives: 90% of visitors would not see more than 10 groups per day ***Clear Creek:*** All Alternatives: Visitors would not expect to encounter more than two groups per day ***Birch Creek:*** All alternatives: Visitors would not encounter more than 20 people per day ***Oak Creek:*** Administrative area – This segment is not used by visitors, therefore, standards relating to crowding do not apply	Monitoring: Staff will document all visitor encounters at popular visitor sites Monitor on 3-year interval Adaptive Management Strategies: The most effective management strategies would be chosen for each location, and may vary depending on context: ▪ Educate visitors about high and low use areas of the park and busy times in the park (newspaper and visitor center communications and shuttle driver communications) ▪ Educate visitors about alternative park attractions and sites ▪ Educate visitors on Leave No Trace ethics ▪ Disperse visitor use to less used areas of the park by informing visitors of those opportunities ▪ Conduct transportation and capacity study to enhance the ability to use alternative transportation as an essential element of visitor use management and resource protection ▪ effort) ▪ Rehabilitate social trails

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
		▪ Build new trails ▪ Adjust shuttle timing and stops ▪ Adjust CUA tours numbers
Human waste	All alternatives: No more than two visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval
		Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste disposal system and require visitors to carry out waste
Visitor-created trails	All alternatives: Concerning soil loss on route/trail: CSA ≤ 140 square inch Number of visitor-created trails: no more than 10 per trail mile; no increase in the number of visitor-created trails No more than one route to climbing area ***Emerald Pools:*** No more than 7 perpendicular trails per trail mile ***Clear Creek:*** Number of visitor-created trails from turnout areas would not be more than one per turnout ***Birch Creek (from Virgin River to base of Navajo Sandstone):*** All alternatives: < two visitor-created trails 90% of the time (i.e., braided trails)	Monitoring: For designated trails: trail monitoring protocol as described Trail and Campsite Monitoring Protocol for Zion National Park – February 2008 For nondesignated trails / routes, count and document number of obvious campsites Monitor on 3-year interval
		Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on trail ▪ Eradicate excess trails ▪ Improve route/trail ▪ Build new trail ▪ Close route/trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: No evidence of adverse effect from human visitation	Monitoring: No defined schedule for monitoring. Staff visit and assess sites as part of regular patrols and site monitoring.
		Adaptive Management Strategies: ▪ Educate visitors about the importance of cultural sites ▪ Increase patrols in problem areas ▪ Limit visitor access to area

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
		▪ Build physical barrier around site and may vary depending on context location: ▪ I maintain conditions within standard effective strategies would be used depending Enact temporary or permanent closure of site / area
Campsite damage	All alternatives: Camping in designated campgrounds only.	N/A
Presence of wildlife	All Alternatives: No evidence of adverse effect from human activity.	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods
Water quality (Unhealthful levels of *E. coli*)	All alternatives: Primary Contact Recreation Class 2A: 30-day geometric mean of a minimum of five samples not to exceed 126 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
AMOUNT OF USE ***North Fork Virgin (below Temple):*** 17,100 people per day and 1,200 people per night ***Emerald Pools:*** Alternative B: 115 encounters with others on the way to or at the lower pools and no more than 81 encounters with others on the way to or at the upper pools Alternative C: 135 encounters with others on the way to or at the lower pools and no more than 95 encounters with others on the way to or at the upper pools ***Pine Creek:*** All alternatives: 50 people per day from March through August 80 people per day from September through February ***Birch Creek:*** All alternatives: 20 people per day ***Clear Creek:*** All alternatives: 600 people per day ***Oak Creek(NPS):*** Zero people per day (recreation opportunities are not available on this segment – administrative area)		
Behunin Canyon, Echo Canyon, Oak Creek (wild-NPS), and Pine Creek (wild) (most protective indicator for all river values: presence of wildlife) **Heaps Canyon and Birch Creek (most protective indicator for all river values: crowding) [NOTE: all segments within wilderness]**		
Crowding	All alternatives: 90% of visitors would not encounter groups larger than six and 90% of visitors would not see more than two groups per day	Monitoring: Staff will document all visitor encounters whenever they are in the wilderness Adaptive Management Strategies: ▪ Educate visitors about the best time to visit the area ▪ Reduce group size limit ▪ Limit number of hikers on route
Human waste	All alternatives: No visible human waste sites	Monitoring: Count and document number of human waste sites Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Recommend the use of solid human waste disposal system and encourage visitors to carry out waste ▪ Require the use of solid human waste

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
		disposal system and require visitors to carry out waste
Visitor-created trails	All alternatives: No more than one visitor-created trail over 90% of route Number of access routes to climbing areas: no more than one for each climbing route	Monitoring: Count and document number of routes Monitor on 3-year interval Adaptive Management Strategies: ▪ Educate visitors about the importance of staying on route/trail ▪ Eradicate visitor-created trails ▪ Improve route/trail ▪ Build new trail ▪ Close route/trail
Evidence of adverse effects of human visitation to cultural sites	All alternatives: N/A	N/A
Campsite damage	Camping is not available along other river segments except in Heaps Canyon ***Heaps Canyon:*** All alternatives: No obvious permanent campsites present	Monitoring: Count and document number of obvious campsites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about camping in designated areas only ▪ Designate campsite in at-large camping area ▪ Close campsite
Presence of wildlife	All alternatives: No evidence of adverse effect from human activity	Monitoring; Continue to monitor active sites Monitor yearly Adaptive Management Strategies: ▪ Educate visitors about the importance of protecting wildlife habitat ▪ Limit use beyond a certain point along the route or trail ▪ Close area during critical wildlife periods

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
Water quality (unhealthful levels of *E. coli*)	All alternatives: Primary Contact Recreation Class 2A: 30-day geometric mean of a minimum of five samples not to exceed 126 MPN/100 mL	Monitoring: Continue monthly monitoring Adaptive Management Strategies: ▪ Educate visitors about proper waste disposal ▪ Investigate for the source of contamination if standard is exceeded
AMOUNT OF USE ***Behunin Canyon and Echo Canyon:*** All alternatives: March through August: 12 people per day September through February: 20 people per day ***Pine Creek, Heaps Canyon, and Birch Creek:*** 20 people per day		
East Fork Virgin River		
East Fork Virgin River, Shunes Creek, Goose Creek (most protective indicator for all river values: N/A—no recreational access)		
Crowding	All alternatives: N/A	N/A
Human waste	All alternatives: No visible human waste sites	N/A
Visitor-created trails	All alternatives Research Trips: No permanent obvious visitor-created trails	N/A
Evidence of adverse effects of human visitation to cultural site	All alternatives: N/A	N/A
Campsite damage	All alternatives: N/A Research Trips: No permanent obvious campsites	N/A
Presence of wildlife	All alternatives: N/A	N/A
Water quality (unhealthful levels of *E. coli*)	All alternatives: Secondary Contact Recreation Class 2B: 30-day geometric mean of a minimum of five samples not to exceed 206 MPN/100 mL	Monitoring: Continue monthly monitoring ▪ Investigate for the source of contamination if standard is exceeded

TABLE 6. SUMMARY TABLE FOR KINDS AND AMOUNTS OF USE / INDICATORS AND STANDARDS

Indicator Variable	Standards	Monitoring and Adaptive Management Strategies
AMOUNT OF USE		
All alternatives:		
No recreational access		

Kinds and Amounts of Use. The amount of use an area can sustain depends on its resource characteristics, the type and quantity of use anticipated, and the effectiveness of management actions. The factors that determine how much use is "too much" depend on the conditions being managed and the type of use being considered. This will vary by river segment, each representing a different type of river area providing different use opportunities.

The maximum amount of visitor use that can be received was estimated based on the management objectives, indicators and standards, and related strategies and tools identified for each planning alternative. Maximum use levels may vary by alternative as each has a different prescription of desired conditions and management actions that would accommodate varying kinds and amounts of use.

With indicators and potential standards developed, analyses shifted to further analyzing and understanding the relationships between visitor use and the condition of each river value. In particular, river values and related indicators that would be most sensitive to the effects of visitor use, particularly use levels, were identified. The baseline condition of these indicators was compared to standards to help assess the effect of existing use levels. This process helped determine if use levels could be allowed to increase or needed to be lowered in different areas within the river corridor. This process helped determine maximum use levels (see table 6) that would keep impacts below standards, protecting river values.

Maximum use levels can be estimated and articulated in a variety of ways depending on the nature of the use in a particular segment. For example, overnight use can be stated as the total maximum capacity of lodging, camping, and wilderness permits. Day use can be stated as the number of people per day or people at one time.

There are some areas within different segments of the river corridor where use levels have been a concern for protection of river values. Park staff has conducted studies and monitoring to assess the condition of river values related to visitor use in some these areas. This data has contributed to existing visitor use management strategies, such as the wilderness permitting system, which has proven to be effective at protecting river values. The park has also implemented other actions to reduce crowding in the wilderness such as reducing the parking lot size at the Taylor Creek trailhead. Through wilderness character monitoring the park found that visitor use levels on the Middle Fork of Taylor Creek were higher than the identified standard. Meaning visitors ability to find solitude was diminished. The backcountry management plan identified options to reduce use levels in areas out of compliance with the standard. Adjusting parking lot size was one of the options. These measures are also protective of river values including the recreational ORV and river-related visitor opportunities to experience serenity, solitude, and general enjoyment along the river corridor. These management strategies and related use levels have been evaluated during this planning process and

revised, as needed, to ensure continued protection of river values.

For segments where current use is well below visitor capacity (that is, where use levels are low enough not to threaten river values), visitor capacities would still be determined and would still serve as management decisions in the Comprehensive Management Plan. However, the same degree of investment in decisions about maximum use levels is not necessary or appropriate in these circumstances. Predictions based on science and monitoring are not likely to be, and do not need to be, as precise in this context because use levels in the river area are not anywhere near visitor capacity. A monitoring program using the indicators and standards (see table 6), would be implemented to ensure that standards are not exceeded and river values remain protected. In addition, given the complex and dynamic nature of visitor use within the river corridor, it is likely that user capacities may need to be adjusted from time to time as new information becomes available or as visitor use patterns change.

For the frontcountry areas in Zion National Park, guidance from the general management plan and this plan will be followed to direct management of the kinds and amounts of use. This plan notes the spectrum of river-related uses and experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels; to enjoying photography and other artistic pursuits; to viewing scenery or camping; to opportunities to experience serenity, solitude, and general enjoyment along the river corridor. The general management plan also provides direction for the types of experiences that visitors can expect in different areas of the park. As noted in the general management plan, in the frontcountry, the recreational experience would be highly social, with frequent interaction among visitors and between visitors and park staff. However, crowding levels would not keep visitors from reaching their desired destination or viewing outstanding park features. There may be opportunities for visitors to experience solitude at certain times of the day, especially during the off-peak season.

The National Park Service is tracking kinds and amounts of use in the frontcountry area (e.g., overall visitation, lodging occupancy, shuttle boarding) to protect river values and mitigate localized incidences of crowding and resource-related impacts. Interim strategies to protect river values in the frontcountry include educating visitors on the best time to visit popular areas, educating visitors on alternative locations to visit to avoid crowds, educating visitors on Leave No Trace ethics and rehabilitating social trails. However, given the complexity and significance of managing visitor use within this section of the river corridor, additional study is needed to further assess the appropriate kinds and amounts of use that would complement existing monitoring and management efforts.

In addition to existing and proposed adaptive management actions (see table 6), the National Park Service has initiated a transportation and capacity study that will provide park management with information to make decisions related to visitor use, including visitor capacity along river segments in the frontcountry. The research is essential because all visitors access the main canyon of Zion National Park using the shuttle system during the peak season (except for visitors staying at the lodge). The implication of managing use levels for frontcountry areas along the shuttle route could affect the timing and amount of access to the park's primary destination, or in essence the "heart of the park," at peak use times. Depending on the outcomes of the study, there may be a need to more directly distribute use throughout the day or year, or to different areas of the park. This may require most visitors to plan further ahead regarding the timing of their visit and related itinerary. The upcoming transportation and capacity study will allow managers to make more informed decisions about visitor capacity and related implications for

management based on a program of scientific study. For a detailed description of the upcoming transportation and capacity study, see appendix E.

RIVER SEGMENT-SPECIFIC MANAGEMENT STRATEGIES

The first tier of management strategies is applied to all designated river segments. The second tier includes segment-specific management strategies that may vary across all three alternatives and may vary by river segment. The segment-specific management includes: strategies to protect and manage the outstandingly remarkable values for which the river was designated; free-flowing condition and water quality; types and levels of development; and kinds and amounts of use. For the most part, types and levels of development and kinds and amounts of use have strategies that differ by segment.

If a segment-specific management strategy does not differ from the broad-based strategy, that strategy description is not repeated in this section of the document. However, it is noted at the beginning of the segment-specific descriptions.

TAYLOR CREEK AND TRIBUTARIES (WILD AND SCENIC SEGMENT)

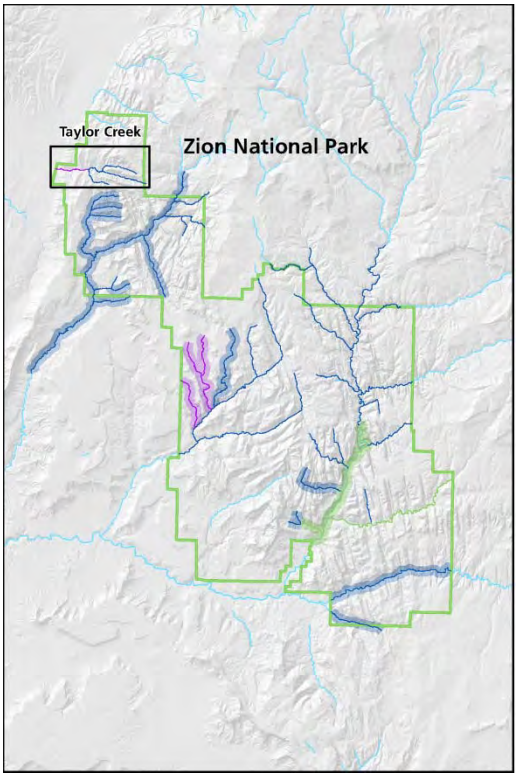
The management strategies for free-flowing condition and water quality are the same as those described in the broad-based strategies and are the same for all alternatives. The outstandingly remarkable values identified for Taylor Creek are geologic and scenic. There are no segment-specific strategies for the geologic or scenic outstandingly remarkable values. This is a day use area where camping is not allowed.

Alternative A (no-action alternative)

Water Quality and Free-flowing Condition. Alternative A is the same as the broad-based strategies for this river and its tributaries.

Types and Levels of Development. The Taylor Creek segment is accessed via Kolob Canyons Road, which runs about 1.5 miles through the segment. Other development in the river corridor includes 2.3 miles of developed trails, two trailheads, and bolts for climbing located at the North and South Forks of Taylor Creek.

Kinds and Amounts of Use/Standards. Under alternative A, education and interpretation would continue without specific focus on river values. Day use limits based on wilderness character indicators and standards would continue. Levels of use on the North Fork Taylor Creek and South Fork Taylor Creek are low and are within the standard identified in the backcountry management plan. However, use on Middle Fork Taylor Creek has exceeded the wilderness standard for visitor encounters.



Using the management options identified in the backcountry plan, the park has reduced the Taylor Creek parking lot size to bring river-related visitor use and experiences back into standard. These adaptive management strategies would continue to be used to protect river values.

Alternative B

Water Quality and Free-flowing Condition. In addition to the actions identified in the broad-based strategies, the park would increase efforts to educate visitors about proper waste disposal.

Types and Levels of Development. Best management practices for road maintenance on Kolob Creek Scenic Drive would be instituted.

Kinds and Amounts of Use/Standards. Education and interpretation would focus on history and connection to natural and cultural resources; day use limits would be considered based on indicators and standards.

When managing areas with visitor-caused impacts, education, management of access, and dispersion of visitor use would be emphasized as visitor use management strategies throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards (table 6). Since the indicators and standards from the backcountry management plan are also protective of river values, they were carried forward into this plan. Strategies may also include the need to reduce use levels in specific high use areas to protect river values.

North Fork Taylor Creek—Indicators of quality for this segment include crowding, presence of human waste, and visitor-created trails. The specific standards for the above indicators can be found in table 6. Crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that group size is limited to 12 people and that 90% of visitors would not see more than 10 other groups per day. Since visitor use on this segment is low, management strategies would include providing visitors information on the area to encourage hiking the North Fork, potentially decreasing crowding along the Middle Fork. Additional adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Middle Fork Taylor Creek—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, and unhealthful levels of *E. coli*. The specific standards for the above indicators can be found in table 6. Crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that group size is limited to 12 people and that 90% of visitors would not see more than 10 other groups per day.

Park staff has observed as many as 58 people per hike and 23 groups. This level of use exceeds the current standards and could potentially degrade visitors' ability to enjoy the recreational and scenic ORVs. Potential management strategies to address crowding includes education, reduction of group size, limits to the number of hikers on the route, reducing the size of the parking area to lower the number of people on the trail at one time, and providing other areas for visitors to hike (North Fork, South Fork, and the main stem of Taylor Creek downstream of the trailhead). Additional adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

South Fork Taylor Creek—Indicators of quality for this segment include visitor-created trails and presence of wildlife. The specific

standards for the above indicators can be found in table 6. Of these indicators, presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that no evidence of adverse effect from human activity would be present. Standards relating to crowding would also be implemented to support the presence of a wildlife indicator. Standards state that group size is limited to 12 people and that 90% of visitors would not see more than 10 other groups per day.

Visitor use is low on this segment, which is mainly used for access to climbing routes. Management strategies include education, reduction of group size, limits on the number of hikers on route, limits on the number of hikers beyond specific points, or closing the canyon during critical wildlife periods (i.e., nesting, breeding). Additional adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Alternative C

Water Quality and Free-flowing Condition. Alternative C is the same as alternative B.

Types and Levels of Development. Alternative C is the same as alternative B.

Kinds and Amounts of Use/Standards. Alternative C is the same as alternative B.

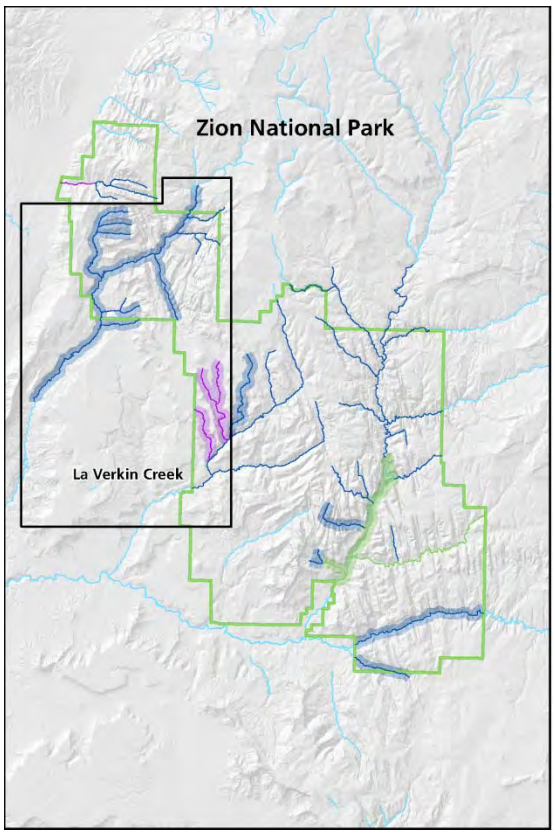
North Fork Taylor Creek— Alternative C is the same as alternative B for this segment.

Middle Fork Taylor Creek—Alternative C is the same as alternative B for this segment.

South Fork Taylor Creek—Alternative C is the same as alternative B for this segment.

LA VERKIN CREEK AND TRIBUTARIES (WILD SEGMENT)

The outstandingly remarkable values identified for La Verkin Creek include geologic, recreation, and wildlife. There are no segment-specific strategies identified to protect or manage geologic resources. The recreational outstandingly remarkable value is addressed under kinds and amounts of use.



Alternative A (no-action alternative)

Water Quality and Free-flowing Condition. Alternative A is the same as the broad-based strategies for this river and its tributaries.

Types and Levels of Development. La Verkin Creek contains only limited development including 11 miles of developed trails and 13 wilderness campsites. Hop Valley Creek has 6.5 miles of developed trail and 2 campsites, one that can accommodate up to 6 horses. Under alternative A, the existing trails would continue to be maintained. The designated campsites and trails would continue to be monitored as identified in the Zion backcountry management plan. Actions would be taken to ensure that standards are being met. The area is accessed from two trailheads—both outside the river corridor.

Kinds and Amounts of Use/Standards. Under alternative A, use limits (permits) would continue to be used for overnight use only. Indicators to protect wilderness character would continue to be monitored.

Alternative B

Water Quality and Free-flowing Condition. In addition to the actions identified in the broad-based strategies, the park would increase efforts to develop cooperative partnerships with private landowners to reduce the impacts of livestock. The park would increase wilderness patrols in the areas to ensure that livestock remain on private lands.

Types and Levels of Development. No changes are proposed to the types and levels of development from alternative A. Wilderness character would be maintained through monitoring the identified indicators and taking action if the standards are not met (table 6).

Kinds and Amounts of Use/Standards. Day use limits would be considered based on indicators and standards.

La Verkin Creek, Timber Creek, Willis Creek, Bear Trap Canyon, Currant Creek, Cane Creek, and Smith Creek—Indicators of quality for these segments include crowding, presence of human waste, visitor-created trails, campsite damage, and presence of wildlife. Standards pertaining to these indicators for NPS-managed lands were

identified in the Zion National Park backcountry management plan. Because the standards established in that plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that group size is limited to 12 people and that 90% of visitors would not see more than 10 other groups per day. In addition, on some segments the presence of humans can negatively impact wildlife species during critical time periods such as nesting and breeding. Monitoring would continue and if adverse effects to wildlife were identified, the following mitigations could be implemented: limit the number of day hikers, limit day use beyond a certain point, or closing the area during critical wildlife periods. Additional adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

On NPS lands, overnight use by visitors in this segment is estimated at 2,550 people per year. Permits are currently required for overnight use, with a limit of 13 groups allowed per night. Permits for day use are not required. At times, the level of day use exceeds wilderness standards. The backcountry management plan identifies management options to mitigate any exceedance of the standard. The options include education, reducing group size limits, or limiting the number of hikers on the trail (permit system, etc.). Most users of this segment begin hiking at the parking area and trailhead at Lee Pass. Monitoring will continue and adjustments to visitor use will be made as outlined in the backcountry management plan.

The BLM segments of La Verkin Creek north and south of the park and Smith Creek are within designated wilderness. Use in these areas is considered low. The indicators and standards identified in table 6 would apply to the BLM segments.

Hop Valley Creek—Indicators of quality for this segment include crowding, campsite damage, and unhealthful levels of *E. coli*. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in that plan are protective of river values, they are being carried forward for this comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, water quality (*E. coli* levels) has been determined to be most protective for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards relating to crowding would also be implemented. Standards state that group size is limited to 12, with two groups per night and that 90% of visitors would not see more than 10 other groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Overnight use by visitors in this segment is estimated at 284 people per year. Permits are currently required for overnight use, with a limit of two groups allowed per night. Permits for day use are not required. Current day use is unknown; however, it is thought to be low. Most visitors hike through Hop Valley to get to and camp on La Verkin Creek.

Alternative C

Water Quality and Free-flowing Condition. Alternative C is the same as alternative B.

Types and Levels of Development. Alternative C is the same as alternative B.

Kinds and Amounts of Use/Standards. Day use limits based on indicators and standards would be considered.

La Verkin Creek, Timber Creek, Willis Creek, Bear Trap Canyon, Currant Creek, Cane Creek, and Smith Creek—Alternative C is the same as alternative B for these segments.

Hop Valley Creek—Alternative C is the same as alternative B for this segment.

NORTH CREEK AND TRIBUTARIES (WILD AND SCENIC SEGMENT)

The outstandingly remarkable values identified for North Creek include geologic, recreational, scenic, ecological processes, fish, and wildlife. There are no segment-specific strategies identified to protect or manage for the following outstandingly remarkable values: geologic, scenic, ecological process, fish, or wildlife. The recreational outstandingly remarkable value is addressed under kinds and amounts of use.

Alternative A (no-action alternative)

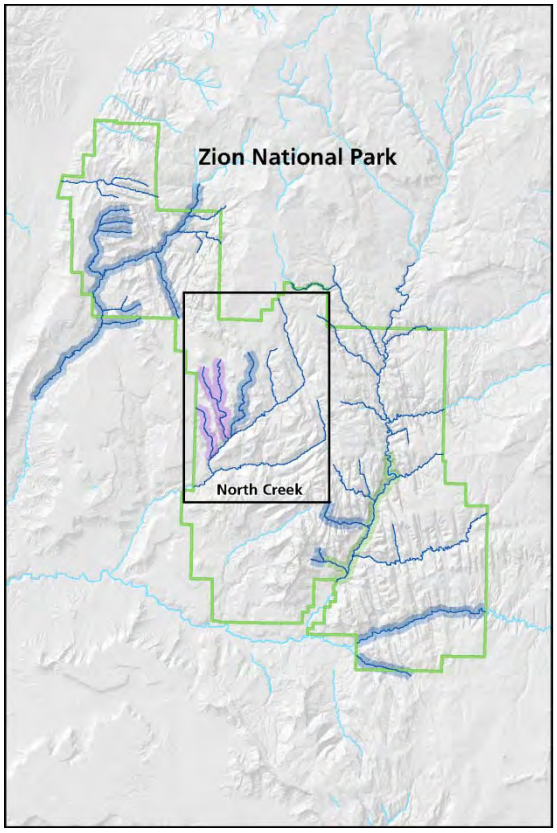
Water Quality and Free-flowing Condition. Under the no-action alternative, management strategies for water quality and free-flowing condition would be the same as those described in the broad-based strategies.

Types and Levels of Development. The wild segments of North Creek remain relatively undeveloped. Russell Gulch, the main stem and both forks of North Creek contain no facilities, although visitors follow a well-worn route through the subway and less-worn routes into other canyons in the area. Little Creek crosses two developed trails: Wildcat Canyon and the Connector Trail. The developed Wildcat Canyon Trail crosses Wildcat Canyon / Blue Creek segment and is within the 0.25-mile boundary of upper Russell Gulch. North Creek can be accessed via five trailheads and parking areas, all of which are outside the wild and scenic river corridor. However, there are no developed trails in North Creek. There are visitor-created trails that are carefully managed to prevent erosion and loss of vegetation. Bolts for canyoneering are at both forks of North Creek, Russell Gulch, and Wildcat Canyon / Blue Creek.

The scenic segments, Wolf Springs Wash, Pine Springs Wash, and Grapevine Wash have several developments left over from livestock grazing in the past; and current developments related to livestock grazing on adjacent private lands. These include dirt roads to private property, water pipelines to private property, fences, stock pond, culverts, and abandoned rock dam (reservoir behind dam filled with sand).

Under alternative A the trails would continue to be maintained. The developments related to current livestock grazing would continue to be maintained as per agreements. Those that are abandoned would remain in place.

Kinds and Amounts of Use/Standards. Under alternative A, the level of recreational activity would be monitored for wilderness character under the guidance of the wilderness stewardship plan, and there would not be additional focus on the protection of river values. Where current use limits are protective of wilderness values, there would be no adjustments to the kinds and amounts of use.



Alternative B

Water Quality and Free-flowing Condition. In addition to the actions identified in the broad-based strategies, the park would work with adjacent landowners on reducing livestock trespass. Opportunities would be pursued to reduce impacts of structures, including acquisition of lands or interest in lands from willing sellers.

Types and Levels of Development. The majority of the routes/trails into and out of the river canyons in the area were not constructed. Because of continued use and over time they are now recognized as the way to access the river segments. The first step in the adaptive management process would be limiting use followed by formalizing and improving some routes to mitigate resource impacts Some visitor-created routes would be revegetated.

Kinds and Amounts of Use/Standards. The level of recreational activity would be monitored to ensure river values are not negatively affected. Recreational activities would be adjusted as needed.

When managing areas with visitor-caused impacts, education, management of access, and dispersion of visitor use would be emphasized as visitor use management strategies throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards (table 6).

Right Fork North Creek (above Barrier Falls) and Wildcat Canyon / Blue Creek—Indicators of quality for these segments include crowding, presence of human waste, visitor-created trails, campsite damage, presence of wildlife, and unhealthful levels of *E. coli*. Currently, the indicator variables are well below the standard. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in the plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, the presence of wildlife has been determined to be the most protective for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards relating to crowding would be implemented to ensure that no evidence of adverse effect on wildlife occurs from human visitation. Standards state that permits are required for both day and overnight use, with group size limited to 6 and no more than 20 people per day. In canyon areas, 90% of groups should not see or hear more than two groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

These segments currently see very low levels of use. This is likely due to the technical aspects of hiking these canyons. These routes required excellent route-finding ability, advanced canyoneering skills, and the hiker must be in good physical condition. In 2007, 95 people asked for and received use permits. In 2011, 56 people asked for and received use permits along these segments. Managing for up to current levels of use, or increased use, would be protective of river values in this segment.

Right Fork North Creek (below Barrier Falls) and North Creek—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, campsite damage, presence of wildlife, and unhealthful levels of *E. coli*. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in the plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state

that group size is limited to 12 and that 90% of visitors would not see more than 10 other groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

These segments currently see low levels of use. Park staff has reported only seeing one to two visitors per day along these segments, although some days there are no visitors in these areas. The maximum amount of use possible along these segments is related to available parking spaces. There are two parking areas from which visitors can access these segments—Right Fork with five parking spaces and Grapevine with six parking spaces.

Left Fork North Creek and Russell Gulch—Indicators of quality for these segments include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, presence of wildlife, and unhealthful levels of *E. coli*. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in the plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that group size is limited to 12 and that permits for day use are required with a maximum of 80 people per day. In addition to these standards, 90% of visitors would not see more than 10 other groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Under alternative B, levels of use could be maintained or decreased. Following the above standards, a maximum of 2,400 people per month is currently permissible on these segments. In July 2010, 1,998 visitors accessed the canyon. In 2010, approximately 10,500 people (2,500 groups) were permitted to visit this area. The current use levels are protective of river values.

Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, and Little Creek—Indicators of quality for these segments include crowding, presence of human waste, and visitor-created trails. The specific standards for the above indicators can be found in table 6. These segments currently see very low levels of use. Specific numbers are not currently available concerning day use. Overnight camping is not allowed in this area. It is perceived by park staff that visitors are not attracted to these areas, and there are no trails, routes, or nearby parking areas. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Alternative C

Water Quality and Free-flowing Condition. In addition to the actions identified in the broad-based strategies, the park would work with adjacent landowners on reducing livestock trespass. Opportunities would be pursued to reduce impacts of structures, including acquisition of lands or interest in lands from willing sellers. There would be more emphasis on managing visitor-created trails.

Types and Levels of Development. Alternative C is the same as alternative B.

Kinds and Amounts of Use/Standards. When managing areas with visitor-caused impacts, education, site management, and dispersion of visitor use would be emphasized as visitor use management strategies. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards (table 6).

Right Fork North Creek (above Barrier Falls) and Wildcat Canyon / Blue Creek—Alternative C is the same as alternative B.

Right Fork North Creek (below Barrier Falls) and North Creek (Main Segment)—Alternative C is the same as alternative b.

Left Fork North Creek, Russell Gulch—Alternative C is the same as alternative B for these segments.

Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, and Little Creek—Alternative C is the same as alternative B for these segments.

NORTH FORK VIRGIN RIVER AND TRIBUTARIES ABOVE THE TEMPLE OF SINAWAVA (WILD SEGMENT)

The outstandingly remarkable values identified for North Fork Virgin River above the Temple of Sinawava include geologic, recreational, scenic, ecological processes, fish, and wildlife. There are no segment-specific strategies identified to protect or manage for the following outstandingly remarkable values: geologic, scenic, ecological process, fish, or wildlife. The recreational outstandingly remarkable value is addressed under kinds and amounts of use.

Alternative A (no-action alternative)

Water Quality and Free-flowing Condition. Under the no-action alternative, management strategies for water quality and free-flowing condition would be the same as those described in the broad-based strategies.

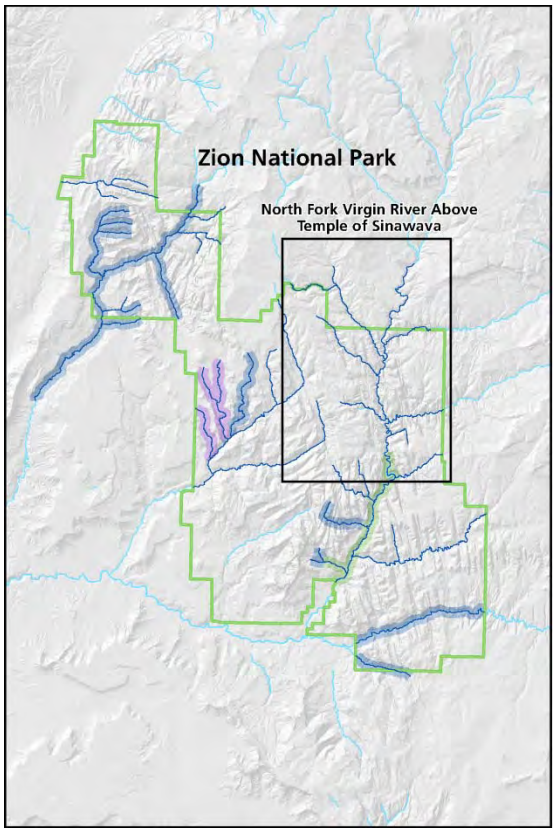
Types and Levels of Development. The wild segment of the North Fork Virgin River includes undeveloped routes leading visitors through narrow slot canyons and providing visitors access to the upper reaches of the Virgin River. The only formal trail in this segment is the paved Riverside Walk, which begins at the Temple of Sinawava and terminates 1 mile upstream. Development in this segment is limited to 12 designated wilderness campsites for overnight visitors, as well as bolts used for canyoneering located at Kolob Creek, Imlay Canyon, Orderville Canyon, and Mystery Canyon. These facilities would continue to be maintained.

Kinds and Amounts of Use/Standards. Under alternative A, visitor use management would continue according to other park plans, NPS *Management Policies 2006* and the Wild and Scenic Rivers Act. Existing flow rates for the use of watercraft would be carried forward from the *2012 Zion National Park Superintendent's Compendium*. Adaptive management strategies from the backcountry management plan would be carried forward for segments that overlap with wilderness to maintain consistency in monitoring and management efforts across plans.

Alternative B

Water Quality and Free-flowing Condition. In addition to the actions described in the broad-based strategies, the National Park Service would work with adjacent landowners and managers to implement best management practices to reduce fecal bacteria.

Types and Levels of Development. In addition to the types and levels of development identified in the broad-based strategies and in alternative A, access to the river would be managed to protect natural processes and wilderness character would be maintained in the upper canyon. The park would formalize a few visitor-created trails



between Riverside Walk and the river with natural surface trails. Excess visitor-created trails would be revegetated. Additional fencing could be placed along Riverside Walk to protect vegetation and reduce the potential for erosion.

Kinds and Amounts of Use/Standards. In general, visitor use management actions would focus on protecting natural processes.

The park would initiate a formalized approval process for determining flow limits for hiking, canyoneering, and boating.

When managing areas with visitor-caused impacts, education, management of access, and dispersion of visitor use would be emphasized as visitor use management strategies throughout the river corridor. Strategies may include the need to reduce use levels in specific high use areas in order to protect river values. These strategies would address the kinds and amounts of use that can be sustained in the Virgin River corridor while protecting river values.

North Fork Virgin River (above the Temple of Sinawava, below Orderville Canyon)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and water quality. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards vary by alternative for this segment and pertain to people at one time.

Under alternative B, levels of use would be decreased due to crowding on this segment. Park staff observed an average of 36 people at one time along this segment in 2011. Previous research indicates that Zion National Park visitors find this level of crowding to be unacceptable. Visitors reported that when 24 people at one time are present, they believed that management actions should be taken to reduce the impacts of crowding (Manning 2003). By managing the people at one time present on this segment, river values would be protected. Management strategies to reduce crowding could be accomplished through adjustments to shuttle timing and adjusting CUA tour permits for this segment

In addition to existing and proposed adaptive management actions (see table 6), the National Park Service has initiated a transportation and capacity study that will provide park management with information to make decisions related to visitor use, including visitor capacity. The research is essential because all visitors access the main canyon of Zion National Park using the shuttle system during the peak season (except for visitors staying at the lodge). The implication of managing use levels for areas accessed via the shuttle route could affect the timing and amount of access to the park's primary destinations. Depending on the outcomes of the study, there may be a need to more directly distribute use throughout the day or year, or to different areas of the park. This may require most visitors to plan the timing of their visit and related itinerary with more advanced notice. The upcoming transportation and capacity study will allow managers to make more informed decisions about visitor capacity and related implications for management based on a program of scientific study.

Orderville Canyon—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and presence of wildlife and water quality. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that no evidence of adverse effect from human activity should occur toward wildlife.

Standards relating to crowding would be implemented to ensure that no evidence of adverse effect on wildlife occurs from human visitation. Standards state that group size is limited to 12 and that 90% of visitors would not see more than 10 groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

For alternative B, levels of use would be managed according to guidance from the backcountry management plan. Visitor use levels on this segment are currently moderate with an average of 26 people per day in 2010 using this segment. From March to August, permits for 50 people per day are available to visitors. From September to February, permits for 80 people per day are available to visitors. This permitting system has been developed around wildlife breeding seasons to ensure that no evidence of adverse effect from human visitation is seen. Yearly monitoring within this segment is conducted.

Kolob Creek—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, campsite damage, presence of wildlife, and water quality. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that 90% of visitors would not see more than two groups per day and that 90% of visitors would not encounter groups larger than six. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.
For alternative B, levels of use would be managed according to guidance in the backcountry management plan. Visitor use levels on this segment are currently low due to the technical nature of the hiking route. Twenty permits (20 people per day or overnight) are available to visitors for this segment. On average, three permits were issued each day during 2011. Due to the low levels of use on this segment, maintaining current standards is protective of all river values.

Oak Creek (Bureau of Land Management)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and water quality. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that that 90% of visitors would not see more than two groups per day and that 90% of visitors would not encounter groups larger than 12. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Visitor use levels on this segment are not currently known in exact numbers. Visitors do not need a permit from the Bureau of Land Management to hike this segment. There is currently one commercial operator providing tours in the canyon. The Bureau of Land Management would continue to monitor this segment as part of rangeland health monitoring efforts, and special use permits would be reviewed each year for compliance. The park would monitor indicators to determine if they are being maintained within standard. Limitations on commercial use may be implemented as a way to manage visitor numbers in Oak Creek, if necessary. If new commercial use permits are issued, protection of river values would be taken into consideration. Additional NEPA compliance may be required to issue new permits.

Imlay Canyon—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, campsite damage, presence of wildlife, and water

quality. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, the presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards relating to crowding would be implemented to ensure that no evidence of adverse effects on wildlife occurs from human visitation. Standards state that permits are required for both day and overnight use, with group size limited to 6 and no more than 12 people per day during wildlife nesting season and 20 people per day during the remainder of the year. Crowding standards state that 90% of visitors would not see more than two groups per day and that 90% of visitors would not encounter groups larger than six.

Visitor use levels on this segment are currently low. Twenty permits (20 people per day or overnight) are available to visitors for this segment. Currently, use levels are far below the current standards. On average, less than seven people per day received permits for this segment in 2011. This permitting system is protective of wildlife present in the canyon. Yearly monitoring within this segment is conducted to ensure that no adverse effect from human visitation on wildlife occurs. River values are protected by continuing current standards.

Mystery Canyon—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, and water quality. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that visitors would not see or hear more than two groups per day, and that 90% of visitors would not encounter groups larger than six. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Visitor use levels on this segment are currently moderate. Twelve permits are available to visitors for this segment. The eroded access trail is a problem for Mystery Canyon. If the trail could be improved, the use limit could possibly be increased to 20 people per day. Currently, use levels are slightly below the current standards. On average, 10 people per day received permits for this segment in 2011. Standards are protective of all river values.

Alternative C

Water Quality and Free-flowing Condition. Alternative C is the same as alternative B.

Types and Levels of Development. Alternative C is the same as alternative B.

Kinds and Amounts of Use/Standards.

North Fork Virgin River (above the Temple of Sinawava, below Orderville Canyon)—Alternative C is the same as alternative B for these segments.

North Fork Virgin River (above Orderville Canyon, above the Temple of Sinawava) and Deep Creek—Alternative C is the same as alternative B for these segments.

Orderville Canyon—Alternative C is the same as alternative B for this segment.

Kolob Creek—Alternative C is the same as alternative B for this segment.

Oak Creek (Bureau of Land Management)—Alternative C is the same as alternative B for this segment.

Imlay Canyon—Alternative C is the same as alternative B for this segment.

Mystery Canyon—Alternative C is the same as alternative B for this segment.

NORTH FORK VIRGIN RIVER AND TRIBUTARIES BELOW THE TEMPLE OF SINAWAVA (WILD AND RECREATIONAL SEGMENT)

The outstandingly remarkable values identified for North Fork Virgin River below Temple of Sinawava and tributaries include geologic, recreational, scenic, cultural, fish, and wildlife. There are no segment-specific strategies identified to protect or manage for the following outstandingly remarkable values: geologic, scenic, cultural, fish, or wildlife. The recreational outstandingly remarkable value is addressed under kinds and amounts of use.

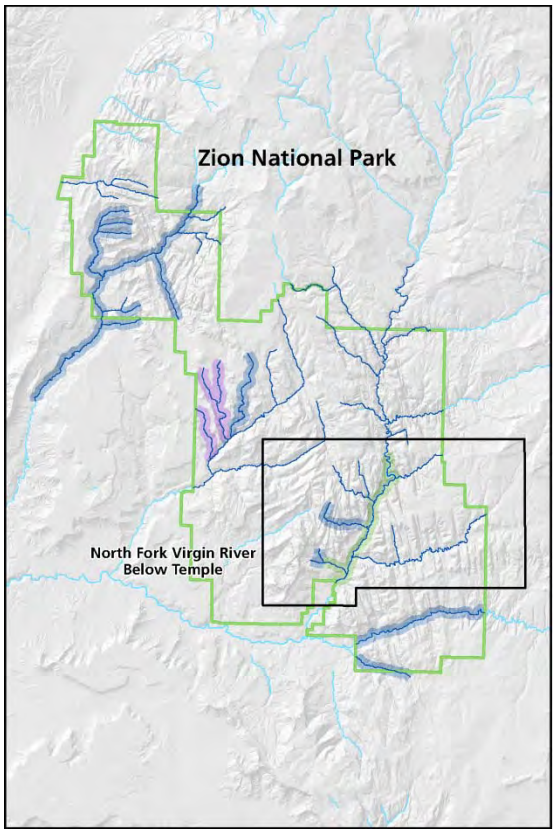
Alternative A (no-action alternative)

Water Quality and Free-flowing Condition. Under the no-action alternative, management strategies for water quality and free-flowing condition would be the same as those described in the broad-based strategies.

Natural Resources. Under the no-action alternative, management strategies for natural resources would be the same as those described in the broad-based strategies.

Cultural Resources. Cultural resources would continue to be protected by cultural site monitoring and other park plans.

Types and Levels of Development. The recreational segment below the temple is the most developed segment of the designated wild and scenic rivers. Major development within the segment includes the visitor center, administrative facilities, maintenance facilities, Zion Lodge, shuttle maintenance facilities, and housing for park and concession employees. Associated with these structures are water pipelines, sewerlines, underground telecommunication lines, underground electric power, spring developments, and water storage tanks. This segment also contains much of the transportation infrastructure including Zion Canyon Scenic Drive and the Zion-Mount Carmel Highway covering nearly 24 miles of roads.



There are 9 shuttle stops, 21 bridges, and 19 miles of developed trails. Overnight visitor accommodations include 320 campsites at the Watchman and South campgrounds, as well as 82 rooms at Zion Lodge. Other visitor services include horse stable facilities for the horseback riding concession, two restaurants at Zion Lodge, three picnic areas, and nine trailheads. Bolts for climbing and canyoneering are located at Oak Creek, Birch Creek, Behunin Canyon, Echo Canyon, Heaps Canyon, Pine Creek, and the main stem of the North Fork below Temple of Sinawava.

Administrative facilities in the segment are clustered near the mouth of Oak Creek Canyon. This area includes an administrative building, maintenance buildings clustered around a storage yard, park housing, and additional office space. These facilities would

continue to be maintained in their current alignment and character in this alternative.

Additional structures in this segment include historic levees and rock gabions, which have modified the natural floodplain. These structures, which date to the 1920s, are primarily in place near Zion Lodge. Other structures in this segment having an impact on stream hydrology include pipeline crossings and cemented boulders.

Kinds and Amounts of Use/Standards. Under alternative A, visitor use management would continue according to other park plans, NPS *Management Policies 2006*, and the Wild and Scenic Rivers Act. No changes would be made pertaining to the evaluation of permit renewal for the horseback riding concession.

Alternative B

Water Quality and Free-flowing Condition. In addition to the actions identified in the broad-based strategies, restoration of natural river processes would be considered to restore free-flowing conditions, including benign neglect of levees and rock-filled gabions. Repairs to these structures would be made only to protect human health and safety. The need for irrigation water for park use would be reduced. The National Park Service would engineer a solution to protect park infrastructure that would minimize impact on free-flowing condition. Bank stabilization would be the minimum necessary to protect property and public safety. Hardened bank stabilization would not be increased above the baseline linear feet in place at the time of designation.

Cultural Resources. Preserve balance between ecology and natural systems (vegetation/wildlife habitat) and the character-defining components of cultural landscapes.

Types and Levels of Development. Existing park facilities that are in floodplains would be protected from flooding by minimal means, which could include existing levees and armoring. Alternatives to better protect and enhance river values would be explored. Please refer to the "Protective Measures" section of this document for more specific protection strategies. The National Park Service would consider use limits over formalizing and improving trails to mitigate resource impacts. Visitor-created trails would be revegetated.

Kinds and Amounts of Use/Standards. The park would consider bank conditions, water quality, and trail maintenance requirements in evaluating the horseback riding concession for permit renewal.

When managing areas with visitor-caused impacts, education, management of access, and dispersion of visitor use would be emphasized as visitor use management strategies throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards (table 6) and would be accomplished through near-term adjustments to shuttle timing and CUA tours for segments accessed via the main canyon. Strategies may also include the need to reduce use levels in specific high use areas to protect river values. These strategies would address the kinds and amounts of use that can be sustained in the Virgin River corridor while protecting river values. In addition to existing and proposed adaptive management actions (see table 6), the National Park Service has initiated a transportation and capacity study that will provide park management with information related to visitor use, including visitor capacity, along river segments in the frontcountry.

North Fork Virgin River (below the Temple of Sinawava) and Echo Canyon (maintained trail)— Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse

effects of human visitation, and water quality. The specific standards for the above indicators can be found in table 6. Additional information regarding the management approach to kinds and amounts of use can be found earlier in this chapter under the "Kinds and Amounts of Use" portion of "Visitor Use Management and Capacity" section.

There are currently no use limits or numerical capacities for this segment. However, the National Park Service and Bureau of Land Management are required to establish capacities consistent with both the Wild and Scenic Rivers Act and the Interagency Guidelines. Therefore, this plan must describe the actual levels of visitor use that would not degrade river values. Determining numeric capacities for this frontcountry segment of the river would require additional discussion and investigation to increase certainty about current use trends and to more precisely define appropriate use levels. Because additional study is needed, interim visitor capacities would be set at current use levels for this segment. The general management plan provides some direction pertaining to frontcountry experiences and states that in these areas visitors will have a sense of being in a natural landscape, although during peak season there will be a low expectation of solitude due to the sights and sounds of other people. The general management plan also states that the probability of encounters with other people is high in the frontcountry, but crowding will not keep visitors from reaching desired destinations or viewing park features. However, additional research is needed to understand the impacts of high visitation on the recreational ORV along the segments of the river corridor that overlap with the frontcountry zone. Upcoming transportation and capacity research will provide the park with data pertaining to: visitor use at selected sites, assessing visitor-related resource impacts at selected sites, and conducting visitor surveys. These efforts will lead to a higher level of certainty about current use and resource impacts in these areas. This would give park managers a higher level of certainty to make an informed decision about visitor capacities along the North Fork Virgin River in Zion Canyon.

Currently, boating permits are required, and there is currently no limit on the number of boat permits available. Permits relating to day and overnight use are not required. A shuttle system along with tour bus groups allows larger numbers of visitors to this segment. During nonpeak seasons, visitors drive to parking areas and turnouts along the Zion Canyon Scenic Drive and use formalized trails or visitor-created routes to access the river. In 2010, over 2 million people visited the park, with over 37,000 visitors riding the shuttle over Memorial Day weekend.

This documented level of use along with additional entrance use numbers and tour bus passenger numbers demonstrate the high levels of use along this segment. Resource impacts such as visitor-created trails and vegetation trampling from and near shuttle stops has been observed. Until visitor capacity studies are completed, the park will continue to apply the following measures to protect all river values, including the recreational ORV:

- educating visitors on the best times (least busy) to visit popular areas
- educating visitors on other places to visit in the park
- educating visitors on Leave No Trace practices
- rehabilitating visitor-created trails

Behunin—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and presence of wildlife. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in that plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6.

Of these indicators, the presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards relating to both the presence of wildlife and crowding have been found to be protective of river values and would be implemented along this segment. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Under alternative B, levels of use would be would be managed according to guidance in the backcountry management plan. This segment currently has moderate levels of use. Current regulations state that group size is limited to six and that permits are required for both day and overnight use. From March to August, permits for 12 people per day are available to visitors. From September to February, permits for 20 people per day are available to visitors. This permitting system has been developed around wildlife breeding seasons to ensure that no evidence of adverse effects from human visitation is seen. Yearly monitoring within this segment is conducted. The current permit system and demonstrated levels of use are protective of the wildlife outstandingly remarkable value.

Echo Canyon (within wilderness)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and presence of wildlife. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, the presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that no adverse effect on wildlife from human activity should be evident. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Visitor use is moderate in this segment. Standards of encounter rates would be used for this indicator and would be based on current day use limits. The use limits for Echo Canyon are for the canyoneering route; the trail does not have use limits. Day use limits during breeding seasons (September through February) are 12 people per day. Day use limits during nonbreeding seasons are 20 people per day. Group size is limited to six for all time periods. Standards for this section would be that 90% of visitors would not encounter groups larger than six, and 90% of visitors would not see more than two groups per day. Management strategies include education, reducing group size, limiting the numbers of hikers on the trail, and closure of the canyon during critical wildlife periods, i.e., nesting, breeding, and migration.

Heaps Canyon (within wilderness)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, campsite damage, and presence of wildlife. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in the plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that group size is limited to six and that 90% of visitors would not encounter more than two groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

This segment currently has low levels of use. This segment offers solitude and a challenging experience of canyoneering, both of which require self-reliance. Permits are currently required for both day and overnight use. Group size is limited to six permits for 20 people per day available to visitors. In 2010, the month with the highest

use, included 166 people getting permits for Heaps Canyon. The current permitting system and demonstrated levels of use are protective of all river values.

Heaps Canyon (Emerald Pools Trail)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and water quality. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use).

Under alternative B, current use levels would be decreased due to extensive crowding. This segment currently has high levels of use. During 2011 field research, park staff observed encounter rates of 135 people in 20 minutes at the lower pools and encounter rates of 95 people at the upper pool. Previous research conducted along this segment indicates that visitors find this level of crowding to be unacceptable. Visitors reported that when an encounter rate of 175 people is reached, they believed that management actions should be taken to reduce the impacts of crowding (Manning 2003). Standards relating to encounter rates have been developed for this segment based on previous research. However, park staff believes that an indicator of people-at-one-time is a more useful indicator and standard for management to understand true crowding issues at both the upper and lower pools. Therefore, park staff would begin to collect PAOT data and would use this metric for monitoring in the future. Once PAOT data are known, adaptive management strategies would be updated. In the meantime, interim measures would include educating visitors on best times to visit popular areas, educating visitors on alternative attractions and sites, educating visitors on Leave No Trace ethics, and rehabilitating social trails.

In addition to existing and proposed adaptive management actions (see table 6), the National Park Service has initiated a transportation and capacity study that will provide park management with information to make decisions related to visitor use, including visitor capacity. The research is essential because all visitors access the main canyon of Zion National Park using the shuttle system during the peak season (except for visitors staying at the lodge). The implication of managing use levels for areas along the shuttle route could affect the timing and amount of access to the primary park destinations such as Emerald Pools Trail at peak use times. Depending on the outcomes of the study, there may be a need to more directly distribute use throughout the day or year, or to different areas of the park. This may require most visitors to plan the timing of their visit and related itinerary with more advanced notice. The upcoming transportation and capacity study will allow managers to make more informed decisions about visitor capacity and related implications for management based on a program of scientific study.

Birch Creek (wild segment)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, presence of wildlife, and water quality. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in this previous plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Under alternative B, current use levels would be maintained with a possibility of being reduced. Current regulations state that group size is limited to six and that 20 overnight permits are available to visitors. This river segment offers solitude and a challenging experience of canyoneering, both of which require self-reliance. As more exact use levels are obtained, it can be determined if

maintaining or reducing current standards is protective of river values.

Birch Creek (from the Virgin River to base of Navajo sandstone) (wild segment)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and water quality. The specific standards for the above indicators can be found in table 6. Standards associated with crowding and visitor-created trails have been determined to be most protective of river values. Standards state the number of visitor-created trails should be <2 visitor-created trails 90% of the time (i.e., braided trails). In addition, no increase in visitor-created trails should occur. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Under alternative B, there is room to increase use levels since very low levels of use have been observed (although exact numbers are unknown). Permits are not required for day use in this segment and overnight use is not allowed. Due to the low levels of use in this segment it has been determined that a moderate increase in day use would be protective of river values.

Oak Creek (recreational segment)—Indicators of quality for this segment include water quality. The specific standards for the above indicators can be found in table 6. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

This segment is in an administrative area that it closed to visitor use. For this reason, there are no impacts of visitor use on this segment.

Oak Creek (wild segment)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, presence of wildlife, and water quality. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in this previous plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

This segment currently has low levels of visitor use as this is a relatively unknown area. Park staff estimates that less than 20 groups per year recreate in this canyon. Due to the low levels of use on this segment, maintaining current levels of use is determined to be protective of river values.

Clear Creek—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, presence of wildlife, and water quality. The specific standards for the above indicators can be found in table 6. Standards associated with crowding and visitor-created trails have been determined to be protective of river values. Standards state the number of visitor-created trails should be no more than 10 trails per road mile. In addition, no increase in visitor-created trails should occur. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

This segment currently has moderate levels of visitor use. No permits for day use are currently required. Overnight use is not allowed. The numbers of visitors who access this segment largely depend on available parking spaces in turnouts along the road. The segment is mostly a dry wash that parallels Zion-Mount Carmel Highway. By maintaining current levels of use, river values would be protected.

Pine Creek (wild segment)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, presence of wildlife, and water quality. Standards pertaining to these

indicators can be found in the backcountry management plan. Because the standards established in this previous plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards relating to crowding would be implemented to ensure that no evidence of adverse effect on wildlife occurs from human visitation. Standards state that group size is limited to six and that 90% of visitors would not see more than two groups per day.

Under alternative B, levels of use would be maintained on this segment. This segment currently has moderate to low levels of visitor use. Most use occurs within the first 0.5 mile of this canyon as an approach to Spry Canyon. Permits are required for Spry Canyon, but are not required for this segment of Pine Creek. On average, 11 people per day obtained a permit for Spry Canyon during the month of June 2011. Maintaining use has been determined to be protective of river values.

Pine Creek (recreational segment)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, evidence of adverse effects of human visitation, and water quality. Standards pertaining to these indicators can be found in the backcountry management plan. Because the standards established in this previous plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, presence of wildlife has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards state that no evidence of adverse effect from human activity should occur toward wildlife. Standards relating to crowding would be implemented to ensure that no evidence of adverse effect on wildlife occurs from human visitation. Standards state that group size is limited to 12 and that 90% of visitors would not see more than 10 groups per day. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed.

Visitor use levels on this segment are currently moderate with an average of 30 people per day in 2010 using this segment. From March to August, permits for 50 people per day are available to visitors. From September to February, permits for 80 people per day are available to visitors. This permitting system has been developed around wildlife breeding seasons to ensure that no evidence of adverse effects from human visitation are seen. Yearly monitoring within this segment is conducted.

Alternative C

Water Quality and Free-flowing Condition. Management would increase monitoring and institute best management practices to maintain or improve water quality (primarily for human health). The need for irrigation water for park use would be reduced. The National Park Service would engineer a solution to protect park infrastructure that would minimize impact on free-flowing condition. Bank stabilization would be the minimum necessary to protect property. Hardened bank stabilization would not be increased above the baseline linear feet in place at the time of designation. The park would consider bank conditions, water quality, and trail maintenance requirements and diversity of recreational experience in evaluating the horseback riding concession for permit renewal.

Natural Resources. Restoration of natural river processes would be supported while enhancing recreation opportunities.

Cultural Resources. Preserve balance between ecology and natural systems (vegetation/wildlife habitat) and the character-defining components of cultural landscapes.

Types and Levels of Development. Same as alternative B plus maintain recreational value / river-related visitor use and experiences with minimal resource impacts. The park would develop a more active trail maintenance and restoration program to limit the impact of visitor-created trails and would consider developing formal, natural surface trails in high use areas. A natural surface trail from the Temple of Sinawava to Zion Lodge could be developed to provide additional hiking opportunities. The trail to Upper Emerald Pools would be formalized as natural surface trail and visitor-created trails would be revegetated. The park would implement trail restoration work related to horse use.

Kinds and Amounts of Use/Standards. The park would consider bank conditions, water quality, and trail maintenance requirements and diversity of recreational experience in evaluating the horseback riding concession for permit renewal. The park would manage horse use, use levels, and trail locations based on indicators and standards.

When managing areas with visitor-caused impacts, education, site management, and dispersion of visitor use would be emphasized as visitor use management strategies, as appropriate, throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards (table 6) and would be accomplished through long-term adjustments to shuttle timing and CUA tours for segments accessed via the main canyon. Strategies may also include the need to formalize and improve sites to accommodate current or increased levels of use while protecting river values. These strategies would be used to address the kinds and amounts of use that can be sustained in the Virgin River corridor while protecting river values.

North Fork Virgin (below the Temple of Sinawava)—Alternative C is the same as alternative B.

Behunin—Alternative C is the same as alternative B for this segment.

Echo Canyon (within wilderness)—Alternative C is the same as alternative B for this segment.

Heaps Canyon—Alternative C is the same as alternative B for this segment.

Heaps Canyon (Emerald Pools Trail)—Indicators of quality for this segment include crowding, presence of human waste, visitor-created trails, and water quality. The specific standards for the above indicators can be found in table 6. Of these indicators, crowding has been determined to be the most protective indicator for all river values (while also serving as proxy for determining appropriate kinds and amounts of use). Standards are associated with encounter rates and vary by alternative and specific location within this segment.

This segment currently has high levels of use. During 2011 field research, park staff observed encounter rates of 135 people in 20 minutes at the lower pools and encounter rates of 95 people at the upper pool. Previous research conducted along this segment indicates that Zion National Park visitors find this level of crowding to be unacceptable. Visitors reported that when an encounter rate of 175 people is reached, they believed that management actions should be taken to reduce the impacts of crowding (Manning 2003). Adaptive management strategies would therefore be implemented to improve facility conditions and maintain current use levels. Standards relating to encounter rates have been developed for this segment based on this previous research. However, park staff believes that an indicator of people at one time is a more useful indicator and

standard for management to understand true crowding issues at both the upper and lower pools. Therefore, park staff would collect data on people at one time and would use this metric for monitoring in the future. Once PAOT data are known, adaptive management strategies would be updated. In the meantime, interim measures would include educating visitors on best times to visit popular areas, educating visitors on alternative attractions and sites, educating visitors on Leave No Trace ethics, and rehabilitating social trails.

In addition to existing and proposed adaptive management actions (see table 6), the National Park Service has initiated a transportation and capacity study that will provide park management with information to make decisions related to visitor use, including visitor capacity. The research is essential because all visitors access the main canyon of Zion National Park using the shuttle system during the peak season (except for visitors staying at the lodge). The implication of managing use levels for areas along the shuttle route could affect the timing and amount of access to primary park destinations such as Emerald Pools Trail at peak use times. Depending on the outcomes of the study, there may be a need to more directly distribute use throughout the day or year, or to different areas of the park. This may require most visitors to plan the timing of their visit and related itinerary with more advanced notice. The upcoming transportation and capacity study will allow managers to make more informed decisions about visitor capacity and related implications for management based on a program of scientific study.

Birch Creek—Alternative C is the same as alternative B for this segment.

Birch Creek (from the North Fork Virgin River to base of Navajo Sandstone)—Alternative C is the same as alternative B for this segment.

Oak Creek—Alternative C is the same as alternative B for this segment.

Clear Creek—Alternative C is the same as alternative B for this segment.

Pine Creek—Alternative C is the same as alternative B for this segment.

EAST FORK VIRGIN RIVER (WILD SEGMENT)

The management strategies for free-flowing condition and water quality are the same as those described in the broad-based strategies and are the same for all alternatives. The outstandingly remarkable values identified for East Fork Virgin River include cultural, geologic, ecological processes, fish, and wildlife. There are no segment specific strategies for the geologic, ecological processes, fish, or wildlife. The management strategies for these ORVs are identified under broad-based strategies.

Alternative A (no-action alternative)

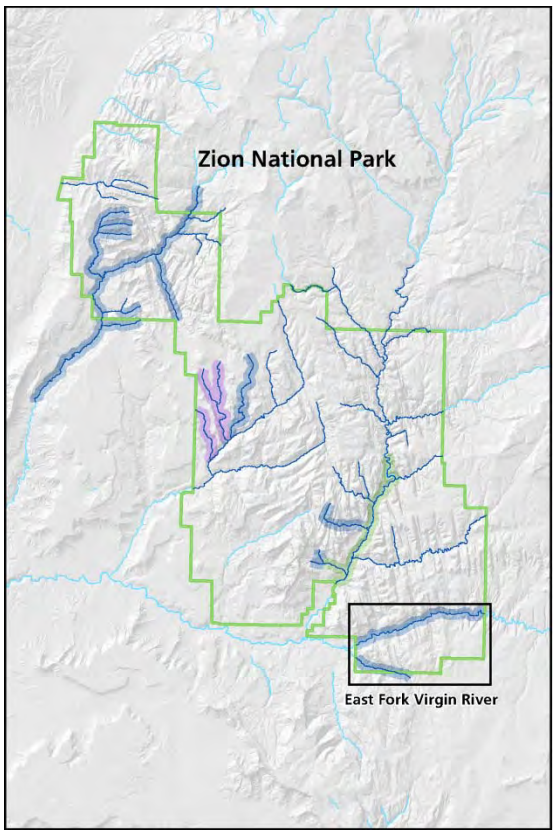
Types and Levels of Development. The only developments along the segment are the stream gauge and routes the researchers use to access the canyon. There are no visitor-related developments in the canyon because it is closed to visitor use. Under alternative A, the walking routes used by researchers would continue to be monitored and the stream gauge would continue to be used.

Kinds and Amounts of Use/Standards. The East Fork segment would continue to be closed to recreational access to protect sensitive wildlife breeding grounds and habitat.

Alternative B

Water quality and free-flowing condition. In addition to the actions identified in the broad-based management strategies, education and outreach on protecting river values would be increased. Increase involvement with other land managers to protect or improve water quality.

Types and Levels of Development. Alternative B is the same as alternative A.



Kinds and Amounts of Use / Standards. Physical access would remain limited to approved researchers. Modern technology would be used to provide virtual access to education on cultural history and natural processes.

East Fork Virgin River, Shunes Creek (Wild Segment)—Indicators of quality for this segment include water quality. Because the standards established in the backcountry management plan are protective of river values, they are being carried forward for the comprehensive management plan. The specific standards for the above indicators can be found in table 6. Of these indicators, none has been determined to be the most protective indicator for all river values because visitor use does not occur in these segments. Adaptive management strategies, as listed from least stringent to most stringent in table 6, would be implemented as needed. Under alternative B, levels of use would be

managed according to guidance in the backcountry management plan.

Alternative C

Water Quality and Free-flowing Condition. Alternative C is the same as alternative B.

Types and Levels of Development. Alternative C is the same as alternative A.

Kinds and Amounts of Use/Standards. Physical access would remain limited to approved researchers. Modern technology would be used to provide virtual access to education on cultural history and natural processes.

East Fork Virgin River, Shunes Creek— Alternative C is the same as alternative B for this segment.

STAFFING AND COST ESTIMATES

NPS decision makers and the public must consider an overall picture of the costs and advantages of various alternatives, including the no-action alternative, to make wise planning and management decisions for the river. Such consideration can shed light on the cost of the no-action alternative and make possible a more relevant comparison to the action alternatives.

The calculations used are estimates for comparison purposes only and are not to be used for budgetary purposes or implementation of funding requests. Actual costs would vary depending on, if and when the actions are implemented. Specific costs would be determined in subsequent, more detailed planning and design efforts.

Presentation of costs in this comprehensive management plan does not guarantee future NPS funding. Project funding would not come all at one time; it would likely take many years to secure and may be provided by partners, donations, or other nonfederal sources. Although the park hopes to secure the necessary funding and would prepare itself accordingly, the park may not receive enough funding to achieve all desired conditions within the time frame of the comprehensive management plan (the next 20-plus years).

ASSOCIATED COSTS

See table 7 for staffing and cost estimates.

TABLE 7. THE VIRGIN RIVER COMPREHENSIVE MANAGEMENT PLAN STAFFING AND COST ESTIMATES

	Alternative A (No-action Alternative)	Alternative B	Alternative C (Preferred Alternative)
Staffing Levels (FTEs)	2	3.5 (includes +3 seasonal hires)	5 (includes +5 seasonal hires)
Annual Operating Costs	$7,821,000	$7,922,000 (base +$101,000)	$7,998,000 (base + 177,000)
One-time Nonfacility Costs	$0	$40,000	$40,000
One-time Facility Costs	$0	$88,000	$440,000

- Additional full-time equivalents (FTEs) would be necessary for expanding wild and scenic river monitoring, interpretation, and permitting. All new staffing would be seasonal hires.
- All other strategies would be implemented with existing staff. (It is not about doing a whole lot more, it is about doing it differently, in accordance with the requirements of the Wild and Scenic Rivers Act.)
- Annual operating costs include staffing, maintenance supplies, and equipment and implementation of the monitoring framework.
- One-time nonfacility costs include interpretation materials (interpretive videos, podcasts, Leave No Trace education).
- One-time facility costs include modest improvements to various trails in the river corridor and revegetation of visitor-created trails. A small expansion of Kolob Terrace Visitor Center is included to allow for additional permitting activities in the future.
- Additional trails would be added to the trail maintenance schedule but would not add to overall deferred maintenance for the park.

PROTECTIVE MEASURES FOR THE ACTION ALTERNATIVES

CULTURAL RESOURCES

The National Park Service and Bureau of Land Management would preserve and protect, to the greatest extent possible, resources that evidence human occupation of the wild and scenic river corridors. Specific protective measures include the following:

- Continue to develop inventories for and oversee research about archeological, historic, and ethnographic resources to better understand and manage the resources, including cultural landscapes; conduct any needed archeological or other resource-specific surveys and NRHP evaluations and identify recommended treatments; incorporate the results of these efforts into site-specific planning and environmental analysis documents; and continue to manage cultural resources in accordance with federal regulations and agency guidelines.

- Archeological surveys would precede any ground-disturbing construction. Known archeological resources would be avoided during all construction activities. If during construction previously undiscovered archeological resources were uncovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate management strategy developed in consultation with the state historic preservation office and, if necessary, associated American Indian tribes.

- Continue ongoing consultations with traditionally associated American Indian tribes; protect sensitive traditional use areas to the extent feasible by avoiding or minimizing impacts on ethnographic resources and continuing to provide access to traditional use and spiritual areas; protective measures could include identification of and assistance in accessing alternative resource gathering areas and screening new development from traditional use areas

- Encourage visitors through park interpretive programs to respect and leave undisturbed any inadvertently encountered archeological resources.

These measures would help to ensure that the archeological, historic, and ethnographic resources that are part of the cultural ORV continue to be protected in good condition.

NATURAL RESOURCES

Nonnative Plant Species

Nonnative plant species can adversely affect the ecological processes ORV, replacing or decreasing native riparian vegetation, as well as vegetation recruitment and succession. The NPS and BLM staff would work with adjacent landowners to implement a noxious weed control program for which standard measures could include the following elements: ensuring that construction-related equipment arrives on-site free of mud or seed-bearing material; certifying all seeds and straw material as weed-free; identifying areas of noxious weeds before construction; treating noxious weeds or noxious weed topsoil before construction (e.g., topsoil

segregation, storage, herbicide treatment); and revegetating with appropriate native species. These measures would help ensure that native riparian vegetation and the ecological processes ORV continue to be maintained in healthy condition.

Soils

Soils are an important element of the ecological processes ORV and soil disturbance needs to be minimized to avoid adverse impacts. If determined to be necessary, the park would build new facilities on soils suitable for development, such as those less readily prone to water inundation or erosion or that have been previously disturbed, and would minimize soil erosion by limiting the time that soil is left exposed and by applying other erosion-control measures, such as erosion matting, silt fencing, and sedimentation basins in construction areas to reduce erosion, surface scouring, and discharge to water bodies. Once work was completed, disturbed areas would be revegetated with native plants in a timely manner. These measures would help ensure that soil disturbance is minimized and would avoid erosion that would degrade the ecological processes ORV as well as protect water quality.

Threatened and Endangered Animal Species

Protective actions would occur during normal agency operations as well as before, during, and after construction to minimize immediate and long-term impacts on rare, threatened, or endangered animal species. These actions would vary by specific project, but protective actions specific to rare, threatened, or endangered animal species could include the following:

- Conduct surveys for rare, threatened, and endangered species, as warranted.
- Locate and design facilities/actions to avoid adverse effects on rare, threatened, and endangered species. If avoidance is infeasible, minimize and compensate for adverse effects on rare, threatened, and endangered species as appropriate and in consultation with the appropriate resource agencies. Conduct work outside of critical periods for the specific species.
- Develop and implement restoration and/or monitoring plans as warranted. Plans should include methods for implementation, performance standards, monitoring criteria, and adaptive management techniques.
- Implement measures to reduce adverse effects of nonnative plants and wildlife on rare, threatened, and endangered species.

Vegetation

- Monitor areas used by visitors (e.g., trails) for signs of native vegetation disturbance. Use public education, revegetation of disturbed areas with native plants, erosion-control measures, and barriers to control potential impacts on plants from trail erosion or visitor-created trails.
- Designate river access / crossing points and use barriers and closures to prevent trampling and loss of riparian vegetation.
- Develop revegetation plans for the disturbed area and require the use of native species. Revegetation plans should specify seed/plant source, seed/plant mixes, and/or soil preparation. Salvage vegetation should be used to the extent possible.

Water Resources

To prevent water pollution during construction, use erosion-control measures, minimize discharge to water bodies, and regularly inspect construction equipment for leaks of petroleum and other chemicals. Minimize the use of heavy equipment in a waterway.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM DETAILED EVALUATION

The National Park Service considered public comment regarding the desire to float segments of the Virgin River within Zion National Park at higher than current flow rate limits. The current flow rate limits for hiking, canyoneering, and boating were established based on public and park employee safety and can be adjusted through the Superintendent's Compendium. The National Park Service determined that the Superintendent's Compendium is an appropriate instrument to deal with flow rate limits for various activities and would provide more flexibility to deal with changing conditions and technology than establishing new limits as part of the comprehensive management plan. Changes to the Superintendent's Compendium would consider river values.

Given the concerns about human waste in high visitation areas such as The Narrows, the planning team considered the placement of a vault toilet in The Lower Narrows. However, given the configuration of the canyon, there would be no practical means of servicing such a facility, so this was dismissed from further consideration.

Another action considered was to eliminate all existing instream and riverbank structures, such as levees, bank armoring and diversion dams, to enhance free-flowing conditions. This idea was dismissed because many of these structures are needed to provide water and utilize NPS and non-NPS water rights, or to protect streamside structures, and many of them are historic (although they are not part of cultural ORVs in the canyon). The elimination of riverbank structures would likely result in rapid loss of at least portions of Zion Canyon Scenic Drive, which is the only vehicle access to upper portions of Zion Canyon and would significantly limit visitor access and impact park operations. The elimination of riverbank structures could also result in damage to Zion Lodge and the utility infrastructure. This type of action would require site-specific NEPA compliance to assess the environmental impacts as well as section 106 analysis for removal of historic structures. The selective removal or modification of some of these structures to reduce their impact to free flow has been included in other park planning documents and remains an objective of the park.

During the public comment period, the idea of designating more of the Virgin River as a wild and scenic river was identified. Based on the previous eligibility and suitability analysis performed by the National Park Service and Bureau of Land Management, all segments in the area that were found eligible and suitable were designated in 2009. Other segments outside this region are beyond the scope of this plan.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Concept	Alternative A would continue current management practices into the future. Its goal would be to retain the existing river-related visitor experience and resource management strategies based on existing park planning. Ongoing coordination with the Bureau of Land Management and other agencies would continue. No action does not imply discontinuing the present uses or management actions and does not mean removing the existing wild and scenic river designation. Because there would be no approved comprehensive management plan as required by section 3(d)(1) of the Wild and Scenic Rivers Act, this alternative would not be in compliance with this portion of the act. The agencies would strive to protect and enhance the free-flowing condition, water quality, and the outstandingly remarkable values for which the rivers were designated through other management actions. Under alternative A, the Virgin Wild and Scenic River would continue to be managed according to other park plans, NPS *Management Policies 2006*, the Wilderness Act and the Wild and Scenic Rivers Act.	Under Alternative B, Virgin River and its tributaries would be managed with an emphasis on resource protection including interpreting natural and cultural resources and restoring natural resources. Restoration of natural river processes would take precedence over recreational activities. A variety of appropriate recreational activities would be available throughout the park and on BLM-managed lands, which are compatible with resource protection. Visitor use levels would generally remain the same in low use areas where use is not impacting river values, but would be reduced in areas experiencing impacts on river values. The monitoring program and adaptive management would ensure that recreation or other actions do not negatively impact river values.	Under alternative C, the Virgin River and its tributaries would be managed with an emphasis on resource protection. Recreational activities that are compatible with resource protection strategies would be available throughout the park and on BLM-managed lands. The Virgin River and its tributaries would be managed to maintain or enhance recreational opportunities—public uses would continue to be allowed unless there is a clear need to limit use. Educational and interpretive opportunities would also be enhanced. The park staff would develop new connections through education and would build advocacy. Relevance would be maintained through use of new technology for media and outreach. The National Park Service would continue to be open to new recreation experiences compatible with protection of river values and provide a diversity of experiences for a variety of abilities, interests, and cultures. The National Park Service would actively manage visitor areas to maintain use levels or allow a small increase in use while protecting river values. A monitoring program and adaptive management would ensure that recreation or other uses do not negatively impact river values.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
	Kinds and Amounts of Recreation Use and Education/Interpretation		
Management Strategies	Visitor use management would continue according to other park plans, NPS *Management Policies 2006*, the Wilderness Act ,and the Wild and Scenic Rivers Act.	Visitor use management would focus on protecting natural processes.	Visitor use management would focus on protecting natural processes and enhancing the recreational ORV / river-related visitor use and experience.
	Taylor Creek (wild segment). Under alternative A, education and interpretation would continue without specific focus on river values. Day use limits (permits) based on wilderness indicators and standards would continue and adaptive management strategies would not be specific to the protection of river values. Using adaptive management strategies from the backcountry management plan, levels of use would be managed on North Fork Taylor Creek and South Fork Taylor Creek because current use is low on these segments. However, extensive crowding on Middle Fork Taylor Creek has resulted in exceeded crowding-based standards. Therefore, use levels would be decreased by adaptively reducing the Taylor Creek parking lot size to bring crowding issues back into standard.	**Taylor Creek (wild segment).** Education and interpretation would be focused on history and personal connections to cultural and natural resources. Day use limits (permits) based on indicators and standards would be considered. Wilderness character would be maintained through monitoring the identified indicators and taking action if standards are not met. Management strategies would include education, providing information on alternate routes to disperse use from Middle Fork, reduction in group size, limits on number of hikers on routes, limits on number of hikers beyond certain points or temporary closures during critical wildlife periods. Adjustments to Taylor Creek parking lot size would also be used to manage crowding.	**Taylor Creek (wild segment).** Same as alternative B.
	La Verkin Creek (wild segment). Under alternative A, use limits (permits) would continue to be used for overnight use only.	**La Verkin Creek (wild segment).** Wilderness character would be maintained through monitoring the identified indicators and taking action if standards are not met. Day use limits (permits) based on indicators and standards would be considered.	**La Verkin Creek (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Strategies	**North Creek (wild and scenic).** Under alternative A, the level of recreational activity would be monitored under the guidance of the backcountry management plan, and there would not be additional focus on the protection of river values. Using adaptive management strategies, current use levels would be maintained for all tributaries of the North Creek segment. Where current use limits and standards are protective of wilderness values, there would be no adjustments to the kinds and amounts of use.	**North Creek (wild and scenic).** The level of recreational activity would be monitored to ensure river values are not negatively impacted and would be adjusted as needed. Education, management of access and dispersion of visitor use would be emphasized in managing areas with visitor caused impacts. Most of the segments have low levels of use and limits set in the backcountry management plan are seen as protective of river values. Wilderness character would be maintained through monitoring the identified indicators and taking action if standards are not met.	**North Creek (wild and scenic).** Same as alternative B.
	North Fork Virgin River above the Temple of Sinawava (wild segment). Existing flow limits would be carried forward from the *Superintendent's Compendium*. Adaptive management strategies from the backcountry management plan would be carried forward for segments that overlap with wilderness zones to maintain consistency in monitoring and management efforts across plans.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** A formalized approval process would be initiated for flow limits for hiking, canyoneering, and boating. Education, management of access and dispersion of visitor use would be emphasized in managing areas with visitor caused impacts. In order to reduce crowding in frontcountry and transitional areas, levels of use would be decreased by adjustments to shuttle timing and commercial use. Further adaptive management options may be identified in the upcoming NPS transportation and visitor use study. Levels of use in wilderness areas would be managed according to guidance from the backcountry management plan.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Strategies	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Adaptive management strategies from the backcountry management plan would be carried forward for segments that overlap with wilderness zones to maintain consistency in monitoring and management efforts across plans, but would not be specific to the protection of river values. Boating would remain limited to private use and permits would continue to be required.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Same as alternative A, plus: Education, management of access and dispersion of visitor use would be emphasized in managing areas with visitor caused impacts affecting ORVs and/or resources. Dispersion of visitors would be accomplished through adjustments to shuttle timing and commercial use and other adaptive management as listed in table 6. Further adaptive management options may be identified in the upcoming NPS transportation and visitor use study.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Same as alternative B.
	Recreational Segment. No changes would be made pertaining to the evaluation of permit renewal for the horseback riding concession.	**Recreational Segment.** The park would consider riverbank conditions, water quality, and trail maintenance requirements in evaluating the horseback riding concession for permit renewal.	**Recreational Segment** The park would consider riverbank conditions, water quality and trail maintenance requirements and diversity of recreational experience in evaluating the horseback riding concession for permit renewal. The park would manage horse use, use levels, and trail locations based on indicators and standards.
	East Fork Virgin River (wild segment). The East Fork segment would continue to be closed to recreational access to protect sensitive wildlife breeding grounds and habitat.	**East Fork Virgin River (wild segment).** Same as alternative A, plus: Modern technology would be used to provide virtual access to education on cultural history and natural processes.	**East Fork Virgin River (wild segment).** Same as alternative B.
	Types and Levels of Development		
	Taylor Creek (wild segment)	**Taylor Creek (wild segment).** A standard for new climbing bolts would be developed to protect river values. Best management practices for road maintenance on Kolob Creek Scenic Drive would be instituted.	**Taylor Creek (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Strategies	**La Verkin Creek (wild segment).**	**La Verkin Creek (wild segment).** Wilderness character would be maintained.	**La Verkin Creek (wild segment).** Wilderness character would be maintained. The park would ensure maintenance of established trails and monitoring of campsites to minimize visitor impacts.
	North Creek (wild and scenic).	**North Creek (wild and scenic).** The National Park Service would partner with landowners, land managers, and the county on best management practices for maintenance, protection of river values, and possible easements; consideration of use limits over formalizing trails to mitigate resource impacts; some visitor-created trails would be revegetated.	**North Creek (wild and scenic).** The National Park Service would partner with landowners, land managers, and the county on best management practices for maintenance, protection of river values, and possible easements. The park would develop a more active trail maintenance and vegetation restoration program to limit the impact of visitor-created trails.
	North Fork Virgin River above the Temple of Sinawava (wild segment). Existing development includes undeveloped routes in slot canyons, the paved Riverside Walk, 12 designated wilderness campsites and bolts used for canyoneering.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Existing facilities would remain. Access to the river would be managed to protect natural processes and wilderness character would be maintained in the upper canyon. The park would formalize a few visitor-created trails between the Riverside trail and river to with natural surface trails. Excess visitor-created trails would be revegetated and additional fencing could be installed to protect vegetation of prevent erosion.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Strategies	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Development in this segment includes much of the park infrastructure and visitor facilities including visitor center, administrative facilities, maintenance facilities, campgrounds, Zion Lodge, shuttle maintenance facilities, housing, roads, bridges, trails and utilities and well as rock gabions and levees along some portions of the river and several weirs and diversions.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Existing facilities would generally remain. Park facilities that are in floodplains would be protected from flooding by minimal means that can include levees and armoring. Alternatives to reduce adverse impacts on river values would be explored. The National Park Service would consider use limits over formalizing trails to mitigate resource impacts. Excess visitor-created trails to Emerald Pools would be revegetated.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Same as alternative B Plus: A natural surface trail from the Temple of Sinawava to Zion Lodge would be developed to provide additional hiking opportunities. Trails to Emerald Pools would be formalized as natural surface trails and visitor-created trails revegetated. Maintain river-related visitor use and experience with minimal resource impacts. The park would develop a more active trail maintenance and restoration program to limit the impact of visitor-created trails. Consider developing more formal, natural surface trails in high use areas. The park would implement trail restoration work related to horse use.
	East Fork Virgin River (wild segment). Existing developments are limited to a stream gauge and routes researchers use to access the canyon, and would remain.	**East Fork Virgin River (wild segment).** The undeveloped state would be maintained.	**East Fork Virgin River (wild segment).** Same as alternative B.
	Water Quality and Free-flowing Condition		
	Taylor Creek (wild segment). Strategies would be the same as for the broad-based strategies.	**Taylor Creek (wild segment).** The park would maintain existing high water quality and free-flowing conditions and increase efforts to educate visitors about proper waste disposal.	**Taylor Creek (wild segment).** Same as alternative B.
	La Verkin Creek (wild segment). Strategies would be the same as for the broad-based strategies.	**La Verkin Creek (wild segment).** Cooperative partnerships with the Bureau of Land Management and private landowners to reduce the impacts of livestock would be increased.	**La Verkin Creek (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Management Strategies	**North Creek (wild and scenic).** Strategies would be the same as for the broad-based strategies.	**North Creek (wild and scenic).** The park and Bureau of Land Management would work with adjacent landowners on reducing livestock trespass. Opportunities would be pursued to reduce impacts of private diversion structures, including acquisition of lands or interest in lands from willing sellers.	**North Creek (wild and scenic).** Same as alternative B Plus: There would be more emphasis on managing visitor-created trails.
	North Fork Virgin River above the Temple of Sinawava (wild segment). Strategies would be the same as for the broad-based strategies.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** The NPS would work with adjacent landowners and managers to implement best practices to reduce fecal bacteria.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Same as alternative B.
	North Fork Virgin River below the Temple of Sinawava (wild and recreational). Strategies would be the same as for the broad-based strategies.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Restoration of natural river processes would be considered to restore free-flowing conditions, including benign neglect of levees and gabions. Repairs to these structures would be made only to protect human health and safety. The need for irrigation water for park use would be reduced. The National Park Service would engineer a solution to protect park infrastructure that would minimize impact on free-flowing conditions. Riverbank stabilization would be the minimum necessary to protect property and public safety. The park would consider bank conditions, water quality, and trail maintenance requirements in evaluating the horseback riding concession for permit renewal.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Management would increase monitoring and institute best management practices to maintain or improve water quality (primarily for human health). The need for irrigation water for park use would be reduced. The National Park Service would develop a solution to protect park infrastructure that would minimize impact on free-flowing conditions. Riverbank stabilization would be the minimum necessary to protect property as well as human health and safety. The park would consider riverbank conditions, water quality, and trail maintenance requirements and diversity of recreational experience in evaluating the horseback riding concession for permit renewal.
	East Fork Virgin River (wild segment). Strategies would be the same as for the broad-based strategies.	**East Fork Virgin River (wild segment).** Same as alternative A.	**East Fork Virgin River (wild segment).** Same as alternative A.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
	Natural Resources		
Management Strategies	**Taylor Creek (wild segment).** Strategies would be the same as for the broad-based strategies.	**Taylor Creek (wild segment).** Best management practices for road maintenance on Kolob Creek Scenic Drive would be instituted. There would be more attention on managing visitor-created trails.	**Taylor Creek (wild segment).** Same as alternative B.
	La Verkin Creek (wild segment). Strategies would be the same as for the broad-based strategies.	**La Verkin Creek (wild segment).** The park would establish cooperative partnerships with the Bureau of Land Management and private landowners on cattle trespass to reduce impacts of nonnative plants would be increased.	**La Verkin Creek (wild segment).** Same as alternative B.
	North Creek (wild and scenic). Strategies would be the same as for the broad-based strategies.	**North Creek (wild and scenic).** Partnerships with adjacent landowners and managers would be further developed to minimize nonnative seed sources and to reduce livestock trespass upstream of the park. There would be increased emphasis on managing visitor-created trails.	**North Creek (wild and scenic).** Same as alternative B, plus: More emphasis would be applied on education to reduce visitor-created trails.
	North Fork Virgin River above the Temple of Sinawava (wild segment). Strategies would be the same as for the broad-based strategies.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** More emphasis on managing visitor-created trails. Limiting public access would be considered, if necessary, to meet desired conditions. NPS presence would increase.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** More education and different approaches to promote resource stewardship would be provided. NPS presence would increase.
	North Fork Virgin River below the Temple of Sinawava (wild and recreational). Strategies would be the same as for the broad-based strategies.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Restoration of natural river processes would be supported to allow natural recruitment of cottonwoods.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Restoration of natural river processes would be supported while enhancing recreation and interpretive opportunities.
	East Fork Virgin River (wild segment). Strategies would be the same as for the broad-based strategies.	**East Fork Virgin River (wild segment).** The park would partner with the Bureau of Land Management and upstream landowners to control exotic seed sources.	**East Fork Virgin River (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
	Cultural Resources		
Management Strategies	**Taylor Creek (wild segment).** Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**Taylor Creek (wild segment).** Same as alternative A. Same as alternative A, plus: Education and interpretation would focus on history and connections to cultural history and natural resources.	**Taylor Creek (wild segment).** Same as alternative B.
	La Verkin Creek (wild segment). Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**La Verkin Creek (wild segment).** Same as alternative A.	**La Verkin Creek (wild segment).** Same as alternative A.
	North Creek (wild and scenic). Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**North Creek (wild and scenic).** Same as alternative A.	**North Creek (wild and scenic).** Same as alternative A.
	North Fork Virgin River above the Temple of Sinawava (wild segment). Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Preserve balance between ecology and natural systems (vegetation/wildlife habitat) and the character-defining components of cultural landscapes.	**North Fork Virgin River above the Temple of Sinawava (wild segment).** Same as alternative B.
	North Fork Virgin River below the Temple of Sinawava (wild and recreational). Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Preserve balance between ecology and natural systems (vegetation/wildlife habitat) and the character-defining components of cultural landscapes.	**North Fork Virgin River below the Temple of Sinawava (wild and recreational).** Preserve balance between ecology and natural systems (vegetation/wildlife habitat) and the character-defining components of cultural landscapes.
	East Fork Virgin River (wild segment). Cultural resources would continue to be protected by cultural site monitoring and other park plans.	**East Fork Virgin River (wild segment).** Physical access would remain limited to approved researchers. Modern technology would be used to provide virtual access to education on cultural history and natural processes.	**East Fork Virgin River (wild segment).** Same as alternative B.

TABLE 8. SUMMARY OF ALTERNATIVE MANAGEMENT CONCEPTS, MANAGEMENT STRATEGIES, AND COMMON TO ALL ACTIONS

	Alternative A	Alternative B	Alternative C
Adaptive Management Strategies and Visitor Use Management		When managing areas with visitor-caused impacts, education, management of access, and dispersion of visitor use would be emphasized as visitor use management strategies throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards and would be accomplished through near-term adjustments to shuttle timing and CUA tours for segments accessed via the main canyon. Strategies may also include the need to reduce or manage use levels in specific high use areas to protect river values. Further adaptive management strategies may be identified in the upcoming NPS transportation and visitor use study. These strategies would address the kinds and amounts of use that can be sustained in the Virgin River corridor while protecting river values.	When managing areas with visitor-caused impacts, education, site management, and dispersion of visitor use would be emphasized as visitor use management strategies, as appropriate, throughout the river corridor. Dispersion of visitors and adjustments to the kinds and amounts of use would be based on segment- and site-specific standards and would be accomplished through long-term adjustments to shuttle timing and CUA tours for segments accessed via the main canyon. Strategies may also include the need to formalize sites in order to accommodate current or increased levels of use while protecting river values. Strategies may also include the need to reduce or manage use levels in specific high use areas in order to protect river values. Further adaptive management strategies may be identified in the upcoming NPS transportation and visitor use study. These strategies would be used to address the kinds and amounts of use that can be sustained in the Virgin River corridor while protecting river values.

TABLE 9. SUMMARY OF THE IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative A (No-action Alternative)	Alternative B	Alternative C (Preferred Alternative)
Free-flowing Condition and Floodplains	In alternative A, existing instream and riverbank structures would remain and continue to adversely impact free-flowing condition and natural stream meandering and floodplains. This would be a continuation of a long-term, minor, adverse impact on free-flowing condition and floodplains along some of the designated segments.	Implementation of alternative B would result in the eventual loss of some gabions and levees in one segment resulting in long-term, minor, beneficial impacts on the free-flowing condition and floodplains. Implementing alternative B would protect and enhance the free-flowing condition of the designated river segments.	Implementation of alternative C would result in the eventual loss of some gabions and levees in one segment resulting in long-term, minor, beneficial impacts on the free-flowing condition and floodplains. Implementing alternative C would protect and enhance the free-flowing condition of the designated river segments.
Water Quality	Alternative A would continue to have a long-term, negligible adverse effect on water quality.	Alternative B would result in a long-term, minor, beneficial impact on water quality due to changes in operations and enhanced partnerships with adjacent land owners.	Alternative C would result in a long-term, minor, beneficial impact on water quality due to changes in operations and enhanced partnerships with adjacent land owners.
Ecological Processes ORV (including vegetation)	Alternative A would a have long-term, negligible, beneficial effect on ecological processes and vegetation	Alternative B would result in a short- and long-term, moderate, beneficial impacts on ecological processes and vegetation from various resource protection and enhancement programs.	Alternative C would result in short- and long-term, moderate, beneficial impacts on ecological processes and vegetation from various resource protection and enhancement programs.
Fish ORV (including aquatic invertebrates)	Alternative A would have minor beneficial effect on native fish, including in the designated river segments.	Alternative B would have long-term, minor, beneficial impacts on native fish in the designated river segments due to improvements in habitat.	Alternative would have long-term, minor, beneficial impacts on native fish in the designated river segments due to improvements in habitat.
Wildlife ORV (including threatened and endangered species)	Alternative A would have minor beneficial effect on native wildlife and threatened and endangered species and their habitats, including federally listed species.	Alterative B would have long-term, minor, beneficial impacts on native wildlife and threatened and endangered species from various protection programs.	Alternative C would have long-term, minor, beneficial impacts on native wildlife and threatened and endangered species from various protection programs.

TABLE 9. SUMMARY OF THE IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative A (No-action Alternative)	Alternative B	Alternative C (Preferred Alternative)
Recreational ORV / River-related Visitor Use and Experience	Under alternative A, there would continue to be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. The adaptive management strategies set forth in the backcountry management plan would be protective of river values, allowing for high quality river-related visitor experience on the low use segments within wilderness. In contrast, the lack of management strategies to address crowding under alternative A would continue to result in long-term, moderate, adverse impacts on river-related visitor experience in the high use frontcountry areas during peak season. Overall, there would be long-term, moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative A are added to the effects of higher demand for use from the St. George airport. In particular, The Narrows and Emerald Pools are experiencing unacceptable levels of crowding, and there is no room for increased use in these areas during peak visitation times. Overall, there would be long-term, negligible to minor, beneficial impacts on river-related visitor experience when the impacts from alternative A are added to the effects of improved entrance, road, and campgrounds conditions throughout the Virgin River corridor.	Under alternative B, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. Therefore, the adaptive management strategies to address crowding under alternative B would result in long-term, minor to moderate, beneficial impacts on river-related visitor experience in the high use frontcountry areas during peak season. Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative B are added to the effects of higher demand for use from the St. George airport. Overall, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience when the impacts from alternative B are added to the effects of improved entrance, road, and campground conditions throughout the Virgin River corridor.	Under alternative C, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. The adaptive management strategies to address crowding under alternative C would result in long-term, negligible to moderate, beneficial impacts on river-related visitor experience in the high use frontcountry areas during peak season. However, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on these trails during peak times. Therefore, adaptive management and future research pertaining to transportation and capacity are being applied to correct issues related to the recreation ORV in high use frontcountry areas. Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative Care added to the effects of higher demand for use from the St. George airport. Under alternative C, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on this trail during peak times. Overall, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience when the

TABLE 9. SUMMARY OF THE IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative A (No-action Alternative)	Alternative B	Alternative C (Preferred Alternative)
			impacts from alternative C are added to the effects of improved entrance, road, and campgrounds conditions throughout the Virgin River corridor.
Scenic ORV / Visual Resources / Viewshed	Alternative A would result in long-term, minor, adverse impacts to the visual resources found within the river corridor; due to lack of formal guidance for protecting the scenic viewshed.	Alternative B would result in long-term, minor, beneficial impacts to the visual resources found within the river corridor as a result of the scenery conservation best practices protecting the scenic viewshed and limiting new construction within the corridor.	Alternative C would result in long-term, minor, beneficial impacts to the visual resources found within the river corridor as a result of the scenery conservation best practices protecting the scenic viewshed and limiting new construction within the corridor.
Park Operations	By continuing to preserve wild and scenic river values and provide several opportunities for outdoor recreation, interpretation, and education in the headwaters area, Zion National Park would continue to provide the same level of protection, monitoring, and visitor services. However, continued exposure to human waste, and increased operational demands associated with restoration activities would result in impacts on park operations that are long-term, moderate, and adverse.	Implementing alternative B would have long-term, minor, beneficial impacts on park operations, due to increased need for monitoring, protection, interpretation, and education, as well as the ability to respond quickly to issues affecting river values.	Implementing alternative C would have long-term, minor, beneficial impacts on park operations, due to increased need for monitoring, protection, interpretation, and education, as well as the ability to respond quickly to issues affecting river values. Site improvements would also reduce the staff time required for resource restoration. There would be a negligible, beneficial, cumulative effect.
BLM Operations	The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because management actions would not change.	The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because management actions would not change.	The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because management actions would not change.

TABLE 9. SUMMARY OF THE IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative A (No-action Alternative)	Alternative B	Alternative C (Preferred Alternative)
Socioeconomics	Alternative A would have a long-term, moderate, beneficial impact on the local and regional socioeconomic environment due to contributions of the Virgin River to local quality of life and the increased importance of recreation-related tourism.	The overall impact on the socioeconomic environment from alternative B would be long-term, minor to moderate, and beneficial. The beneficial impacts would result from protecting river values. These actions would increase the park's contribution to the local economy and quality of life because of visitor spending on local services and goods, NPS employment, NPS contracting, and concessioner activity and employment.	The overall impact on the socioeconomic environment from alternative C would be long-term, minor to moderate, and beneficial. The beneficial impacts would result from protecting river values and maintaining, improving, and increasing access to the river corridor. These actions would increase the park's contribution to the local economy and quality of life because of visitor spending on local services and goods, NPS employment, NPS contracting, and concessioner activity and employment.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

As defined in the Council on Environmental Quality "Forty Most Asked Questions" (Q6a), the environmentally preferable alternative is defined as ". . . the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources." It should be noted that there is no requirement that the environmentally preferred alternative and the preferred alternative be the same.

Alternative A (no-action alternative) would continue existing natural and cultural resource management actions, including interagency efforts. Alternative A provides some range of diversity and individual choices. It does not provide as much resource protection and beneficial management as some other alternatives, therefore, more resource impacts would be expected if visitor use levels increase under this alternative. Thus, the no-action alternative would not meet NEPA criteria.

Alternative B would continue to provide a range of NPS visitor use opportunities. There would be more focused interpretation of the Virgin River and its tributaries. This would provide some range of neutral and beneficial uses of the environment. This alternative would also enhance cooperative protection of natural and cultural resources in and around the national park.

Alternative C would allow an expansion of visitor use opportunities and resource interpretation, thus providing the widest range of neutral and beneficial uses of the environment of any alternative. This alternative would also continue protection of the undeveloped river segments. This alternative would also enhance cooperative protection of natural and cultural resources in and around the national park.

After consideration of the alternatives in this comprehensive management plan, alternative C best meets CEQ criteria and is the environmentally preferable alternative. This alternative would fully satisfy more of the national environmental criteria than either alternatives A or B. Alternative C would provide a high level of protection of natural and cultural resources throughout more of the Virgin River. The alternative would provide protection of river values by integrating resource protection with visitor use.

IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The development of a preferred alternative involved evaluating the alternatives with the use of an objective analysis process called choosing by advantages (CBA). Through this process, the planning team identified and compared the relative advantages of each alternative according to a set of factors. The benefits or advantages of each alternative were compared for each of the CBA factors.

The overall goal of the Virgin River comprehensive management plan is to protect and enhance the outstandingly remarkable values, free-flowing character and water quality for which the river and its tributaries were designated, leaving the river and its tributaries protected for the benefit and enjoyment of present and future generations. More specifically, the goals of this comprehensive management plan are

- To protect and enhance free-flowing condition and water quantity and to promote the river's ability to shape the geologic landscape by ensuring a river flow regime that is essentially natural and includes a full range of base flow, flood events, and annual and seasonal variation. In reaches where free-flowing conditions have been altered, impediments are reduced and hydrologic function

improved to the degree practicable while protecting life and property. There would be no net increase in bank hardening or channel alteration.

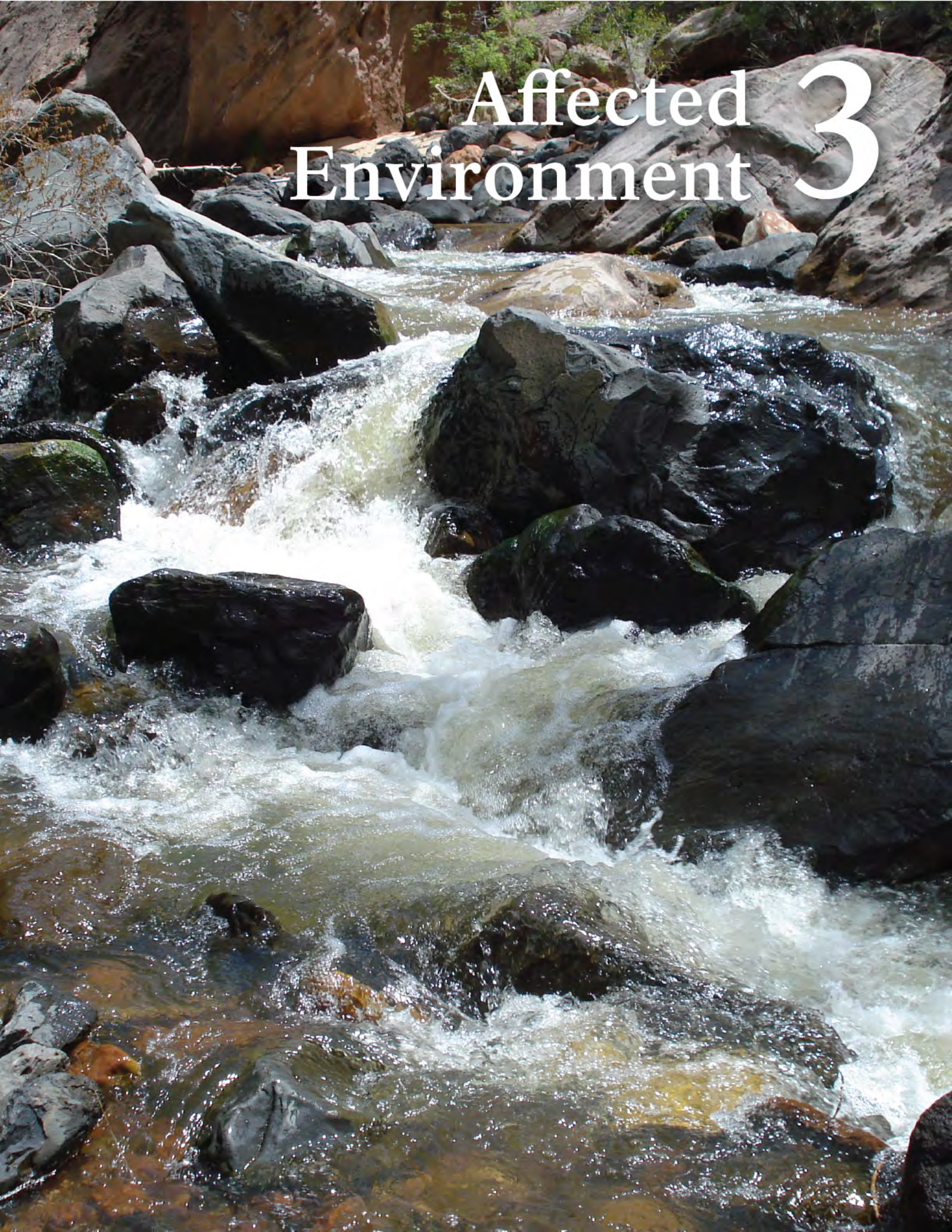
- To protect and enhance river-related natural resources and ecological processes. The natural function of riparian areas, wetlands, and floodplains of the Virgin River and its tributaries is maintained and restored—restoration activities strive to return habitat to natural levels of complexity and diversity, and water quality reflects natural background conditions and variability and, at a minimum, maintains established water quality standards for the protection of park values. In cases where natural water quality substantially deviates from standards, such as naturally high sediment levels, those conditions are protected by seeking site-specific standards; achievement of this goal would benefit fish, wildlife, ecological processes, and geologic values.
- To protect and enhance river-related cultural resources. The Virgin River basin has been inhabited for thousands of years and evidence of this history, including historic and prehistoric sites, remains today. River-related cultural resources are cherished and preserved as important links to the human history of the river basin.
- To protect and enhance the recreational ORV, thereby providing appropriate visitor use and access and a diversity of recreational opportunities that allows visitors to experience the river and have a direct connection to its unique values.
- To implement a visitor use management framework that will protect and enhance the recreational ORV while providing uses that do not adversely affect the recreational ORV or the other river values.
- To establish land use and development constraints and to establish clear direction on managing land uses and associated developments in the river corridors so that the protection and enhancement of river values and function, including scenery, are supported, and to strive to resolve conflict between development and natural river function.

The first four goals were used to evaluate the alternatives. The last two goals were used to analyze and enhance the visitor use management program and to establish land use; development constraints were considered action items that would be developed for the preferred alternative once it is developed. Therefore, the four factors that were used in evaluating the alternatives were:

- Factor 1—protect and enhance free-flowing conditions and water quality
- Factor 2—protect and enhance river-related natural resources and ecological processes
- Factor 3—preserve and protect river-related and cultural resources
- Factor 4—provide appropriate visitor use and access

Many CBA evaluations contain a factor that evaluates the effect of the alternatives on park operations and efficiency. Because there was a narrow range to consider for the alternatives and the action items had a relatively low cost, this factor was dropped from consideration.

The relationships between the advantages and costs of each alternative were established to indicate the alternative that gives the National Park Service the greatest overall benefits for each factor listed above for the most reasonable cost.



3 Affected Environment

INTRODUCTION

This chapter describes the affected environment (existing setting and baseline conditions) for the outstandingly remarkable values and the resources that could be potentially affected by the actions proposed in this plan. Discussion begins with river values such as free-flowing condition, water quality, and ecological process and also includes, per WSRA direction, discussion on types and levels of development. The recreation ORV is expanded to include river-related visitor use and experiences. More typical environmental assessment topics including agency operations and socioeconomics are also included. The topics are:

- Free-flowing Condition and Floodplains
- Water Quality
- Geologic ORV
- Ecologic Processes ORV
- Fish ORV
- Wildlife ORV (including threatened and endangered wildlife species)
- Cultural ORV
- Scenic ORV / Visual Resources / Viewsheds
- Recreational ORV / River-related Visitor Use and Experiences
- Types and Levels of Development
- Agency Operations
- Socioeconomics

NATURAL RESOURCES

FREE-FLOWING CONDITION AND FLOODPLAINS

The Virgin River and its tributaries have carved, and continue to carve, spectacular vertical-walled canyons through the Navajo sandstone and surrounding sedimentary strata. The erosive force is provided by frequent flood events that occur most often from sudden summer monsoon storms and from spring snowmelt, and rarely but significantly, from large winter rain-on-snow flood events. Annual flow is highly variable and large runoff years are more likely during El Niño climate events.

Sediment transport from the North Fork Virgin River is estimated at 800,000 to 1 million tons per year, and yield from other tributaries is of similar magnitude when scaled for the relative size of each drainage basin.

Streamflow in the large rivers and almost all tributaries is natural and free-flowing. There are no large reservoirs on the watershed that would significantly reduce flood flows, affect base flows, cause daily hydropower fluctuations, or modify stream temperatures. Therefore, discharge patterns show the full range of natural conditions. Water flow in the park is protected by federal reserved and appropriated water rights held by the National Park Service and recognized in the Zion National Park Water Rights Settlement Agreement. Additionally, the Utah state engineer manages the Virgin River Basin as if it is fully appropriated, so no new diversions of water are permitted.

Consumptive use of water upstream of the park amounts to about 6%–10% of the average annual discharge, reducing total discharge by that amount, but not altering flood flows or the range of natural variation. The greatest influence on flows is Kolob Reservoir on Kolob Creek (2 miles upstream of the park), which has the capacity to substantially alter flows on Kolob Creek capturing much of the spring runoff and augmenting summer and fall flows, typically by releasing 5–10 cubic feet per second (cfs) in the summer or fall. The Crystal Creek pipeline provides for the diversion of an average of 4,000 acre-feet (acre-ft) per year from the upper reaches of Crystal Creek, piping water to Kolob Reservoir and releasing it down Kolob Creek to meet the water needs of the Washington County Water Conservancy District downstream near St. George. Controlled reservoir releases are limited to 35 cfs under the Zion National Park Water Rights Settlement Agreement.

Related to free-flowing condition is the topic of floodplains. Through much of lower Zion Canyon (i.e., from the park's south boundary upstream to the Canyon Junction bridge), the 100- and 500-year floodplains closely follow the banks of the Virgin River. Earthen levee systems present along the riverbanks near Zion Lodge and through The Watchman Campground have altered the historic floodplains in these areas. The probable maximum flood area flows out into open areas of the park, portions of the housing areas, campgrounds, and much of the valley floor. All of the existing park facilities near Oak Creek are within the probable maximum floodplain of that creek. The current visitor center parking area, resource management offices, and one historic residence are within the 100-year floodplain of Oak Creek; the visitor center, most other housing, and the maintenance area are within the 500-year floodplain; and two houses are outside the 500-year floodplain. The water tank and corrals at Birch Creek are within the probable maximum floodplain of the river.

The channel of the North Fork above Birch Creek was channelized in the 1920s and 1930s to protect the newly constructed Zion Lodge. The stream was confined to the westernmost portion of the 1,000-foot-wide floodplain by excavating the channel deeper and by building levees along the eastern side of the channel for about 4.5 miles. Some levees are armored with rock-filled gabions. The wires along the bottom of many of the gabions have rusted away, but the levees have been periodically repaired. One breech of the levee has occurred, allowing the river to form a meander.

High water levels occur in the spring of most years as snow melts off at higher elevations. A combination of deeper than normal snowpack and sudden warm spring temperatures or heavy rain can cause flooding throughout the watershed. Global climate change would affect the timing and severity of flood events. Natural floodplains in Zion Canyon are currently impacted by park development, levees, and river channelization.

Climate change will likely affect the free-flowing condition and floodplains of the Virgin River and its tributaries, although small-scale changes in stream and spring flow will be difficult to document due to the high degree of year-to-year variability in stream flows, and a history of variability on a multi-decadal time scale. Regarding free-flowing condition, it is expected that average discharge and typical base flow will decrease due to reduced winter precipitation, increased evapotranspiration, and a resulting decrease in groundwater recharge. Smaller springs and seeps also may dry up and larger springs may see some reduction in flows, which in turn may affect flow rates of the Virgin River's tributaries. The frequency and magnitude of floods will likely change and along with that the sediment transport characteristics of streams, although this change could be complex in nature due to a potential increase in large floods and a decrease in smaller events. Climate change influences of the geology ORV could manifest with changes in flood patterns, resulting in changes in sediment transport and stream morphology.

Instream Flows

In Zion, the instream flows for the designated wild and scenic river segments and tributaries are protected under the Zion National Park Water Rights Settlement Agreement, which was signed in 1996 and the interlocutory decree issued on November 29, 2001. This agreement was intended to settle NPS water rights claims as part of an adjudication of water rights in the Virgin River basin. It addresses NPS-owned appropriative rights and federal reserved water rights, and it is considered protective of park waters and related values, water rights, and outstandingly remarkable values of the river and tributaries. The designation of Virgin River as part of the National Wild and Scenic River System does not affect the agreement among the United States, State of Utah, Washington County Conservancy District, and Kane County Water Conservancy District, as contained in Zion National Park Water Rights Settlement.

The Bureau of Land Management has initiated discussions with the State of Utah about acknowledging a federal water reserve for the designated BLM segments. No decision has been made at this time.

WATER QUALITY

Water quality conditions of the North and East Forks of Virgin River and its tributaries are generally considered natural and high quality. They are reflective of the largely unaltered geohydrologic setting and are generally within state water quality standards. This is due to the relatively light level of development in the watershed and to the fact that most, and for some of the tributary streams all, of the flow is from groundwater discharge from the Navajo sandstone. The Navajo sandstone is made up of over 99%

pure quartz sand and provides a near perfect sandstone filter. Major cations in the water are calcium, magnesium, and sodium, while anions are dominated by bicarbonate, sulfate, and chloride. The dissolved minerals are present at levels that would be expected in an arid watershed of sedimentary rock and increase in a downstream direction as the river contacts geologic layers with a greater amount of soluble minerals. Water temperatures are marginal for cold-water fish, but are well suited for native fish species.

Two water quality characteristics that could be considered problematic are suspended sediment and fecal bacteria. The sediment loading in these streams is high during floods, and while it might be influenced to some degree by upstream land use practices, it is generally considered to be a reflection of the extreme rate of natural erosion of this watershed. This level of sediment loading and turbidity during floods would be considered a major deficiency elsewhere, but in these rivers it is an attribute of natural conditions rather than a concern. Sediment levels appear to be a major factor in preventing the invasion of nonnative fish species.

The level of fecal bacteria has proven to be a chronic problem on the North Fork Virgin River upstream of the Temple of Sinawava near Chamberlain's Ranch. The State of Utah has included this reach on the list of rivers not meeting water quality standards, and the park advises extra caution for visitors hiking the upper reaches of the North Fork Virgin River. Recreation involving full-body contact with the water in this area is not recommended based on the levels of contamination; the source of the contamination is under investigation. The contamination is confined to the summer irrigation season, which also coincides with the primary recreation season. Other than this period (typically June through September), the *E. coli* levels in the river are mostly less than 10 MPN per 100 mL. When they are both present it is 300–500 MPN/100 mL compared to a standard of 126 MPN/100 mL. Even in the summer when livestock are present on private lands upstream from the park but irrigation is not, the levels are about 40 MPN/100 mL. The National Park Service therefore concludes that the source of the problem is the irrigation return flows washing feces from the pastures into the river, rather than the presence of livestock that have free access to the river. Occasional spikes of bacteria concentrations also occur on other rivers, usually during flood events when such occurrences would be expected.

Protection from water quality degradation is provided under the Clean Water Act by state-designated protected uses. All segments are protected as a source of irrigation water. The North and East Forks of Virgin River and North Creek are protected as sources of domestic drinking water. All of the segments except the North Fork Virgin River are protected for secondary contact recreation; the North Fork Virgin River is designated for primary contact recreation in recognition of the large number of people engaging in water play and swimming. To protect fish and aquatic life, the North Fork Virgin River, Kolob Creek, and Taylor Creek carry a designation for cold-water fisheries; La Verkin Creek has a designation for warm-water fisheries; and the East Fork Virgin River and North Creek are designated for nongame fish. In addition, the North and East Forks of Virgin River and Kolob Creek have a high quality category 1 designation that precludes new point-source discharges. A stream-specific standard for total dissolved solids is established for North Creek at 2,035 mg/L, although this has little bearing on park waters in a different geologic setting.

Climate change will likely affect the drainages' water quality. Water quality changes can be expected to include increases in average and maximum water temperature and decreases in dissolved oxygen as a result of increased air temperate and reduced summer flows. The concentration of specific pollutants and dissolved solids in general is expected to increase due to reduced flows.

GEOLOGIC ORV

Geologic resources were dismissed from further analysis in chapter 1 because the effects of any of the proposed actions in this plan / environmental assessment would be negligible or less. Since geologic resources are an outstandingly remarkable value for several river segments, additional information on geologic resources is provided in this chapter.

The Virgin River corridor and its tributaries are uniquely situated along the western margin of the Colorado Plateau where the recent history of tectonic activity and erosional downcutting has resulted in a labyrinth of deep sandstone canyons, volcanic phenomena, and widespread exposures of brilliantly colored sedimentary deposits. Unique geologic features include Navajo sandstone exposures; a remnant of the world's largest sand dune desert; river-carved canyons forming the world's tallest sandstone cliffs; narrow slot canyons; hanging waterfalls, springs, and seeps; and accelerated erosional processes. This dynamic geologic system creates a diverse landscape of channels, canyons, and springs that support a variety of ecological communities, including hanging gardens, desert fish, and other aquatic species. The geologic resources of the Virgin River and its tributaries offer world-class opportunities for canyoneering, rock climbing, hiking, and wilderness experiences.

North Fork Virgin River and Tributaries above the Temple of Sinawava, including Kolob Creek / Oak Creek, Goose Creek, Imlay Canyon, Orderville Canyon, Deep Creek, and Mystery Canyon

The North Fork Virgin River and its tributaries in this segment form a labyrinth of deep slot canyons as they all slice through the massive beds of Navajo sandstone 2,000 feet thick. Each of the streams begins in strata above the Navajo sandstone, then becomes a slot canyon of progressively greater depth as the channel descends through the sandstone. These are world-class examples of exceptionally rapid erosion through the aggressive downcutting of stream channels into a massive layer of easily eroded sandstone. At their narrowest points, the vertical-walled slots are from 20 feet wide on the North Fork Virgin River and Deep Creek, to 5–10 feet wide on the smaller tributary streams. As the channels cut through the lower one-third of the Navajo sandstone, groundwater flows from the Navajo sandstone aquifer in myriad springs, seeps, and hanging gardens. Some of this flow trickles or gushes from discrete fractures, while in many areas the discharge is directly from the pores of the sandstone, forming extensive wet weeping walls and lushly vegetated hanging gardens. The tributary streams are steep and include many waterfalls and plunge pools. There are also myriad ephemeral waterfalls that cascade over the cliffs following intense rainfall or generous snowmelt.

North Fork Virgin River and Tributaries below the Temple of Sinawava, including Birch Creek, Pine Creek, Behunin Canyon, Echo Canyon, Clear Creek, and Heaps Canyon

This reach of the North Fork Virgin River and its tributaries flows through majestic Zion Canyon where the colorful 2,000-foot-high cliffs of Navajo sandstone dominate the scene. Each of the tributaries cuts deep slot canyons into the upper portion of the Navajo sandstone, then pours into Zion Canyon over a high waterfall. There are also myriad ephemeral waterfalls that cascade over the cliffs following intense rainfall or generous snowmelt. As the North Fork Virgin River cuts into the softer rock layers below the Navajo sandstone, the canyon widens and the river is no longer confined as a slot canyon. Many springs exist at the base of the Navajo sandstone and provide the perennial flow of

each of these tributaries and most of the flow of the river. However, Clear Creek lacks the presence of springs from the lower Navajo sandstone because the segment ends with the confluence with Pine Creek at a point above the level of the Navajo sandstone aquifer. Some of the spring discharge trickles from discrete fractures, while in many areas the discharge is directly from the pores of the sandstone as wet weeping walls and lushly vegetated hanging gardens. In the recent geologic past, landslides have dammed the canyon—the mile-long Sentinel Slide is the most prominent. The lakebed sediments upstream of the landslide and the steep channel where the river is still cutting through the landslide dam have a great influence on the geomorphology of the North Fork Virgin River. A rate of erosion—about 1,300 feet per million years—for the North Fork Virgin River, its tributaries, and the surrounding landscape is exceptional, even for the Colorado Plateau. This is illustrated by the presence of massive vertical cliffs, deep slot canyons, numerous hanging valleys with waterfalls, the daily occurrence of rock falls, frequent landslides, and the exceptional sediment transport by the river, estimated at 800,000 to 1 million tons per year.

East Fork Virgin River

This segment contains an abundance of high Navajo sandstone cliffs reaching up to 1,200 vertical feet in height. The East Fork Virgin River forms a narrow slot canyon 1 mile upstream of this segment within the park. Numerous waterfalls exist where differential rates of erosion have left all of the ephemeral tributary drainages as hanging valleys well above the canyon floor. Streamflow arises from discharge from numerous springs originating in the bottom third of the Navajo sandstone. The exceptional rate of erosion is indicated by the presence of high cliffs, colluvium and landslide deposits, expansive exposures of slickrock in the upper half of the Navajo sandstone, and a large level of sediment transport in the river.

North Creek and Tributaries, including Right Fork of North Creek, Left Fork of North Creek, Little Creek, and Russell Gulch

This segment and its tributaries contain an abundance of high Navajo sandstone cliffs reaching up to 1,800 vertical feet in height. Several narrow, exemplary slot canyons exhibit waterfalls, pour-offs, and plunge pools. Streamflow arises from discharge from several springs originating in the bottom third of the Navajo sandstone. Recent volcanism is apparent along North Creek and its Left Fork. Recent lava flows have poured down North Creek on multiple occasions, first one million years ago, then again 260,000 years ago. The remains of the flows are visible along the canyon walls, Lee and Cave valleys, and the canyon of Little Creek. There is also a classic "inverted valley" along the north side of North Creek and west of Left Fork, where erosion resistant lavas that once flowed down the canyon bottoms now form ridgelines due to rapid erosion of the adjacent soft sedimentary rocks. Lakebed deposits, which are rare in erosional environments of this high degree, exist in the Right Fork of North Creek as a result of lakes created first by a Pleistocene lava dam and later by a landslide. While fossils in the Navajo sandstone are rare, there is a unique block of sandstone in the Left Fork of North Creek with several dozen dinosaur tracks.

La Verkin Creek and Tributaries, including Willis Creek, Bear Trap Canyon, Timber Creek, Hop Valley, Currant Creek, Cane Creek, and Smith Creek

This segment and its tributaries contain an abundance of high Navajo sandstone cliffs reaching up to 2,000 vertical feet in height. Several narrow, exemplary slot canyons exhibit waterfalls, pour-offs, and plunge pools. Streamflow arises from several springs originating in the bottom third of the Navajo sandstone. Hop Valley, Bear Trap Canyon,

and Willis Creek are superb examples of joint and fault controlled canyons, and while structural control of drainages is usual, it is compelling here because the canyons are boldly cut into the thick sandstone. Lakebed deposits, which are rare in erosional environments of this high degree, are found in Hop Valley and along Currant and Cane creeks. A landslide dam at the downstream end of Hop Valley filled the canyon 200 to 300 feet deep and subsequent filling of the canyon behind the dam resulted in today's 4-mile-long straight, vertical-walled, flat bottom valley with a perennial stream meandering for much of its length. A rate of erosion in this area of about 1,300 feet per million years is exceptional, even for the Colorado Plateau, and is illustrated by the presence of massive vertical cliffs, deep slot canyons, numerous hanging valleys with waterfalls, the daily occurrence of rock falls, frequent landslides, and the exceptional rate of sediment transport.

Taylor Creek and Tributaries including North Fork of Taylor Creek, Middle Fork of Taylor Creek, and South Fork of Taylor Creek

Taylor Creek and its tributaries flow from a collection of parallel canyons in the Navajo sandstone; below the confluence of the tributaries, the creek flows westward across the Hurricane Fault. The canyons are formed along a series of east-west trending joints that are bound by large monoliths of massive Navajo sandstone. The eolian sandstone is 2,000 feet thick and forms the highest sandstone cliffs known on Earth. Each of the forks flow in a vertical-walled canyon that is an oversized version of a slot canyon with a floor 100 feet to 300 feet wide, which then narrows to a true slot canyon in the upper reaches. Recent landslide dams and lake deposits are found in the Middle Fork and South Fork of Taylor Creek—the former with a landslide dam that occurred in 1990 and failed catastrophically in 1993, and the latter with two landslide dams roughly 4,000 and 2,000 years old.

Hanging valleys are present in these canyons and, while they are less numerous than in other parts of Zion National Park, they are elevated over 1,000 feet above the valley floor and produce short-lived waterfalls after rain events. Evidence of exceptionally active erosion abounds in the recent rockfalls and landslides, talus and colluvium covered slopes, and high rates of sediment transport. While spring discharges from the Navajo aquifer are small, they are sufficient to produce several hanging gardens and small perennial flows where the channel cuts through the base of the Navajo sandstone. Near the west end of this segment, Taylor Creek cuts across the Hurricane Fault, which is recognized as the topographic boundary between the Colorado Plateau and the Basin and Range physiographic province.



Slot Canyon

ECOLOGICAL PROCESSES ORVS (INCLUDING VEGETATION)

Along most river segments, natural river processes proceed unimpeded, allowing seasonal flooding and meander migration, vegetation recruitment, and plant succession. Riparian vegetation is abundant and diverse, and it comprises an important segment of park vegetation. These riparian areas are directly influenced by permanent water and

include land and vegetation adjacent to rivers, streams, springs, and seeps. The riparian communities in Zion National Park include nearly 25 miles of perennial streams. These communities tend to be in small or linear locales. The riparian areas support the richest flora and avian fauna in the park and are important habitat for many species. Due to their linear nature, the riparian areas also serve as connectors between habitat types and provide travel corridors for wildlife.

The cottonwood galleries along the East Fork Virgin River and Shunes Creek provide rare examples of relatively intact, properly functioning riparian systems. However, river channelization along the North Fork Virgin River, below the Temple of Sinawava, has altered the flood regime and resulted in a lack of recruitment of new cottonwood trees in the original floodplain.

The Virgin River and its tributaries have created unique habitats for rare plant communities in a desert southwest ecosystem. Steep-walled canyons, carved over time by the rivers, create cool, moist microclimates that support hanging gardens, which are rare and exemplary in the region. These gardens, which occur at seeps along the vertical sandstone walls, support a complex biotic community that includes several plant and animal species found only in the Virgin River system. The hanging gardens in Zion National Park are more numerous and larger than gardens found elsewhere and are sought out by researchers due to their rareness in the region.

There are no endangered, threatened, and candidate plant species within the Virgin River corridor and tributaries within Zion National Park.

Climate change will likely affect the vegetation and ecological processes of the Virgin River and its tributaries. Shifts or disruptions in ecological processes could occur, including changes in species compositions and distributions, changes or loss of habitat, longer and more intense fire seasons, increases in insect and/or disease epidemics, and increases in nonnative invasive species. If springs and seeps dry up, vegetation in hanging gardens would be reduced in size or be lost entirely at some sites. Increased frequency and intensity of wildfires and the spread of nonnative and native warm climate species may substantially alter the Virgin River and tributary riparian vegetation.

North Fork Virgin River above the Temple of Sinawava

The North Fork Virgin River above the Temple of Sinawava and Orderville Canyon, support the most exceptional examples of hanging gardens in the region. The gardens are home to seven species of plants that grow nowhere else in the world. The moist microclimate provided by the river adds to the diversity of plant species in these gardens, which in some cases includes up to 26 species. These gardens also provide habitat for the endemic Zion snail, also known as wet-rock physa *(Physa zionis)*.

East Fork Virgin River and Shunes Creek

The East Fork Virgin River has regionally outstanding examples of hanging gardens with riverside microclimates supporting endemic plants like maidenhair fern (*Adiantum* spp.), Zion shooting star (*Dodecatheon pulchellum*), and yellow columbine (*Aquilegia flavescens*). Further, the cottonwood gallery forests along the East Fork Virgin River and Shunes Creek provide rare examples of relatively intact, properly functioning riparian corridors. Natural river processes proceed unimpeded, allowing seasonal flooding and meander migration, vegetation recruitment, and plant succession. Riparian vegetation is abundant and diverse. Thick grasses and sedges along the banks form stable undercuts for fish habitat, woody species provide habitat for numerous species of wildlife, and invasive riparian woody

species are limited. These communities provide a regionally significant reference reach for restoration of degraded systems throughout the region.

FISH ORV

The Virgin River and its tributaries provide habitat supporting up to 15 species of fish according to the park's certified species list (accessed at https://nrinfo.nps.gov/Species.mvc/Search). Of these, six are native and nine are nonnative.

The rivers provide unique and intact habitat for breeding populations of four native species: (1) Virgin River spinedace (*Lepidomeda mollispinus*), (2) flannelmouth sucker (*Catostomus latipinnis*), (3) desert sucker (*Catostomus clarki*), and (4) speckled dace (*Rhinichthys osculus*). The Virgin River spinedace is nationally significant and exists only in the Virgin River system. Both the Virgin River spinedace and the flannelmouth sucker are managed under conservation agreements. The Virgin River and several of its tributaries support regionally significant levels of natural and sustainable reproduction for all four native fish species. These fish populations have a high degree of annual variability, but are generally stable. The North and East Forks of the Virgin River provide the most productive habitat for these fish in the Virgin River basin. The geologic setting and flow regime provide high flows and large sediment loads, unique water quality, and frequent disturbance, which are effective deterrents to nonnative species. Other factors contributing to the productivity for native fish are connectivity to tributary systems and habitat diversity for spawning, rearing, and supporting adult fish. Additionally, the Zion springfly *(Isogenoides zionensis),* an important species of the food web, is found along the Virgin River and its tributaries. The type specimen for this species was identified in Zion in 1949. Because the native fish in the Virgin River system are unique to this system, they reach the level of national significance.

Climate change likely will affect the rivers' fish populations. Thermal stress could contract habitats for native fish in the upstream direction so that they are more confined to park waters and constricted against habitat barriers including barrier falls, slot canyons, and reduced stream flows above springs. One of the greatest concerns is that warmer waters might increase the risk of nonnative fish proliferating to the detriment of natives. Nonnative cold water fish, which are currently present in small numbers, could be lost.

North Fork Virgin River above the Temple of Sinawava

This segment contains all four of the native fish species, including the Virgin River spinedace and flannelmouth sucker, both of which are species of concern. Fish numbers and the diversity of spawning, rearing, and adult fish habitats are high in the lower 1 mile of this segment, but drop off to almost nothing in the tightest part of The Narrows due to frequent and energetic flood events. The numbers of Virgin River spinedace and flannelmouth sucker are low, but natural and sustainable reproduction is occurring. Nonnative brown trout exist in small numbers, possibly because of the flood and sediment regime that do not impact the abundance of native fish. The Zion springfly is a recently discovered species found in this segment of the North Fork Virgin River and is indicative of a disturbance-adapted aquatic fauna.

Deep Creek (Bureau of Land Management)

Deep Creek contains two native fish species—flannelmouth sucker and desert sucker—although much of the use may be transitional. Reproduction may be occurring, but additional monitoring is needed. Habitat is marginal for native fish species and the presence of native fish is impacted by nonnative species such as brown trout (*Salmo*

trutta) and cutthroat trout (*Oncorhynchus clarkii*).

North Fork Virgin River below the Temple of Sinawava

This segment contains all four of the native fish species, including the Virgin River spinedace and flannelmouth sucker, both of which are species of concern. The Zion springfly is a recently discovered and nationally significant species and is found in this segment of the North Fork Virgin River. The North Fork Virgin River below the Temple of Sinawava has some of the highest levels of native fish reproduction in the Virgin River basin and typically contains an excellent distribution among age classes for all four species. The geologic setting and flow regime provide high flows and large sediment loads, good water quality, and frequent disturbance, which are effective deterrents to nonnative species. Other factors contributing to the productivity for native fish are connectivity to tributary systems and habitat diversity for spawning, rearing, and supporting adult fish.

East Fork Virgin River

This segment contains all four of the native fish species, including the Virgin River spinedace and flannelmouth sucker, both of which are species of concern. The East Fork Virgin River has the highest levels of native fish reproduction in the Virgin River basin and typically contains an excellent distribution among age classes for all four species. This segment contains some of the finest native fish habitat in the Virgin River basin, characterized by largely natural flows, large sediment loads, unique water quality, and frequent disturbance, which are an effective deterrent to nonnative species. Habitats include connectivity to tributary systems and diversity for spawning, rearing, and supporting adult fish.

Shunes Creek

This segment contains two native fish species: the Virgin spinedace, a species of concern, and the speckled dace. Shunes Creek has native fish reproduction, but additional monitoring is required to confirm the extent of the reproduction and sustainability of age classes. Shunes Creek is characterized by low flows during the dry season, but continues to carry a natural flow regime, including floods that create habitat diversity. Due to low flows, stream temperatures can be a concern. The water flow in Shunes Creek is disconnected from the East Fork Virgin River during low flow seasons.

North Creek

This segment contains the speckled dace and desert sucker—both are native fish, but neither are species of concern. Virgin River spinedace use North Creek downstream of the designated reach, but their occupancy and reproduction are intermittent due to recent flooding and periods when the stream is dry from agricultural diversions. North Creek is a drop-pool system with limited runs and riffle habitat. The water flow in North Creek is periodically disconnected from the Virgin River during low water periods.

WILDLIFE ORVS (INCLUDING THREATENED AND ENDANGERED SPECIES)

Wildlife is an outstandingly remarkable value in the Virgin River and its tributaries due to the habitat for and populations of desert bighorn sheep (*Ovis canadensis nelsoni*), Mexican spotted owl (*Strix occidentalis lucida*), and the endemic Zion snail. Related to the river corridors are the seven species of amphibians (four toads, two frogs, and one salamander) and many of the 80 mammalian species and 299 bird species in the park's certified species lists (accessed at https://nrinfo.nps.gov/Species.mvc/Search).

Climate change will likely result in changes in wildlife populations, including changes in species compositions and distributions, changes or loss of habitat, increases in insect and/or disease epidemics, and increases in invasive species. Decreases in precipitation could result in lower populations of desert bighorn sheep in the park (Loehman 2010).

Mexican Spotted Owl

Zion National Park is within the Colorado Plateau Recovery Unit for the Mexican spotted owl, which is a federally threatened species. The entire park and all of the designated wild and scenic river segments on BLM lands covered in this plan are designated as critical habitat for the Mexican spotted owl. The Mexican spotted owl reaches the northwestern limits of its range in this recovery unit. Owl habitat appears to be highly fragmented. In southern Utah, breeding owls primarily inhabit deep, steep-walled, and hanging canyons. They nest and roost in caves and on ledges. Most owls remain in the same territory year after year. They hunt primarily at night and, in the Colorado Plateau Recovery Unit, they prey more on wood rats than on birds. There are 87 known spotted owl territories on the Colorado Plateau (USFWS 1995). Zion has 22 known territories, which are widely distributed. A spotted owl monitoring program for the park was initiated in 1995, and a storehouse of data on Zion's owl population provides the best regionwide opportunity for owl research.

The federally threatened Mexican spotted owl breeds in many of the designated river corridors at the highest density in the state and the region. Breeding occurs in the cool microclimates provided by the narrow canyons along the designated stream courses. As primary nesting habitat, the river corridors provide the core of the designated critical habitat identified in the recovery plan for this species.

Desert Bighorn Sheep

In the East Fork Virgin River and Shunes Creek, the convergence of river-carved cliffs, availability of near-stream vegetation for forage, and proximity of year-round water provides the specific requirements for successful rearing of bighorn young. Lambing grounds are concentrated along this river segment and are exceptionally productive. The productivity of these lambing grounds is critical for the long-term reproductive success of the species because Virgin River sheep disperse throughout the area and are the source for bighorn sheep populations in much of the region.

Zion Snail

The North Fork Virgin River above the Temple of Sinawava and Orderville Canyon are home to the endemic Zion snail. This snail is found in some of the most exceptional hanging gardens in the region. This rare snail, identified in 1926, is of national significance because it is found only in Zion National Park along the Virgin River and its tributaries.

CULTURAL ORV

Cultural values as an impact topic were dismissed from further analysis in chapter 1 because the effects of any of the proposed actions in this plan/environmental assessment on those resources and values would be negligible or less and the planned actions protect and enhance the outstandingly remarkable cultural values. Since cultural values are an ORV for two river segments, additional information on cultural resources and values is provided in this chapter.

The continuum of human occupation along the Virgin River and its tributaries encompasses thousands of years of diverse people, cultures, and uses. In the arid southwest landscape, the presence of plentiful water, accompanying vegetation, animal diversity, arable land, and other resources found along the Virgin River and its tributaries provided ideal conditions for communities to flourish. Not surprisingly, the Virgin River system contains some of the best examples in the region of precontact American Indian sites that provide a tangible connection between traditionally associated tribes and their ancestors. Furthermore, the Virgin River corridor contains places and resources important to the cultural traditions of contemporary American Indian tribes. The ancestral American Indian groups include the Desert Archaic, Fremont, primarily Ancestral Puebloan agriculturalists, and historic Southern Paiute peoples. Present day descendants of the Southern Paiute inhabitants of the canyon continue to visit Zion National Park for traditional cultural purposes.

Climate change could be affecting cultural resources along the Virgin River and its tributaries. There is the potential for loss and more site exposure due to erosion when river channels adjust to changes in floods and sediment loading (i.e., buried archeological sites would be exposed). This could result in the subsequent possibility of vandalism/theft, and changing cultural landscapes.

North Fork of the Virgin River below the Temple of Sinawava

Zion National Park and the Virgin River lie within the traditional homeland of the Southern Paiutes. The Virgin River corridor has a rich history in Southern Paiute life. The primary life element for the Paiutes is water and this area serves as a place that was continually inhabited because of the availability of water. The abundant water supported farming, attracted animals, promoted plant growth, and contributed to day to day living. Researchers have documented numerous accounts of the special importance of the Virgin River to Paiute people. Many of the names of prominent features in Zion come from the Paiute language such as the Temple of Sinawava—the beginning of the Narrows on the Virgin River. Zion Canyon was a meeting place with abundant food, both vegetal and animal. Other resources were plentiful as well, such as specific minerals for color pigments and willow for basketry.

The canyon, the river, and the overall river ecoscape retains its cultural significance to Paiute people and, therefore, its integrity as a place of special meaning and continues to be used for the gathering of plant resources for traditional cultural and religious purposes. Given the long-standing and ongoing relationship of the Southern Paiute people to this area, an outstandingly remarkable cultural value was found for the North Fork of the Virgin River below the Temple of Sinawava.

East Fork of the Virgin River

The importance of cultural resource sites in the East Fork of the Virgin River is tied to the uniqueness of Parunuweap Canyon itself. It is one of the few remaining places in the area occupied by the Virgin Branch Ancestral Puebloan culture where a geographically discrete body of sites representative of a long-term community has remained mostly undisturbed. This river canyon exists in a nearly unaltered state, as compared to other areas of the region that have experienced significant historic era developments. Precontact sites along the East Fork of the Virgin River are among the "type" sites through which the Virgin Branch was initially recognized as a distinctive regional manifestation of the Formative period Ancestral Puebloan cultures. In addition, Southern Paiute and Mormon Pioneer historic sites also occur within this canyon.

Most of these sites are contributing features to the Parunuweap Canyon Archeological District, listed in the National Register of Historic Places in 1996 with significance at the national level. Parunuweap Canyon was legislatively included in Zion National Park in 1918 in specific recognition of the nationally significant archeological resources present.

Because of the relatively undisturbed condition of this river canyon, the setting is ideal for future research where the interrelationships of geographically, culturally, and temporally related sites can be studied. The East Fork of the Virgin River perfectly embodies a natural classroom and is an exemplary site for research on the Ancestral Puebloan culture; therefore, an outstandingly remarkable cultural value was found on this segment of the Virgin River.

SCENIC ORV / VISUAL RESOURCES / VIEWSHEDS

The Virgin River and its tributaries create diverse opportunities for views of the river's unparalleled scenery, which can be both dramatic and subtle. The river creates a landscape of cross-bedded sandstone cliffs towering thousands of feet above the canyon floor. The geologic tapestry of contrasting colors and textures—red, white, and pink cliffs, slivers of blue sky, and lush green ribbons of riparian vegetation and hanging gardens—encompass the sculpted and undulating canyons. Seasonal waterfalls flow over slickrock from hanging canyons more than 100 feet above the canyon floor.

River and tributary canyons offer a pleasing contrast in soil, rock, vegetation, water, and views that greatly enhance the visual quality, with still or cascading water dominating the landscape. Light changes in the canyon depending on the time of day and the season. Rocks can appear fiery red, golden, bright white, gray, or black. The absence of water in some dry washes also creates visual drama and interest. These elements combine to offer a landscape character that is unique and unforgettable on a scale that draws visitors from all over the world.

Climate change could affect vegetation growing in the viewsheds of portions of the Virgin River and its tributaries. If there were a widespread mortality of pinyon and juniper trees due to drought or shifts in other vegetation, it would affect visual resources and some viewsheds. Impacts on scenic views from reduced flow rates could also be expected.

North Fork Virgin River above the Temple of Sinawava including Tributaries Orderville Canyon, Deep Creek, and Mystery Canyon

The Narrows, Orderville Canyon, Mystery Canyon, and Deep Creek, above the Temple of Sinawava, are world-class examples of narrow river canyons framed by soaring cliffs, where lush hanging gardens and the combination of water and light define the landscape. The section of the North Fork Virgin River known as The Narrows is memorable and rare for its visual qualities—in particular, the play of light and shadow on the walls, a feature enhanced by the echoing sounds of cascading water in the narrow gorge. The water in this area, possibly more so than in any other river segment, dominates the physical characteristics and shapes the visual experience. Special features include canyon walls that are over 1,500 feet high with a width of less than 25 inches in some areas. Rich red sandstone walls and dark desert varnish contribute to color and texture variety. Big Spring and Mystery Spring are some of the finest examples in the region of spectacular hanging gardens, providing a striking visual combination and contrast of lush greenery and abundant wildflowers in a narrow sandstone canyon.

North Fork Virgin River below the Temple of Sinawava including Tributaries Birch Creek, Oak Creek, and Pine Creek

Along the North Fork Virgin River, the landscape is transformed as the narrow river bottom widens, exposing open expanses framed by vertical sandstone walls. Foreground views include a variety of textures and colors including grasses, cottonwoods, and riparian vegetation, which

changes with the seasons and gives way to soaring red rock walls. Towering iconic features dominate this segment including The Great White Throne (the world's largest sandstone monolith), Angels Landing, The Watchman, the Beehives, Weeping Rock, Streaked Wall, West Temple, Altar of Sacrifice, and Court of the Patriarchs.

The Birch Creek tributary of the North Fork Virgin River contains dramatic views of rock cliffs towering above the river and includes an alternative and spectacular view of the Court of the Patriarchs.

The Oak Creek tributary of the North Fork Virgin River provides views of the Towers of the Virgin and West Temple from within a remote, natural setting.

The Pine Creek tributary includes a colorful, sculpted, deep, cave-like slot canyon. Farther down the canyon, an outstanding view of the Great Arch of Zion becomes evident.

North Creek including Tributaries Right Fork North Creek, Left Fork North Creek, and Russell Gulch

The Left Fork is particularly diverse in scenic views, beginning at the initial descent across spectacular cross-bedding (abrupt changes to variation in color and texture due to different rock layers) and down Russell Gulch into the Left Fork of North Creek. Clear, deep potholes, the characteristic "subway" curvature of the canyon walls, and the slot "subway tracks" are very unusual in the region. Hanging gardens in the Right Fork are richly diverse and complex. The slot canyons, coupled with the wide canyon vistas in the first and last sections of the canyon make this area extremely diverse. The upper section is particularly worthy of regional significance. High relief and surface variations meld well with the contrast in soils, rock, vegetation, and cascading water.

Taylor Creek including Tributaries North Fork Taylor Creek, Middle Fork Taylor Creek, and South Fork Taylor Creek

The Taylor Creek segment contains some of the most striking and contrasting colors and textures in the river corridor—from dark green alpine vegetation and colorful sprays of wildflowers to vivid red sheer rock walls and alcoves. Unique geologic features include views of Zion Fingers and the Double Arch Alcove, as well as historic cabins along the creek that contribute to the scenic value in this unique segment of the river corridor. The Zion Fingers include a series of slot canyons that emerge from a large red rock escarpment.

Bureau of Land Management Specific Identification of Scenic Values

Bureau of Land Management assigns VRM classes to all lands they manage. The VRM classes are categories assigned to public lands, which serve two purposes: (1) an inventory tool that portrays the relative value of the visual resources, and (2) a management tool that portrays the visual management objectives. There are four classes I, II, III, and IV. The areas covered by this plan are either in VRM class I or class II. The class objectives are as follows:

- **Class I Objective:** To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- **Class II Objective:** To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.

BLM areas designated as wilderness are in visual resource management class I. The following designated wild and scenic river

segments are wholly within designated wilderness, so they are VRM class I: La Verkin Creek, Smith Creek, Deep Creek, and Shunes Creek. Portions of Goose Creek and Kolob Creek are within designated wilderness and are VRM class I and other portions are outside wilderness and are designated as class II.

RECREATIONAL ORV / RIVER-RELATED VISITOR USE AND EXPERIENCE

Exceptional recreational opportunities exist along the Virgin River and its tributaries, providing visitors from around the world with a chance to develop personal and lasting connections with the river within some of the most unique water-carved desert canyons in the region. The dramatic setting, dominated by scenic grandeur, contributes to a spectrum of river-related uses and experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, to viewing scenery or camping, to opportunities to experience serenity, solitude, and general enjoyment along the river corridor. For generations, the striking contrast of heat and water, stone and gardens have drawn people to this unique desert river and its tributaries. This section of the chapter describes aspects of recreational ORVs, including river-related visitor use and experiences that may be affected by the management alternatives within each of the Virgin River segments. For an overview of the segments that have recreational ORVs, please review table 2. The description of these elements is based on the best professional judgment of Zion National Park and BLM staff, NPS planners, and research results from other specialists.

North Fork Virgin River above the Temple of Sinawava

Hiking the section of the North Fork Virgin River known as The Narrows offers a memorable and rare experience due to its dramatic scenery and setting; in particular, the play of light and shadow on the walls and lush gardens clinging to the rock faces—features enhanced by the echoing sounds of cascading water in the narrow gorge. Recreation in this world-class segment of the river is extremely popular, attracting people from around the world to this relatively easily accessible narrow slot canyon. Visitors are drawn to the shaded canyon where wading in the water is central to the experience and provides a refreshing respite from the desert heat. From a half-hour walk along the cool canyon path to experiencing a multiday backpacking adventure wading in sometimes waist-deep water or a kayak trip down the canyon during spring runoff, this segment of the river allows visitors of varying ages and abilities a chance to get into the river and experience the canyon. The grandeur and towering walls of stone also draw photographers, writers, and painters.

There is a risk for contraction of waterborne diseases when recreating in the water in the uppermost reaches of this segment in the summertime. The park recommends minimizing contact with the river above the confluence with Deep Creek, where this larger tributary and spring discharge provides substantial dilution. The park always recommends a careful choice of sources for drinking water and always treating it before consumption.

Imlay Canyon

Imlay is thought by some canyoneers to be the best canyon in Zion. The canyon should only be attempted by the most advanced and experienced canyoneers. The canyon offers a physically and technically challenging hike that includes many icy cold swims and numerous rappels. The unique geologic features, such as large potholes, combined with interesting scenery create a difficult and challenging canyoneering experience.

Orderville Canyon

The Orderville Canyon segment offers an outstanding canyoneering experience that

allows visitors to be enclosed in a deep and confined canyon. While not as technically challenging as other slot canyons in the river corridor, this section offers a high degree of adventure for visitors with a wider range of physical abilities. The steep and narrow rock walls create a quiet sensation of being embraced by the earth for long stretches of the segment. Visitors in this tributary also enjoy views of hanging gardens and pour-offs of water into the river. This unique setting combined with the opportunities for solitude provides a rare and unusual recreational opportunity.

Deep Creek

From its origin on Cedar Mountain to the confluence with the North Fork Virgin River, Deep Creek offers a unique canyon experience characterized by clear water, numerous plunge pools, pristine natural beauty, and exceptional opportunities for solitude.

Mystery Canyon

From springs and hanging gardens to sounds of water and the experience of solitude, the Mystery Canyon segment offers visitors outstanding recreational opportunities and challenging adventures. Where one slot canyon joins another at the confluence with the North Fork Virgin River, canyoneers must rappel down a waterfall into The Narrows.

North Fork Virgin River below the Temple of Sinawava

This segment of the river offers a recreational setting that is intimate and sublime, defined by the river and the extreme geology. The setting is transformed as the narrow river bottom widens, exposing open grassy areas framed by vertical sandstone walls. Visitors of all ages and abilities come here from around the world to engage in a full spectrum of river-related activities, such as bicycling or walking along the paths that parallel the river, camping, or splashing and wading in the water. No matter what the activity, nearly all visitors come to this segment to experience the scenery, which is unarguably moving and memorable. A diversity of towering iconic features dominate this segment, including The Great White Throne (the world's largest sandstone monolith), Angels Landing, The Watchman, the Beehives, Weeping Rock, Streaked Wall, West Temple, Altar of Sacrifice, and the Court of the Patriarchs. Artists, writers, and photographers have long been drawn to this area of the river to capture the canyon's ever-changing beauty.

Pine Creek

Adventure seekers who experience the Pine Creek tributary enjoy the technical canyoneering challenge in a quintessential slot canyon with fluted and sculpted cave-like walls. This segment also contains several outstanding swimming holes surrounded by the undulating colors of rock.

Left Fork North Creek

Perhaps one of the most popular technical canyoneering routes in the region, if not the country, is a geologic feature known as the Subway along the Left Fork of North Creek. This route offers a unique combination of adventure and exceptional scenery and is appropriate for the average physically fit person. The Subway gets its name from the unusual tube-like shape within the slot canyon of rock. Adventure seekers enjoy route finding, swimming, and short rappels. The exemplary geology and red rock waterfalls also attract photographers worldwide.

La Verkin Creek

Whether you are hiking La Verkin Creek within Zion National Park or on the river

segments managed by the BLM St. George Field Office, you will have outstanding opportunities for solitude and unconfined recreation in a desert landscape dominated by pinyon/juniper forest. Here, the creek itself varies from braided channels to narrow canyons containing deep pools and large boulders. Within this unique setting, visitors enjoy excellent opportunities to engage in a wide range of river-related recreational activities such as hiking and backpacking, swimming or wading in plunge pools, horseback riding along the creek, and enjoying the scenery and solitude of this unique landscape.



RECREATIONAL OPPORTUNITIES AND TRENDS

Whether enjoying a stroll along the riverside walk or exploring the park's dramatic canyons, park visitors have a variety of opportunities to experience the Virgin River and its outstandingly remarkable values. The kinds of use occurring within the river corridor include bicycling, scenic driving, hiking, camping, canyoneering, boating, climbing, backpacking, horseback riding, photography, wildlife and bird watching, and other activities conducted either privately or through concessioner services. Because each visitor may connect with the natural and cultural heritage of the park in a unique and personal way, the opportunities to experience the canyon are endless.

During the peak season from early April through mid-November, visitors can access Zion Canyon Drive via shuttle buses. Visitors staying at Zion Lodge also have driving access to the lodge during this time. Visitors can leave their vehicles in Springdale or at the visitor center parking lot while exploring Zion Canyon on shuttle buses, which have room for backpacks, climbing gear, two bicycles, and other equipment. Shuttles begin at the Zion Canyon Visitor Center and stop at the Zion Human History Museum, Canyon Junction, Court of the Patriarchs, Zion Lodge, The Grotto Picnic Area, Weeping Rock, Big Bend, and the Temple of Sinawava. Many visitors enjoy the interpretive shuttle ride through the canyon. Visitors may continue exploring the rest of the park by driving their personal vehicles through the Zion-Mount Carmel Tunnel to the east side of the park, or north along Kolob Terrace Road, or to the Kolob Canyons section of the park. With few vehicles on the Zion Canyon drive during peak season, bicyclists have an opportunity to explore the canyon on an uncongested roadway. Bicyclists can also ride the shuttle back to their starting point if they desire. The shuttle provides easy access for hikers interested in accessing trails from the main canyon.

Longer hikes into side canyons require advance planning, and many canyons require ropes, hardware, and advanced technical skills for rappelling and ascending. Canyoneering permits are required for all through-hikes of the Virgin River and tributaries, the Left Fork of North Creek (the Subway), and all canyons requiring the use of descending gear or ropes. Seventy-five percent of slot canyon permits are awarded through calendar and lottery reservations several months in advance. Visitors need to be prepared and aware of weather conditions before starting a trip because hikes throughout the park could involve walking in water, where rivers and washes are subject to flash

flooding. The BLM segments get very little use and permits are not required for day use.



Hiking The Narrows is a particularly popular activity for visitors, and permits are issued one day in advance. Because large groups increase impacts in the wilderness, group size is limited to a maximum of 12 people. The group size for all canyoneering trips other than The Narrows, Left Fork, Pine Creek, and Orderville and Keyhole canyons is six people per day.

Climbing is another popular activity in Zion National Park. The best conditions for climbing are from March through May and September through early November. Climbing in the summer can be extremely hot, especially on unshaded walls. Due to the nature of sandstone, climbing is not recommended for inexperienced climbers. The climbs are high, exposed, big wall climbs. Because of the park's 2,000-foot cliffs, few areas are suitable for top roping; there are few sport climbing opportunities in the park. However, there are two accessible bouldering areas in the main canyon. Climbing permits are not required for day climbs, but are required for all overnight bivouacs. Some rock formations and routes are closed to climbing from March 1 to mid-July each year to protect nesting peregrine falcons. Some areas that are routinely closed include The Great White Throne, Cable Mountain, Court of the Patriarchs, and Streaked Wall.

Private boating in Zion National Park is a good way to see a different side of the park for those who are prepared. All boating within the park is by permit only. Inner tubes are not allowed in any watercourse in Zion National Park at any time. Boating is allowed in the North Fork Virgin River when the river flow is in excess of 150 cfs. This typically happens in the spring between March and late May. Visitors can boat different sections of the river depending on personal skill level and experience. Many people float the river between the Temple of Sinawava and Court of the Patriarchs, as it is one of the sections of the river with a lower class rating. A few skilled and experienced individuals will choose to do a run through The Narrows. The section of the river between Chamberlain's Ranch and the Temple of Sinawava is very difficult with few to no options for escape if problems occur. This run should be attempted only by highly experienced boaters due to the commitment level and lack of escape and rescue options. Permits will not be issued for the stretch from Chamberlain's Ranch to the Temple of Sinawava when the river is flowing in excess of 600 cfs. For more information about permitting and safety, see the "History of Flow Limits, Related Rules, and Visitor Safety" section below.

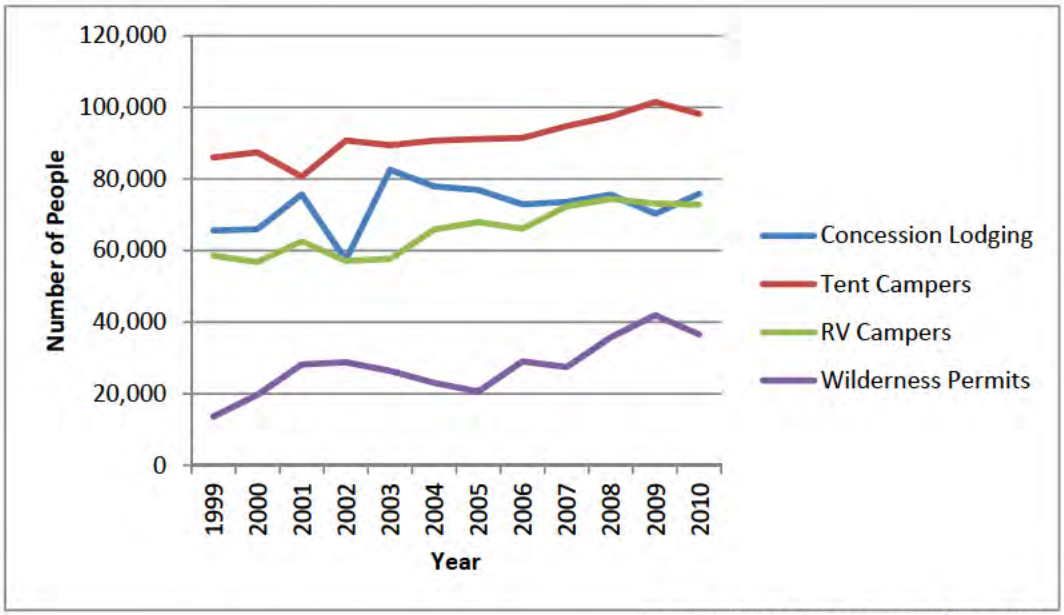


Birders who seek to view some of the park's 291 species can go to the visitor center to obtain checklists. In particular, birding

enthusiasts may have the unique opportunity to catch a glimpse of peregrine falcons or California condors. Those with a quiet step and observing ears may even be lucky enough to hear the hoot of Mexican spotted owls in the canyons at dusk. Many visitors will have the opportunity to see desert bighorn sheep while driving through the east side of the park during springtime. Visitors with the most watchful eye may notice the slow progress of the endemic Zion snail. These are just a few of the species that make the Virgin River and its tributaries so outstandingly remarkable. With towering canyon walls, waterfalls, and hanging gardens, photographers and visual artists also have a multitude of opportunities to explore their visual senses with the color, texture, and light of the water carved canyons. Additionally, there are various interpretive programs offered where visitors can learn about all of the rich values of the Virgin River. Visitors attend guided hikes, patio talks, drop-in programs, evening programs, and can ride the shuttle with a park ranger. Topics include geology, plants, animals, human history, and more.

Guided horseback riding is another option for visitors to Zion Canyon from March through October. There are options for commercial riding excursions lasting one hour to half a day. The one-hour option follows the Virgin River for about 1 mile to Court of the Patriarchs, then back to the loading corral. The half-day ride offers a more adventurous trip around the Sand Bench Trail, which gradually ascends 500 feet to give visitors a spectacular view of the southern end of the park.

Camping is another way for visitors to enjoy Zion National Park and BLM lands. As shown in figure 4, the number of people camping has increased in the park over the years, in both the wilderness and the frontcountry. Camping use along the BLM river segments is thought to be low. The number of people camping in the Zion Wilderness has more than doubled since 1999. Zion National Park has three frontcountry campgrounds—South and Watchman campgrounds are in Zion Canyon; Lava Point Campground, which is about a one-hour drive from Zion Canyon on Kolob Terrace Road. There are no campgrounds in Kolob Canyons. There are no developed campgrounds along the BLM river segments. Permits are required for overnight backpacking trips and are issued at both visitor centers the day before or the day of the trip. There are no permits required for backpacking on the BLM river segments.



Source: NPS Public Use Statistics Office 2011

FIGURE 4. CAMPING AND LOD ING TRENDS

OVER LL VISITOR USE LEVELS AND TRENDS IN ZION NATIONAL PARK

Over the years, visitation to Zion National Park have steadily i ncreased leading to concer n about the amount of use that can be sust ined in the park while protecting natural and cultural resources and providing a quality visitor experience. As shown in figure 5, t ne highest numbers of visitors enter the park through the south entran e into the m ain canyon. Although use has increased p rkwide, the main canyon, which is also the heart of the Virgin River c orridor, has continued to be an area of particular concern as visitation numbers continue to grow.



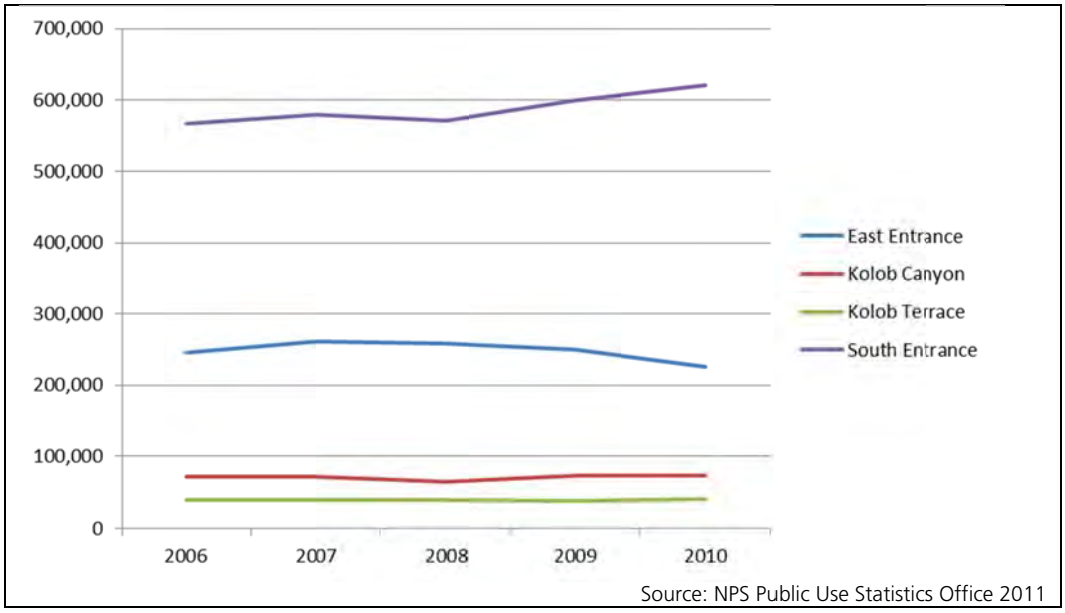


FIGURE 5. TRAFFIC COUNTS AT GATES

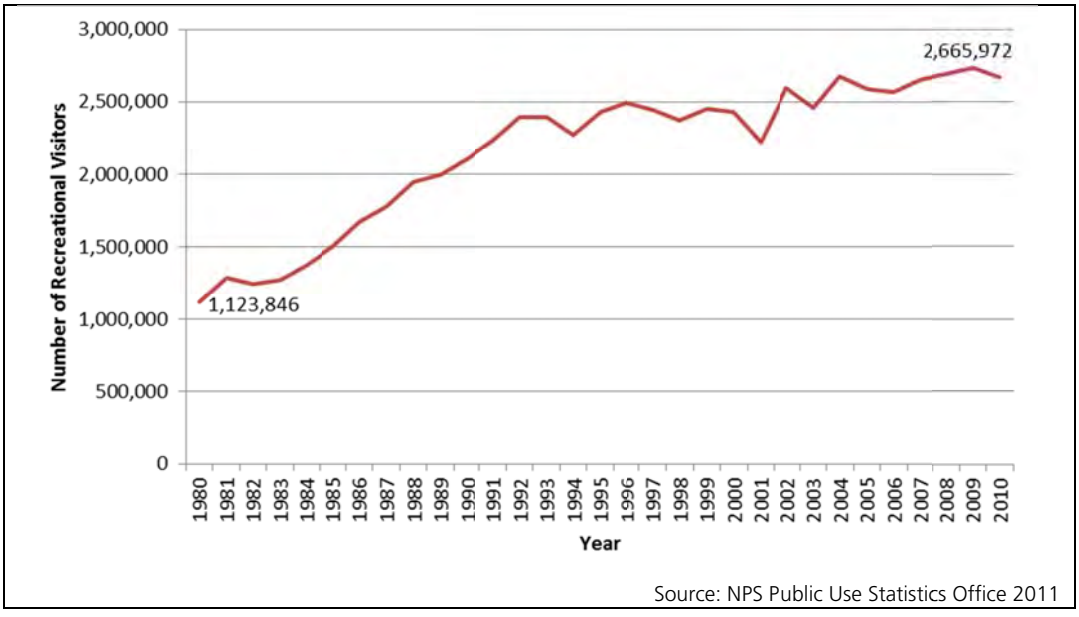


FIGURE 6. ANNUAL PARK VISITATION

Zion National Park managers explored the concept of visitor capacity over 30 years ago to assist in the preparation of a development concept plan. As shown in figure 6, visitor use has nearly tripled since 1980. A study titled "Preliminary Analysis of Carrying Capacity Concepts as Applied to Trail Use within Zion Canyon" was an initial analysis of using a capacity approach to understand visitor use on the shorter trails within Zion National Park (Tomrdle 1980). At that time, one desired objective of the Zion Canyon development concept plan was to reduce congestion within the canyon. Congestion was perceived as crowding on the roadways and parking lots within the canyon. The study was also initiated because a transit system was being considered as a method to reduce automobile traffic issues within the canyon in the 1980s (Tomrdle 1980). However, there was concern that an unintentional outcome of the transit system would be increased use of canyon trails during the day. At that time, there was little understanding of use levels on the trails. Findings from the 1980 study demonstrated that the most popular day use areas in Zion Canyon were already functioning at or above assumed capacities. Therefore, the study cautioned that implementation of a transit system would allow more use to take place on the trails because parking lot size would no longer be a regulating factor. One suggested management strategy for protecting visitor experience was to regulate use by controlling the density of people within the canyon. It was the opinion of park staff in the 1980s, and supported by field investigations, that the physical resource capacity on the trails had not been reached and would not be reached due to anticipated increases in visitor use due to a transit system (Tomrdle 1980).

Therefore, the team focused on the concept of addressing social capacity as the most limiting factor for managing use on trails. Although these findings were based on the best available science of the time; today, staff at Zion National Park recognizes that both physical resource and social impacts have occurred over the years during peak visitation months. Figure 7 shows monthly visitation trends from 2006–2010, with April through October being the peak season for visitation.

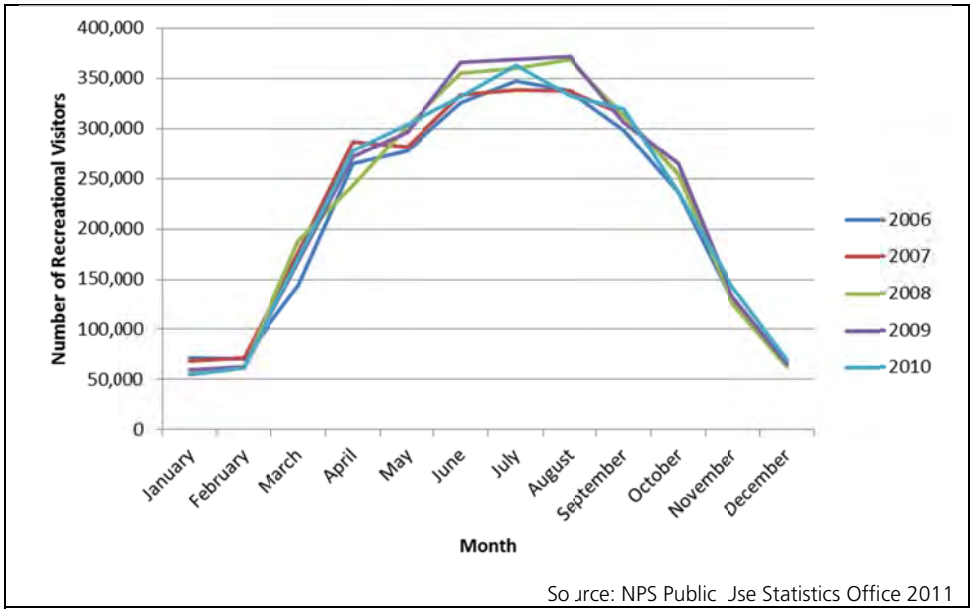


FIGURE 7. MONTHLY PARK VISITATION

Climate change will likely affect visitor use on the Virgin River and its tributaries. Lower flows could result in less river-based recreation or different river-based recreation, change in seasonal use, or concentration of use along different river segments. The period for summer activities may increase because of an increase in the number of warm shoulder season days, but could also decrease due to increasing aridity and high temperatures in mid-summer (Smith et al. 2001 and Wagner 2003 as cited in Loehman 2010). Severe storms also may increase in frequency and intensity, which may accentuate summer flash floods, although the impact to visitor use could be minimal because systems are already in place to warn visitors of flood hazards. Changes in riparian vegetation, fish, and other wildlife populations also would likely affect recreational ORV / river-related visitor use and experiences.

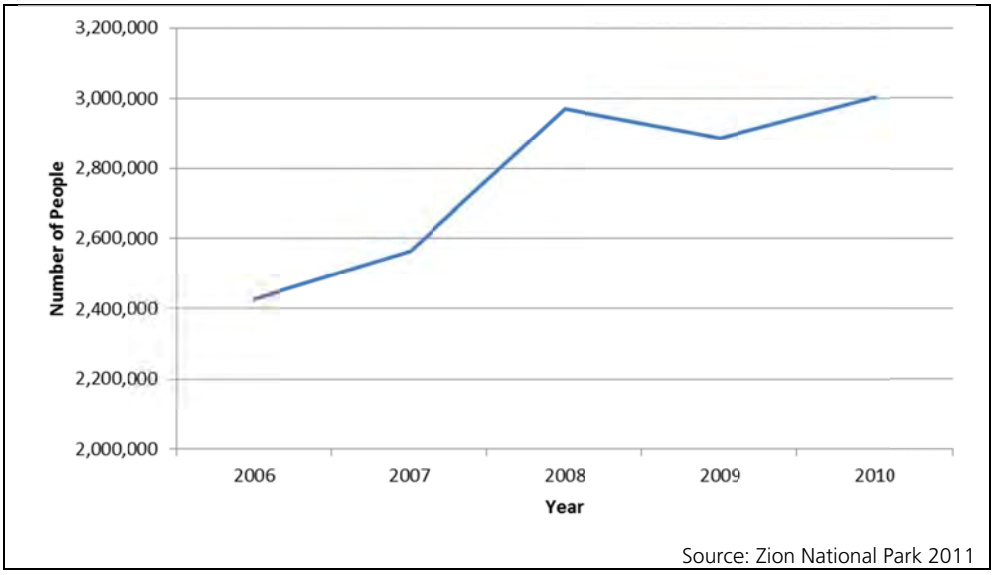
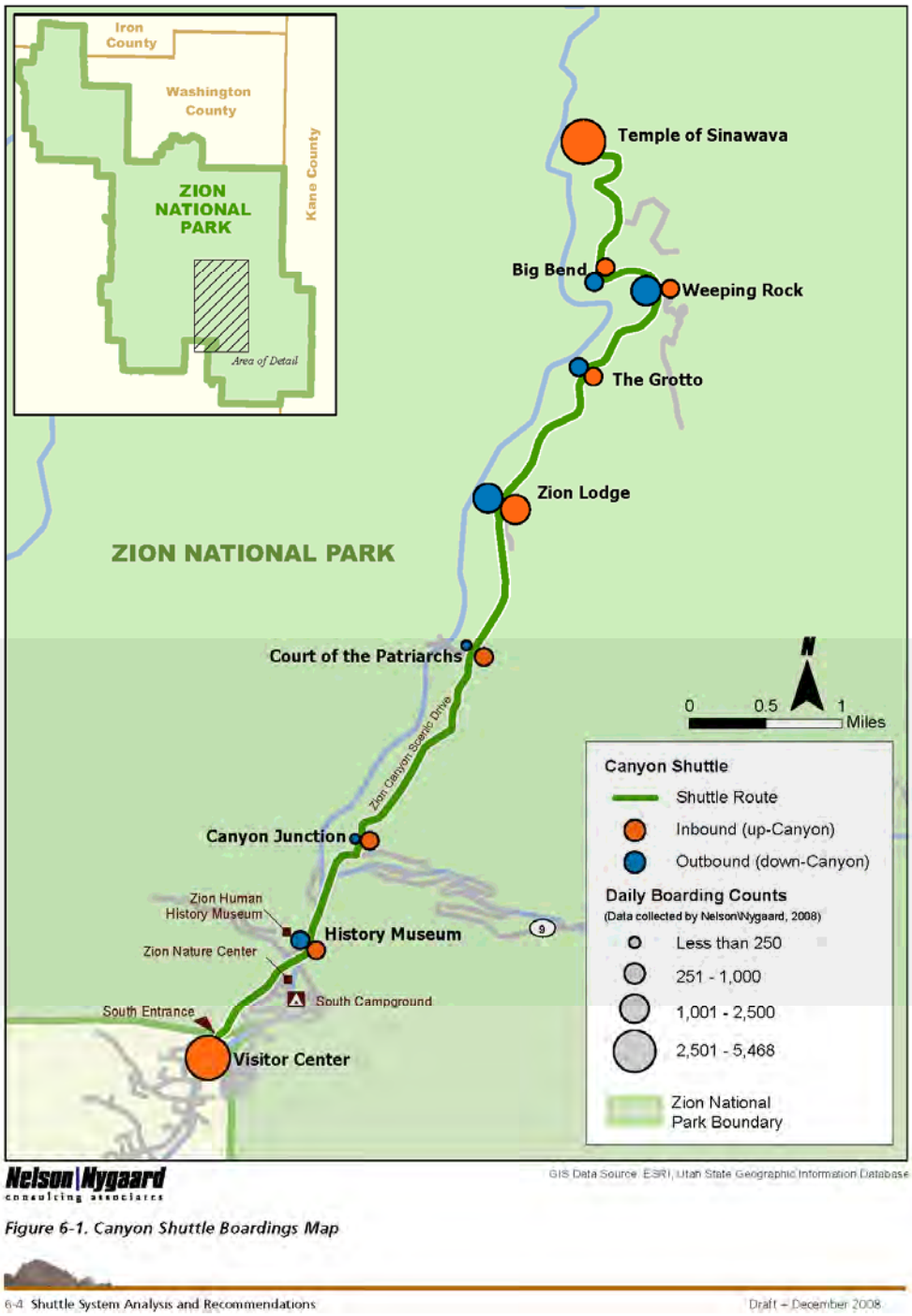


FIGURE 8. SHUTTLE RIDERSHIP

Since the implementation of the Zion Canyon shuttle system in 2000, the number of people with access to the canyon at one time has increased greatly. With a fleet of 30 buses, the shuttle system has expanded visitor access to the canyon and has been considered a great success. However, increased access has also led to shifting resources and experiential impacts throughout the canyon. Figure 8 shows the increase in shuttle ridership from 2006–2010 (NPS 2011). Shuttle ridership counts were conducted during the Zion Canyon Transportation Technical Analysis study (NPS 2009a). Data were collected over a two-day period on a Friday and Saturday August 7 and 8, 2008, and was combined to create a sample full day. As shown in table 10, the study revealed that the Canyon shuttle route carried over 19,000 people in a one-day time period. It should be noted that this rate surpasses most light rail lines in the United States and is comparable to some of the nation's highest ridership bus lines, e.g., San Francisco local bus route 38-Geary. During the study sample, the most significant boarding activity began at 7:30 a.m. and carried through until 8:45 p.m., with peak daily activity occurring between 12:30 p.m. and 6:30 p.m. As shown in figure 9, the busiest stops were the visitor center and the Temple of Sinawava with boarding numbers between 4,500 and 5,500 per stop. The stops with the least activity were Canyon Junction and Court of the Patriarchs (NPS 2009a).

TABLE 10. CANYON SHUTTLE STOP-BY-STOP BOARDING AND MAX LOADS

Stop ID	Stop Name	Total Ons	% Riders Boarding	Average Max Load
Inbound (up-canyon)				
1	Visitor Center (Ons only)	5,468	28.2	75
2	History Museum	629	3.2	85
3	Canyon Junction	342	1.8	86
4	Court of the Patriarchs	411	2.1	85
5	Zion Lodge	1,183	6.1	82
6	The Grotto	370	1.9	81
7	Weeping Rock	784	4.1	79
8	Big Bend	259	1.3	76
9 and 10	Temple of Sinawava	4,692	24.2	88
Outbound (down-canyon)				
11	Big Bend	376	1.9	93
12	Weeping Rock	1,151	5.9	100
13	The Grotto	773	4.0	103
14	Zion Lodge	2,343	12.1	109
15	Court of the Patriarchs	184	1.0	107
16	Canyon Junction	56	0.3	106
17	History Museum	336	1.7	101
18	Visitor Center (offs only)	0	0.0	37
		19,357		



Source: NPS 2009b

FIGURE 9. CANYON SHUTTLE BOARDING MAP

QUALITY OF VISITOR EXPERIENCE IN ZION NATIONAL PARK

Studies have evaluated the quality of visitor experience in Zion National Park. In August 2006, the University of Idaho Visitor Services Project provided 978 questionnaires to visitors, obtaining a response rate of 64%. During November 2006, the university provided another 584 questionnaires, obtaining a response rate of 68%. Results showed that 74% of summer visitor groups and 60% of fall visitor groups were families. Over 50% of visitors surveyed were between the ages of 36–65, while 24% of summer visitors and 6% of fall visitors were ages 15 years and younger (NPS 2007).

Perceived Crowding

In the 2006 survey, summer visitors generally reported feeling more crowded than fall visitors, and the facilities that felt most crowded (combined ratings of "moderately," "very," and "extremely") during both seasons were campgrounds, with crowding reported by 59% and 33% of visitors, respectively (NPS 2007). Picnic areas had the lowest level of crowding for summer visitors (26%), whereas fall visitors experienced the least crowding at visitor centers (5%) (NPS 2007).

A study conducted by Manning et al. (2003) at three backcountry trailheads—Weeping Rock, The Grotto, and The Narrows—surveyed nonpermitted day use visitors (activities visitors were engaged in did not require a permit). The study asked questions pertaining to natural conditions, crowding, and peacefulness/quiet as important indicators of quality for visitor experience. Data about number of encounters with other persons/groups experienced, preferred, and expected and the acceptability of group sizes were also presented.

The most common group size (43.8%) was two people, and the second most common (16.4%) was four people; the majority of groups (79.8%) consisted of four or fewer people (Manning et al. 2003). The same year, a similar study surveyed permitted day use visitors who had hiked in backcountry canyons (activity visitor was engaged in required a permit). Two people were the most common group size for permitted groups (30.3%); the majority of permitted groups (77.6%) consisted of six or fewer people. Nonpermitted day users determined group sizes of more than 10 people to be unacceptable, and permitted day users determined group sizes of more than 8 people to be unacceptable, despite the fact that nonpermitted visitors tended to have smaller group sizes (Manning et al. 2003).

Permitted overnight backcountry visitors were also surveyed in 2002. The most common group size (56.5%) was two people, and the second most common (13.7%) was one person; the majority of groups (81.7%) consisted of three or fewer people (Manning et al. 2003). Permitted overnight users determined group sizes of more than 8 people to be unacceptable.

These surveys found that perceived crowding actually changed the visitation habits of 26.3% of nonpermitted day users, 40.2% of permitted day users, and 55.6% of permitted overnight users. Of day users who changed the way they visited, 61.7% and 66.7%, respectively, said that they visit different locations because of increased crowding and 70.5% and 85.7%, respectively, visit during less busy times (e.g., week days, off-season) because of increased crowding. In addition, 27.3% and 40.2%, respectively, actually visited less often because of increased crowding (Manning et al. 2003). Of overnight users who changed the way they visited, 68.8% said that they visit different locations because of increased crowding and 62.5% visit during less busy times (e.g., week days, off-season) because of increased crowding. In addition, 26.7% visited less often because of increased crowding (Manning et al. 2003).

During July and August of 2003, further research was conducted by Manning et al. (2003) at Weeping Rock, The Grotto, and The Narrows. The purpose of this research was to collect data on visitor use and users, explore possible standards for indicator variables and to measure visitor attitudes towards selected management actions.

Weeping Rock

Research (Manning et al. 2003) on visitor-based standards were compared to 2011 staff observations for encounter rates near Weeping Rock in the Echo Canyon tributary on the North Fork Virgin River below the Temple of Sinawava. The 2003 results indicated visitor-based thresholds for acceptability of crowding and thresholds for when management actions should occur. In 2011, Zion National Park staff gathered additional information on visitor numbers at the same places as the 2003 study. In 2011, an average of 69 people were encountered in 10 minutes on the way to Weeping Rock, and 33 were encountered in 50 minutes for the East Rim through Echo Canyon. Results from the 2011 trail counts indicated that use levels were still within the management action threshold reported in the 2002 and 2003 research. However, use levels were higher than the 2003 visitor-based standard for acceptability (figure 10).

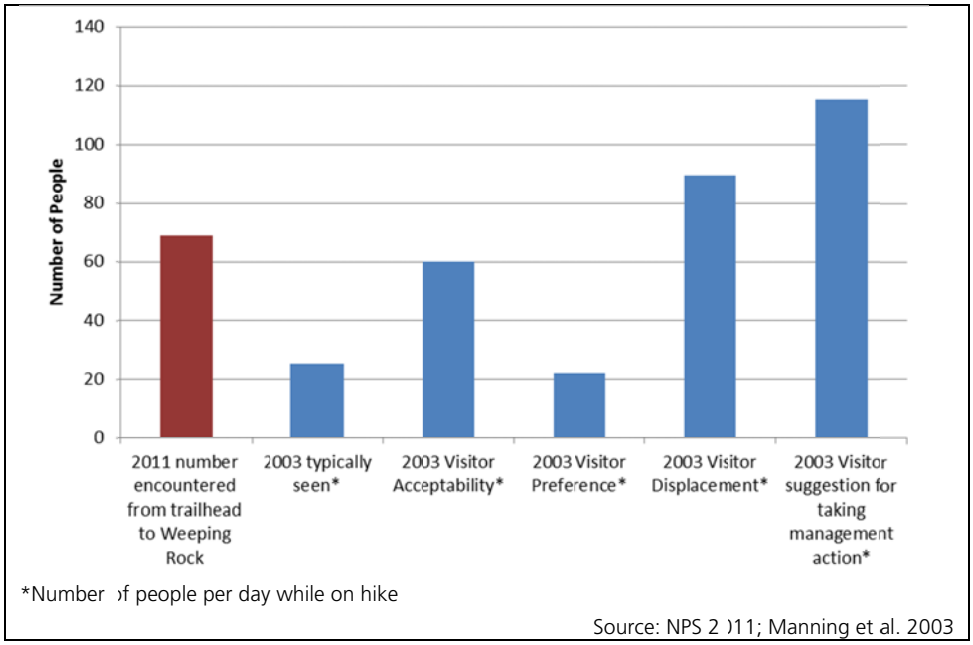
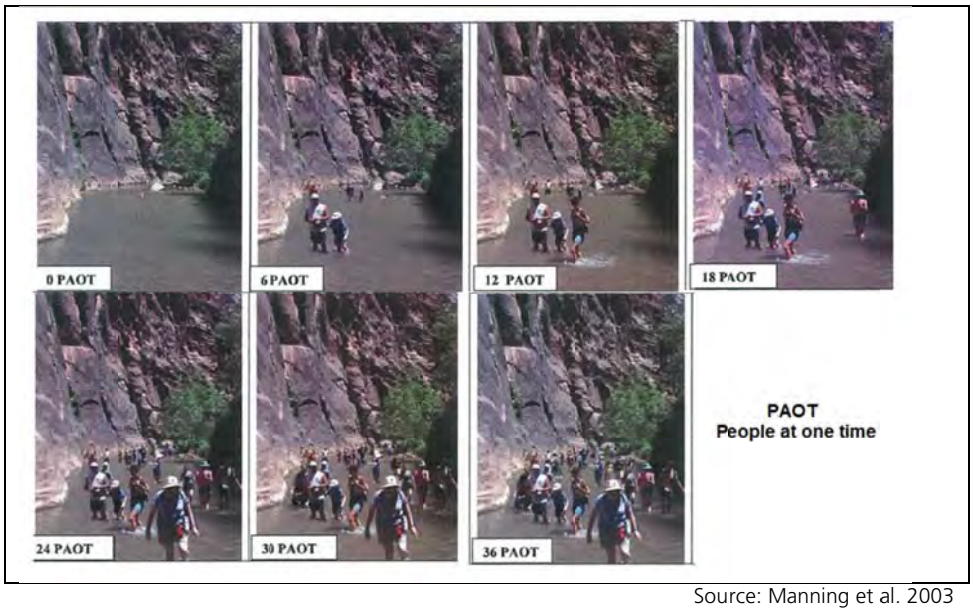


FIGURE 10. 2003 AND 2011 HIKING ENCOUNTER COMPARISON FOR WEEPING ROCK

The Lower Narrows

Unlike other tributaries on the North Fork above the Temple of Sinawava, the main segment of the North Fork above the Temple and below Orderville Canyon is in the frontcountry and receives extensive use. This section of the river includes Riverside Walk and extends 1.5 miles up the canyon. Impacts caused by visitors in this area includes: crowding, inappropriate disposal of human waste, trail widening, visitor-created trails, and noise. Based on results from the Manning et al. study (2003) and NPS staff efforts in 2011 to cross-test this methodology (figures 11 and 12), it is clear that visitors have opinions about when management action should occur to reduce crowding

(limit use) and therefore improve the quality of visitor experience. Findings showed that 24 people at one time were the visitor-based standard for when management action should occur (Manning et al. 2003). The 2011 monitoring results showed that current use levels were at 36 people at one time, indicating that use levels were exceeding the crowding-based standards for The Lower Narrows during peak season (figure 15).



Source: Manning et al. 2003

FIGURE 11. 2003 SURVEY METHODOLOGY FOR OBTAINING VISITOR RESPONSES FOR PEOPLE AT ONE TIME AT THE LOWER NARROWS

Emerald Pools

A portion of the Heaps Canyon tributary (North Fork Virgin River below the Temple of Sinawava) is in the frontcountry and encompasses the Upper, Middle, and Lower Emerald Pools, which receive extensive use. Impacts caused by visitors in this area include crowding, improper disposal of human waste, and visitor-created trails. Visitor-created trails are an issue of concern in this tributary. For example, on the Emerald Pools Trail, which is 1.5 miles of paved and unpaved trails, from the bridge over the Virgin River to the upper pools, 68 visitor-created trails have been counted. This is approximately 34 visitor-created trails per trail mile or four times that of what the park deems acceptable in wilderness. The management team used the 2011 staff observations and trail counts extrapolated from similar segments during the Manning et al. (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for when management action should be taken to prevent crowding issues. Findings showed that current levels of use are above the visitor-based standard (Manning et al. 2003). Bringing these rates down to an acceptable level would require a 15% reduction in encounter rates for visitors hiking to the Upper, Middle, and Lower Emerald Pools. The 2011 encounter rates for the Upper, Middle, and Lower Pools are shown in figure 13.

Trail Encounter Rates

Zion National Park staff conducted additional visitor trail counts in 2011 to have a better understanding of use on trails in Zion

Canyo ı within the vild and scenic river bound ries. Those indings are summarized by number of visito s encountered per minute and nu nber of visitors encountered pe mile (figures 13 and 14).

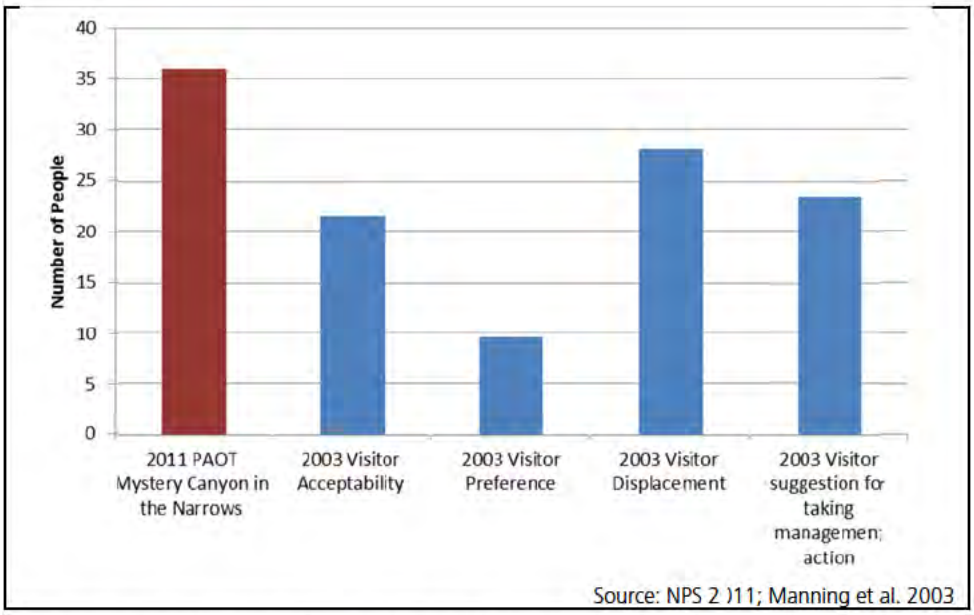


FIGURE 12. 2003 AND 2011 MEAN PAOT COMPA RISONS FOR THE LOWER NARROWS

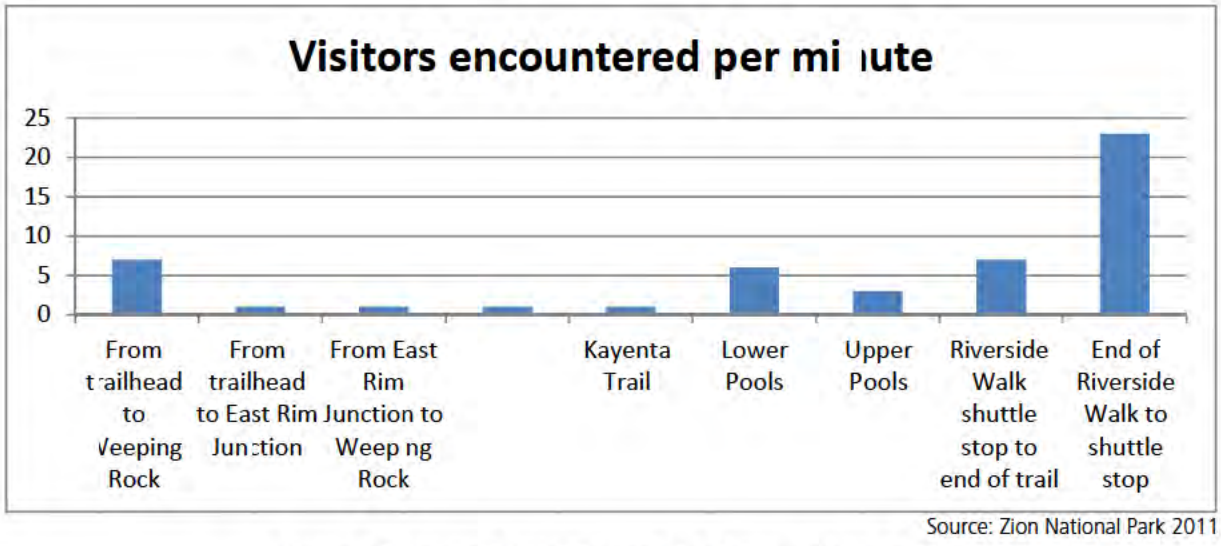
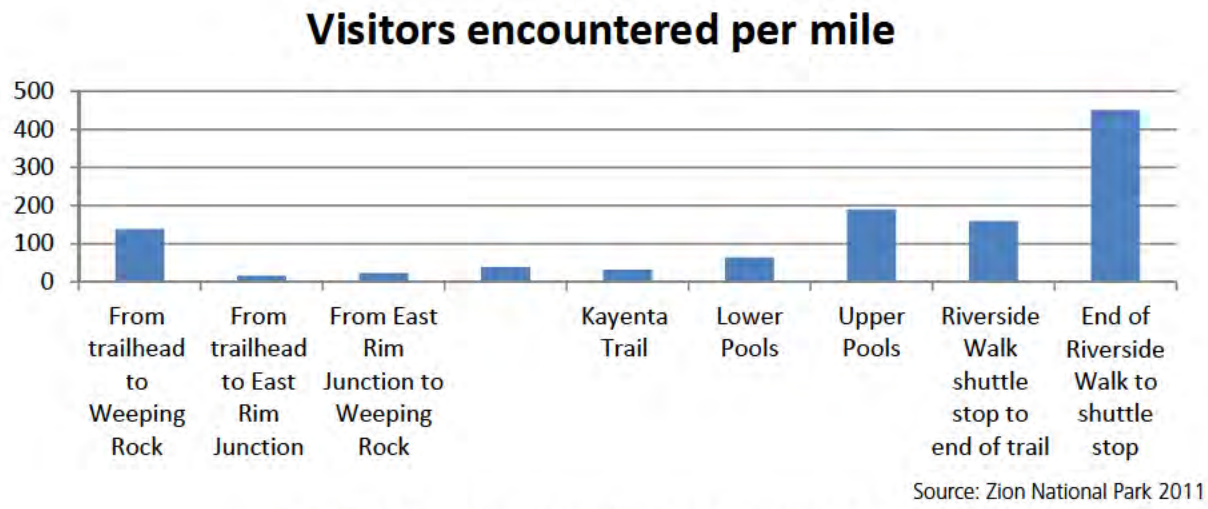


FIGURE 13. VISITORS ENCOUNTERED PER MINUTE ON T IE TRAIL



Source: Zion National Park 2011

FIGURE 14. VISITORS ENCOUNTERED PER MILE ON THE TRAIL

Opportunities to Experience Solitude

In the 2002 surveys, visitors were also asked about opportunities to experience solitude, and it was rated as "very important" or "important" by 81.5% and 80.8% of day user survey respondents, respectively, and by 96.2% of permitted overnight users (Manning et al. 2003). These responses are supported by the findings that solitude or uncrowded conditions were reported as the experiential component enjoyed most by 25.9% of permitted day users and 38% of permitted overnight users (Manning et al. 2002, 2003). Not only can the presence of solitude enhance visits, but crowded conditions can also detract from quality experiences; crowds were the experiential component least enjoyed by 22.5% of nonpermitted day use visitors, 17.9% of permitted day users, and 17.5% of permitted overnight users (Manning et al. 2003).

Opportunities to Experience Natural Quiet

Survey results also indicated that the "opportunity to avoiding seeing and/or hearing aircraft" was rated as "very important" or "important" by 72.4% and 65.1% of day use survey respondents, respectively, and by 64.4% of permitted overnight users (Manning et al. 2003). Peace/quiet was "enjoyed most" by 12.4% of permitted overnight users (Manning et al. 2003). Another study (Grau 2005) incorporated auditory elements into visual crowding research methods used by Manning et al. (2003). The Grau study affirmed the important connection between visual and auditory characteristics of a setting. The findings suggest that the sound levels had an effect on the evaluations of the number of people at one time. Based on findings, sound is an important element for managers to consider when developing strategies that promote a high quality visitor experience in slot canyons at Zion National Park. Study recommendations suggest that managers can communicate the importance of soundscapes to visitors through education and interpretation (Grau 2005).

Satisfaction with Facilities and Services

The quality or condition of facilities and services, particularly trails and campsites, with which visitors interact can have an appreciable effect on the quality of the park

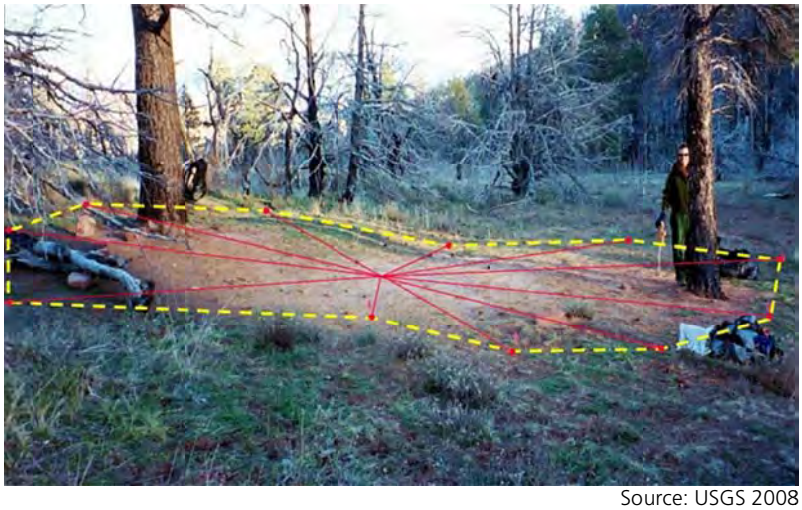
experience. Visitor satisfaction with informational services and other facilities/services are reported below based on the 2006 visitor survey. The quality and condition of trails and campsites and their corresponding influences on visitor experience are also included.

The majority of informational services received satisfactory (combine proportions of "very good" and "good" quality ratings) ratings by over 75% of visitors in both the summer and fall. The informational services that received the highest percentage of satisfactory ratings were the park brochure/map (92% summer, 88% fall), assistance from other staff (91% summer, not rated in fall), and assistance from entrance station staff (89% summer, 90% fall). The park brochure/map was also rated as the most important informational service (combined proportions of "extremely important" and "very important" ratings). The park website, although rated as the third most important informational service, received one of the lowest satisfaction ratings (74% summer, 72% fall). The informational service that received the highest "very poor" rating was the radio information station 1610 a.m. (13% summer); however, a relatively low number of visitors (75) rated that service (NPS 2007).

The majority of facilities/services also received satisfactory ratings by over 75% of visitors in both the summer and fall. The facilities/services that received the highest percentage of satisfactory ratings were the trail (94% summer, 93% fall), scenic turnouts/overlooks (92% summer, 89% fall), and the Zion Canyon Visitor Center (90% both summer and fall). The trails were also rated as the most important facility/service. The campgrounds, although rated as the third most important facility/service, received one of the lowest satisfaction ratings (77% summer, 68% fall). The facilities/services that received the highest "very poor" ratings were campgrounds (4%) in the summer and food services (6%) in the fall.

Trail and Campsite Condition

In general, wilderness visitors seek trails that do not show a lot of recreation-related impacts; in fact, opportunities to avoid such conditions were rated as "very important" or "important" by 71.4% nonpermitted day users and 77.8% permitted day user survey respondents and by 80.3% of permitted overnight users (Manning et al. 2003). The same is true for campsites; opportunities to use campsites that do not show a lot of recreation-related impacts were rated as "very important" (41.7%) or "important" (40.2%) by 81.9% of permitted overnight users (Manning et al. 2003). Findings showed that crowding has had a greater influence on changing hiking/visitation than poor trail conditions (Manning et al. 2003). Further, 8.9% of nonpermitted day users hike different trails because of deterioration of trails; only 2.3% hike less often. Additionally, 24.3% of permitted day users visit different wilderness canyons because of environmental deterioration; 18.9% visit less often. Permitted overnight wilderness users (18.8%) visit different areas of the wilderness because of deterioration of trails and/or campsites; only 6.3% visit less often (Manning et al. 2003).



Source: USGS 2008

In 2008, data were collected to determine baseline conditions of visitor use-associated resource impacts on trails and in campsites (USGS 2008). Findings were used to assist managers with identifying indicators and standards for trail and campsite condition. Management implications related to the selection of management actions for avoiding or minimizing trail and campsite impacts are detailed in the report. Research was conducted at the following areas, which are considered to be representative of the park's wilderness. Formal trails were evaluated for the West Rim, La Verkin, Willis Creek, and Hop Valley; informal trails were evaluated for the Lower Subway and Lower Coal Pits. Formal campsites were evaluated for La Verkin, West Rim, and The Narrows. Data collected pertained to the area of vegetation loss and exposed soils. The report informed Zion National Park planning and management decision making regarding the resource impacts associated with camping and hiking activities. This was accomplished through the development and application of campsite and trail impact assessment methods as part of a long-term monitoring program. Procedures were refined through their application to a large sample of designated campsites and formal and informal trails, and the subsequent data set was used to characterize existing baseline conditions. Park planners and managers also reviewed the study findings when considering the selection of appropriate indicators and standards. Subsequent application of the standards to the data set characterized the current status of compliance for some indicators and provided an opportunity to describe alternative park management options for addressing current and future situations when standards are exceeded (USGS 2008).

INTERPRETATION AND EDUCATION IN ZION NATIONAL PARK

There is a variety of interpretive programs offered where visitors can learn about all of the rich values of the Virgin River. Visitors attend guided hikes, patio talks, drop-in programs, evening programs, and Junior Ranger programs and can ride the shuttle with a ranger. A summary of visitors reached through interpretation and education in 2011 can be found in table 11.

TABLE 11. SUMMARY OF VISITORS REACHED THROUGH INTERPRETATION AND EDUCATION IN 2011

Interpretation and Education	
Ranger-led Programs	85,760 visitors reached during 2,357 programs
Roving Interpretation	69,834 visitors reached
Educational Outreach	7,141 students reached during 213 programs
Kolob Canyons Visitor Center	85,457 visitors
Zion Canyon Visitor Center	729,974 visitors
Zion Human History Museum	277,433 visitors
Zion Nature Center	7,158 visitors



Source: USGS 2008

Virtual visitors, who explore the park website (www.nps.gov/zion), can receive interpretation about human use of the Zion National Park landscape, dating back to 6000 BC; flora and fauna; geologic formations; and fossil within the park.

The park publishes a seasonal newspaper/map and guide that provides extensive trip planning information to educate visitors on how to prepare for a visit to Zion National Park. The information includes

- entrance fee information and visitor center operating hours
- services available such as lodging, restaurants, groceries, ATMs, showers, and laundry
- emergency response contact numbers
- wildlife and flash flood warnings
- recreational opportunities and a hiking guide
- schedule of ranger-led activities
- average weather temperature, sunrise and sunset times, and lunar calendar
- learning opportunities available through the Zion Natural History Association
- transportation options, restrictions, and other conditions

Other educational publications include a bird, mammal, plant, and reptile and amphibians lists.

The park's *Wilderness Guide* is updated and published annually, and it is one of the primary tools used by staff to educate visitors. The guide is available for download from the park website (http://www.nps.gov/zion/planyourvisit/upload/ZionWG2012.pdf) or by hard copy at visitor contact stations. Cautions regarding wilderness trips and Leave No Trace principles are highlighted on the front page, and the remainder of the 12-page packet contains advice on trip planning, recreational activities, and safety.

SAFETY IN ZION NATIONAL PARK

The health and safety of park visitors, staff, and neighbors are of great importance to the National Park Service. Park staff is responsible for maintaining conditions that protect the health and safety of employees and the public in the park. Statutory and regulatory provisions applicable to national park units require the National Park Service to not only provide safe facilities, utilities, and grounds within the park, but also promote safety in park program and project operations (NPS *Management Policies 2006* section 8.2.5). Safety is of upmost importance; however, visitors take inherent risks when they enter the wilderness canyons. Visitors need to be prepared and aware of weather conditions before starting a trip because hikes throughout the park could involve walking in water, where rivers and washes are subject to flash flooding. During the summer season, extreme temperatures can also pose risks to hikers if they do not come prepared for this environment. Information about park conditions and safety is provided to visitors through a variety of avenues including the park website, brochures, and communication with park rangers. Incidents rarely occur in the wilderness areas, yet the park is prepared implement its established search and rescue protocols in the case of an emergency.

Two key safety aspects would be addressed as part of this plan because they relate to recreational activities that occur in the river corridor. These two topics are (1) permanent protective equipment for climbing and (2) flow rate limits in various canyons for recreational activities.

Hardware and Equipment / Climbing Safety

A wide range of equipment and hardware has been developed over time to be used as protection for the climber. Hammer-driven pitons, which widened, and scarred cracks have been generally replaced by removable devices, assisting in clean climbing practices. However, the exploration of steeper, more difficult face climbing has led to an increase in the placement of fixed, artificial protection (e.g., bolts) by some climbers.

At this time, the use of removable and fixed anchors, as well as other climbing equipment, is appropriate in wilderness. However, fixed anchors must be placed judiciously and closely managed in order to prevent the degradation of wilderness resources and character. Where anchor points are necessary for climber safety, the use of removable equipment is desired and highly recommended. Fixed anchors should not be placed merely for convenience or to make an "unclimbable" route climbable.

Fixed anchors (e.g., webbing, bolts, pitons, chains) currently in place may remain. They may be replaced or removed by individual climbers during a climb or the NPS during park operations.

Safety remains a responsibility of the climber. The National Park Service will not, as policy or practice, monitor fixed anchors to evaluate their condition or accept any responsibility for fixed anchors.

The placement of new fixed anchors may be allowed when necessary to enable a safe rappel when no other means of decent is possible, to enable emergency retreat, during self-rescue situations. The infrequent placement of new fixed anchors is allowed

when ascending a route to connect terrain that is otherwise protected by removable anchors (e.g., one crack system or other natural feature to another) or when there are no features which will accommodate removable equipment but the occasional placement of a fixed anchor may provide a modicum of safety during the ascent (e.g., traditional face climbing). New, bolt intensive climbing routes (e.g., sport climbs, bolt ladders) are not appropriate in wilderness and should not be created. The park may place and maintain fixed anchors for administrative and emergency purposes.

When a climber determines the need for anchor placement or replacement, this must be accomplished in compliance with regulated and permitted standards (e.g., power drills prohibited). At this time there is no permit or approval system in place, or proposed, with regard to the placement of fixed anchors; however, one may be developed and implemented if the park determines it is necessary, through research and monitoring, to protect natural and cultural resources.

For fixing climbing gear on BLM lands within wilderness, the following applies:

> ix. For members of the public, no exceptions to the prohibited uses found in section 4 (c) of the Wilderness Act, are allowed – including creating structures or installations – without explicit, case-by-case authorization from the BLM managing office. Unauthorized structures and installations will be dismantles or removed as soon as practicable. Authorizations may be appropriate for:
>
> a. allowing the placement of permanent, fixed climbing anchors. The BLM will not authorize the public install permanent fixed anchors using motorized equipment. (USDI, BLM, 6340 – Management of Designated Wilderness Areas, 7/13/2012)

History of Flow Limits, Related Rules, and Visitor Safety

Prior to the mid-1960s, there were no flow limits or permit requirements for hikers in The Narrows. Flow limits are important to visitor use because high flow rates can endanger public safety if appropriate cautions are not taken. Even when a visitor is hiking on dry land, if flow limits are exceeded thereby causing flash floods, water could overcome the riverbank and become a hazard. Hazards can include campsites being washed out, visitors becoming trapped in canyons, and visitors drowning because of large amounts of water.

In 1997, Shelby et al. published a study of acceptability of flow rates for through hikers (from top to bottom of canyon) in The Narrows. The study found that most hikers could not complete hikes at flows above 150 cfs.

Prior to 1998, wilderness permits were required for all overnight trips and all through trips of The Narrows and its tributaries. In 1998, due to rapid increase in participation in canyoneering, the permit requirement was expanded to include all canyons that required the use of ropes.

In the late 1990s, Zion National Park prohibited watercraft use on any river in the park. The prohibition was the result of concern with the proliferation of inner tube rentals and a crowded and hectic atmosphere along the banks of the river in Zion Canyon. In 2000, the park agreed to allow kayakers to boat the river, but required that they use craft designed for whitewater use and that they obtain wilderness permits. The permits allowed the park to monitor the amount of use and to limit use. Permits were not issued for boating when the river was low enough for hikers to access the river in order to prevent potential conflicts. The flow

threshold was also based on a pattern of increased turbidity in the river when flows exceeded 120–150 cfs. When the water was turbid, native fish would not show a flight response to a passing object.

In the early 2000s, after meeting with staff from the National Weather Service and the USDI solicitor, park staff created a standard operating procedure to discontinue the issuance of wilderness permits if the National Weather Service issued the greatest flash flood concern—a flash flood warning. A warning is issued when the National Weather Service determines through Doppler radar that enough rain has fallen to cause flooding. Permits are not issued until eight hours after the warning is lifted in order to allow water to drain from the park's longest drainages. The eight-hour period is considered the maximum time it would take a flood originating in the headwaters to pass through The Narrows, based on measurements of the speed of flood fronts with a 2-hour margin of safety added. Throughout the summer months, the National Weather Service issues a flash flood potential rating. It also issues forecasts that can include a high probability of heavy rain as well as flash flood watches. Park staff strives to educate visitors concerning the risks of their proposed trips, but wilderness permits are not denied unless a flash flood warning has been issued or flows in the North Fork are above flow limits. At all other times, visitor safety is the visitor's responsibility.

In 2004, the flow limit for canyoneering trips ending in the lower portion of The Narrows was increased from 120 cfs to 140 cfs. The increase was based on staff experience that indicated upstream trips from the Riverside Walk could be completed at flows higher than 120 cfs. After a conversation with the USDI solicitor, signs were erected on the Riverside Walk indicating that The Lower Narrows was closed to hikers at flows above 140 cfs.

Since 2007, the park has closed the Echo Canyon canyoneering route in early summer due to constantly shifting snow/ice accumulations in the canyon resulting from snow sliding down a massive slickrock ramp. The closure occurred after multiple groups were trapped in the canyon over the course of two summers and required rescue.

There has never been a large demand for kayak trips through The Narrows. The busiest year for the activity was 2009 with 12 permits issued. (Prior to 2009, there were not significant incidents from kayaking in The Narrows.) Of the 12 permitted groups, four were reported overdue and two required rescue. In 2010, the park staff had a meeting with local boaters to request assistance in the event of future rescues. All agreed to help, but none were willing to assist at flows above 600 cfs. The park staff also compared permits with flows and discovered that only six permits to boat had been requested over the previous 10 years. The Narrows at flows between 600 cfs and 700 cfs, and that only one permit had been issued at flows in excess of 700 cfs. After considering the difficulty of rescue and the lack of demand for permits, we instituted a 600 cfs upper limit for kayaking The Narrows. The Shelby et al. (1997) study provides a limited amount of information indicating that trips through The Narrows at flows in excess of 600 cfs may not be possible. There is no upper flow limit for kayaking trips below the Temple of Sinawava, and access for rescue to the area is not problematic.

Based on staff experience, visitor feedback, and the Shelby et al. (1997) study, flow limits were increased from 140 cfs to 150 cfs in 2012. Park staff has found that the average late spring hiker in The Narrows can safely complete the trip at 150 cfs.

Every effort should be made to avoid closing areas to recreational use as a result of safety concerns. Wilderness travel has inherent risk, and visitor's safety is their responsibility. Areas within Zion National Park may be closed for the following safety reasons:

1. If an area of the park has repeated incidents that involve a large percentage of visitors, the park may evaluate continued use of the area. The evaluation may include steps to eliminate or mitigate the problem or, if necessary, seasonal or permanent closure.

2. If park staff can not envision a method to safely rescue an injured visitor, the area may be closed. Wilderness rescues are always challenging, and can cause resource damage. They can take hours or days. An area should not be closed simply because rescue would be difficult. An area should be closed if rescue is not possible without undue risk to rescue personnel.

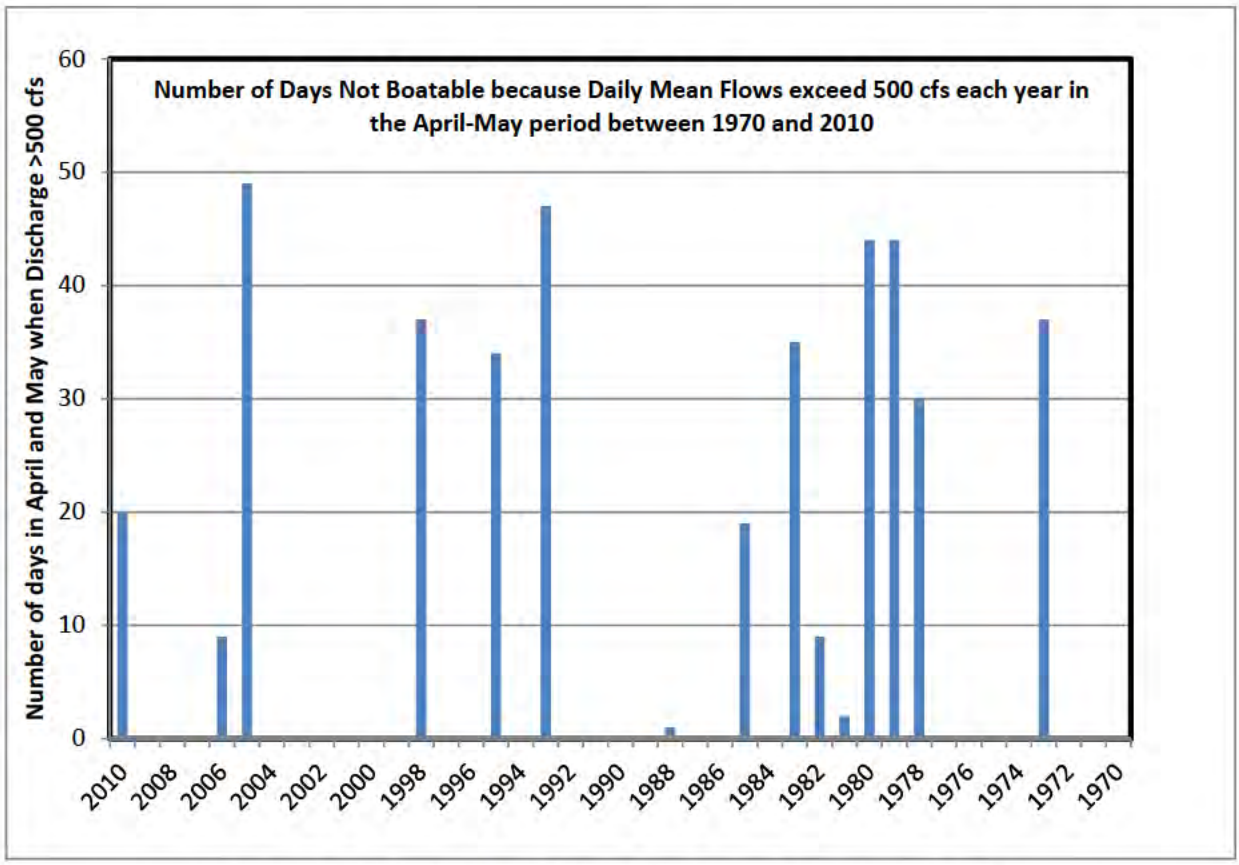


FIGURE 15. NUMBER OF DAYS MEAN FLOWS EXCEED 500 CFS SINCE 1970

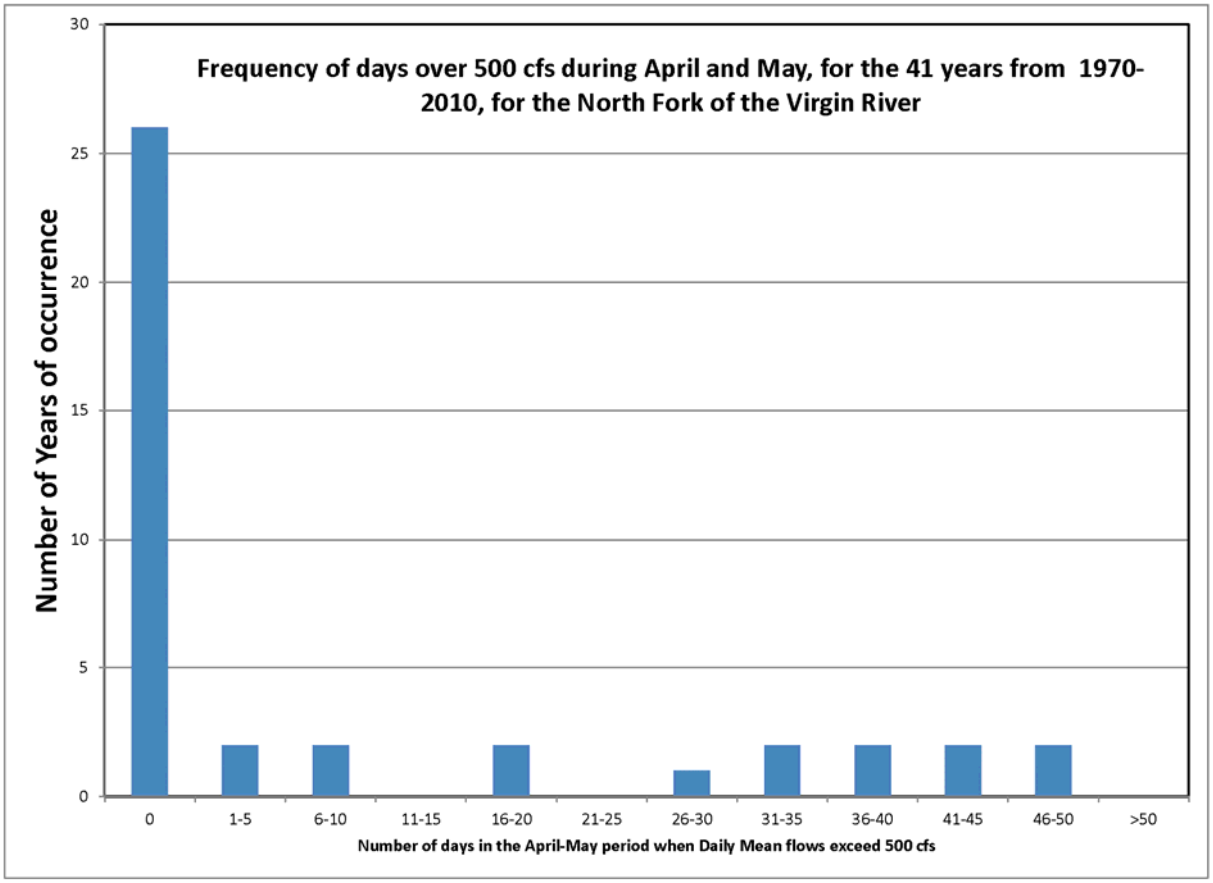


FIGURE 16. FREQUENCY OF DAYS OVER 500 CFS, 1970–2010

TYPES AND LEVELS OF DEVELOPMENT

INTRODUCTION

Current development within the river corridor includes transportation infrastructure such as roads, bridges, shuttle stops, and trails along with bank hardening to protect these items; visitor amenities including picnic areas, turnouts, trailheads, campgrounds, and interpretive areas; and administrative uses including entrance stations, maintenance, utility installations, housing, offices and support. The level of development varies from almost no development on the wild segments of La Verkin Creek, North Creek, and the East and North Forks (above the Temple of Sinawava) of the Virgin River to more substantial development on the recreational segment of the North Fork Virgin River. The following segment-by-segment description provides a summary of existing types and levels of development for the various designated segments. The descriptions of the development reflect existing conditions.

NORTH FORK ABOVE THE TEMPLE OF SINAWAVA AND TRIBUTARIES (WILD SEGMENT)

The wild segment of the North Fork Virgin River includes undeveloped routes leading visitors through narrow slot canyons, providing visitors access to the upper reaches of the Virgin River. The only formal trail in this segment is the paved Riverside Walk, which begins at the Temple of Sinawava shuttle stop and terminates 1 mile up the canyon. Development in this segment is limited to 12 wilderness campsites within the park for overnight visitors, as well as climbing bolts at Kolob Creek, Imlay Canyon, Orderville Canyon, and Mystery Canyon.

On-stream and off-stream diversions of water reduce total annual discharge by a minor amount, estimated at 4% or less. This lack of large storage reservoirs permits the patterns of floods, allowing high and low flows to remain substantially natural. A spring development exists at the downstream end of the wild segment to provide water to the comfort station.

The Kolob Creek segment features Kolob Reservoir, which alters the flow of the creek. Water storage, the interbasin transfer from Crystal Creek, and regulated releases act to increase the stream flows during the fall and summer and reduce flows during spring runoff.

The Deep Creek segment has numerous small ponds, spring diversions, and a few wells on the Deep Creek drainage. All capture or divert small quantities of water. The largest diversion transports water from Crystal Creek to Kolob Reservoir during spring runoff. It is recognized in the Zion National Park Water Rights Settlement Agreement, which includes a provision that the diversion must always pass 5 cfs of flow to protect downstream flow during base-flow conditions. The entirety of diversions from deep upstream of the wild section is less than 5% of the total flow, and, given that there are no large reservoirs, flow in this reach is considered essentially natural.

NORTH FORK BELOW THE TEMPLE OF SINAWAVA AND TRIBUTARIES (WILD AND RECREATIONAL SEGMENT)

The recreational segment below the Temple of Sinawava is the most developed section of the wild and scenic river and Zion National Park. Major development within the segment includes the park's visitor center, administrative facilities, and Zion Lodge. This segment also contains much of the park's major transportation infrastructure

including nearly 24 miles of roads, 16 shuttle stops, 21 bridges, and 19 miles of developed trails. Bolts for climbing and canyoneering are located at Oak Creek, Behunin Canyon, Echo Canyon, Heaps Canyon, Birch Creek, Pine Creek, and the main stem of the North Fork below the Temple of Sinawava. Visitor accommodations include 320 campsites at the South and Watchman campgrounds, as well as 82 rooms in Zion Lodge. Other visitor services include stable facilities for the horseback riding concession, the visitor center, three picnic areas, the Zion Human History Museum, and nine trailheads.

Administrative facilities in the segment are clustered near the mouth of Oak Creek Canyon. This area includes an administrative building, maintenance buildings and storage yard, park housing, and additional office space.

Additional structures in this segment include historic levees and rock-filled gabions, which have modified the natural floodplain. These structures, which date to the 1920s, are primarily in place near Zion Lodge. Other structures in this segment that have an impact on stream hydrology include pipeline crossings and cemented boulders.

There are several park spring developments in Zion Canyon that capture water for park administrative uses, including drinking fountains, public toilets, guest lodging, park residential use, irrigation, and fire protection. Each of these developments includes a collection system that may be as simple as a pipe inserted into a crack in the rock discharging water, a number of very small collection basins, or an underground infiltration gallery. Each is connected by pipes to a storage tank and distribution system.

Two low-head diversion dams currently exist on the North Fork Virgin River in lower Zion Canyon. They are: Oak Creek diversion, owned and operated by the National Park Service, and Flanigan diversion that is shared between the park, the town of Springdale, and Springdale Consolidated Irrigation Company. Both predate establishment of the park, beginning as crude brush and boulder dams and evolving over the years into concrete and grouted rubble dams with shoreline works built of concrete and stone masonry. The purpose of these dams is to raise the water surface elevation so that a portion of the stream flows into an irrigation ditch or pipeline. The combined amount of diversion at the Flanigan diversion dam is 5.35 cfs, and the National Park Service diverts 1.21 cfs of river water from the Oak Creek diversion. The combined maximum diversion from both dams is 6.56 cfs or about 13% of the typical summertime base flow. This diminishment affects the river for the lower 2 miles of the scenic river. Both dams raise river levels above the dams by roughly 7–10 ft; neither dam stores any water nor any effective amount of sediment. The water rights associated with these dams date to the 1870s and 1880s. All of the water right owners intend to retain these dams for the foreseeable future. The dams are a minor barrier to navigation, although they do not form life-threatening hydraulics and are passable to skilled boaters at higher flows. The dams are barriers to upstream fish travel at low and moderate flows, but are probably passable during large flood events.

The following developments are described by segment:

The Behunin Canyon segment has no diversions (natural flow).

The National Park Service has two spring developments in the Birch Creek segment. One is an infiltration gallery a short distance upstream of where Birch Creek crosses the Sand Bench Trail, and the other is at the base of the Navajo sandstone on the north slopes of the canyon. These springs are the primary source of potable water for the park. Water is piped across the bed of the North Fork Virgin River at the confluence with Birch Creek, then to a 1-million-gallon storage tank. Piping then carries the water down-

canyon to all park developments in lower Zion Canyon.

Developments in the Clear Creek segment at the east entrance include two residences, two entrance kiosks, a vault toilet, a water supply well (water right 81-514), chlorinator, pipelines and storage tank.

At Crawford Ditch, the ditch and diversion dam are no longer in use, although the ditch alignment is still visible in many places and is a significant historic feature. It is in the North Fork Virgin River recreational corridor.

The Echo Canyon segment has no diversions (natural flow).

Gifford Ditch—This diversion dam and ditch remain in use. The diversion dam is a short distance upstream from the scenic junction and the ditch carries river water along the west side of the river to irrigate lands in the South Campground. It is also referred to as the Oak Creek Ditch. It is in the North Fork Virgin River recreational corridor.

There are two springs in the upper Oak Creek segment that were developed for water by the town of Springdale in the 1950s. Congress passed legislation in 1928 and 1943 granting the town use of these springs inside the park. The spring developments themselves are outside the recreational river corridor, but the pipelines, storage tanks, and access roads and trails are within the corridor. The springs were used until the 1980s when an agreement was reached with the park to provide an equivalent amount of water from the park water supply, which continues in place today. The pipelines and tanks have fallen into disrepair, but remain in place along the stream. The town still holds water rights for these springs.

In the Pine Creek segment, a diversion dam and ditch once carried water from lower Pine Creek to fields in lower Zion Canyon. Nothing of the diversion dam remains, although remains of the ditch are identifiable in a few scattered locations. There are no water rights associated with this development.

A park spring development exists at Temple Spring that includes capture of water at the spring, a small storage tank, and pipelines that lead from the spring to the comfort station at the Temple of Sinawava, traveling across the bed of the river.

For a time, the park provided water via a pipeline at Scout Lookout where the trail to Angels Landing branches off from the West Rim trail, but the system has been inoperable for several decades; that water was obtained from a small spring catchment farther up the west rim trail and piped about 4,000 feet to a spigot at Scout Lookout. The spring is outside of the recreational corridor for the North Fork Virgin River, but some of the metal pipe is inside the corridor.

Upper and Lower Grotto Spring have been developed for water supply and remain in use by the Grotto picnic area, Zion Lodge, and other park uses farther down the canyon. Developments consist of above- and below-ground catchment systems, a chlorinator, storage tank, and distribution pipelines, all of which are in the North Fork Virgin River recreational corridor.

Water from developments at Wylie Retreat Spring is piped, settled, and chlorinated for use at Zion Lodge. These developments are in the North Fork Virgin River recreational corridor.

Historically, there were at least three other diversion dams on the North Fork Virgin River, two in this same vicinity and one more upstream of Zion Lodge. All of these have long ago been washed out and no evidence of their presence remains in the river channel. Some remains of the ditches and pipelines leading from these diversions remain in the corridor. No water rights are associated with these dams.

EAST FORK VIRGIN RIVER AND TRIBUTARY (WILD SEGMENT)

In historic times there have been several stream diversion dams and irrigation ditches along the East Fork Virgin River associated with the pioneer town of Shunesburg, the center of which was a short distance downstream of the current park boundary. The town had been abandoned by the time these lands were added to the park in 1918 and 1925. The diversion dams were quickly washed out, the ditches deteriorated over the years, and the fields were dry. At this time, these developments have no influence on the free flow of the river, although some of the historic features remain on the terraces outside of the channel.

There is a USGS stream gauge on the lower East Fork Virgin River in the wild corridor. As currently configured, it consists of a pressure transducer in the stream and data logger, solar panel, and satellite antenna mounted on a very large boulder. This site provides critical information for monitoring, understanding, and managing the river, so while the configuration of the equipment might change in the future, the gauging station is expected to remain in perpetuity.

In order to monitor the function of a healthy riparian system, the National Park Service has marked three measuring reaches along the East Fork Virgin River. Each includes seven cross sections, the ends of each marked with rebar stakes, and one set of three shallow wells (2 inch-diameter PVC well 10–15 ft deep). These are intended for long-term monitoring.

Diversion and consumption of water upstream from the park reduces the flow in the park by an estimated average of 13%. The middle reaches of the river upstream from the park are effectively dry during the summer irrigation season. Springs inside the park and just upstream on BLM lands provide the entire summer base flow of the river. There are no large reservoirs on the watershed, so in spite of the somewhat diminished base flows, the floods and overall hydrologic patterns are largely natural.

Current flows of Shunes Creek segment are entirely natural at present. A historic diversion and ditch existed inside the park until the owner moved the diversion outside the park in 2000. Remnants of the ditch remain in the lower 3/4 miles of the canyon.

NORTH CREEK AND TRIBUTARIES (WILD AND SCENIC SEGMENT)

The North Creek segment remains relatively undeveloped. While the segment contains no facilities, it is crossed by five miles of developed trails and is accessed via five trailheads, all of which are outside the wild and scenic river corridor. Bolts for canyoneering are located at both forks of North Creek, Russell Gulch, and Blue Creek.

The Grapevine Wash segment crosses four private tracts of land. A low stone dam is present in the bed of Grapevine Wash at the south end of Cave Valley. It is about 8 ft high and 30 ft wide at the crest, is completely silted in, and stores no water. There are no water rights associated with this structure.

The Wolf Spring Wash segment crosses a single private tract of land. Wolf Spring Wash has a history of water developments, some of which remain in the scenic segment. One reservoir was constructed just above the confluence with Pine Spring Wash. The low earthen dam remains but has been breached and the reservoir filled with sediment, so it no longer holds water. No valid external water rights are associated with this dam. There are scattered pipelines, roads, troughs, and water tanks associated with the development of Aspen Spring under private water rights. The spring is on public lands just outside of the river corridor and the place of use for the water is on nearby private lands. The use of the water and the maintenance of the distribution system is expected to continue.

The Pine Spring Wash segment crosses a single private tract of land and has two reservoirs in the scenic segment. The low earthen dams remain but they have been breached, and the reservoirs filled with sediment, so only one holds a small amount of water. No valid external water rights are associated with these dams. There is a diversion dam with private water rights on NPS lands immediately upstream of the scenic segment where a portion of spring runoff in Pine Spring Wash is diverted into a ditch and reservoir system east of the scenic segment. The water is used on private lands that Pine Spring Wash flows through for slightly more than 1 mile. Dirt roads are used to access the water developments and private lands in the vicinity of the scenic segment.

The Little Creek segment has three small spring developments with ponds in the wild corridor, all of which are near Pocket Mesa in the upper portion of the watershed. The earthen-dammed ponds have surface areas of 0.05, 0.03, and 0.08 acres. There are no external water rights associated with any of these springs.

There are no external water rights, impoundments, diversions, or other water developments in the Russell Gulch wild corridor.

LA VERKIN CREEK AND TRIBUTARIES (WILD SEGMENT)

La Verkin Creek contains only limited development including 12 miles of developed trails and 15 wilderness campsites. It is accessed from two trailheads, both outside the river corridor.

Upstream of the La Verkin Creek segment there are several small impoundments and spring developments on the watershed. There are no large impoundments or main stem diversions. The combined water consumption is negligible so that total stream discharge and flood patterns are not appreciably altered.

The Hop Valley segment crosses two private tracts of land. Private lands exist in the upper portions of Hop Valley with associated private water rights, which could involve structures for diverting water from the stream, piping, and irrigation.

There are no developments on the BLM segments.

TAYLOR CREEK AND TRIBUTARIES (WILD AND SCENIC SEGMENT)

The Taylor Creek segment is accessed via Kolob Canyons Road, which runs about 1.5 miles through the segment. Other development in the river corridor includes 2.3 miles of developed trails, two trailheads, and bolts for canyoneering located at the North and South Forks of Taylor Creek.

There are no developments on the BLM segments.

PARK OPERATIONS

ZION NATIONAL PARK

Park operations consist of NPS, concessioner, and contractor operations, which encompass protecting natural and cultural resources; maintaining all roads, trails, buildings, and other structures in a safe and aesthetically pleasing condition; providing dining and lodging opportunities for park visitors; ensuring visitor safety; and providing interpretative programs for park visitors.

Climate change could affect agency operations and facilities in a variety of ways. A warmer and dryer landscape could influence facility design and park operations. Changes in river flows could affect the park's potable water supply. There may be an increased need for shade structures. Changes in visitor use patterns and summer storms could affect park patrols and emergency services operations. Changes in wildfire frequency and intensity would affect firefighting operations.

PARK OPERATIONS BY RIVER SEGMENT

North Fork Virgin River above Temple and Tributaries

The wild segment of North Fork Virgin River and its tributaries includes undeveloped routes leading visitors through narrow slot canyons. Although no formal trail system exists, these routes provide visitors access to the upper reaches of Virgin River. Development in this segment is limited to 12 designated wilderness campsites for overnight visitors.

The area from the Temple of Sinawava parking area to the mouth of Orderville Canyon is not within wilderness. This area has a paved trail that leads visitors into the narrows. The trail is maintained regularly. Park staff patrols the area often because of the high use.

North Fork Virgin River below Temple and Tributaries

The recreational segments (North Fork Virgin River, Clear Creek, Pine Creek, and Oak Creek) are where the majority of the visitor use occurs and where most of the development exists in the park. This is a focus area for park operations. There are miles of constructed trails and paved roads that are regularly maintained. There are springs that have been developed that provide drinking water for visitors and residents in the park. There are miles of pipeline that transport that water and water tanks that store the water for later use. Water is also taken out of the North Fork Virgin River at the Flanigan and Gifford diversion dams. It is then used for irrigation. There are pedestrian and vehicle bridges over the river that must be maintained. Zion Lodge and the horse concession are within Zion Canyon. Their facilities are maintained on a regular basis. In Zion Canyon park facilities include shuttle stop structures, the Grotto picnic area, many scenic view turnouts, trailheads, and restroom facilities. All of these facilities are maintained. The canyon is also patrolled by law enforcement.

The Zion-Mount Carmel Highway heading toward the east park entrance through the tunnel has trailheads, scenic turnouts, restroom facilities, and bridges all that need maintenance.

The park headquarters, Human History Museum, and emergency services operations are at the mouth of Oak Creek Canyon. The maintenance yard and staff housing are farther up the canyon.

Toward the south park entrance are the South and Watchman campgrounds, the Zion Canyon Visitor Center, the Nature Center, the maintenance yard and storage area for the park shuttle, and housing for park staff. All of these areas require daily maintenance by park staff.

The wild segments (Oak Creek, Pine Creek, Birch Creek, Heaps canyon, Behunin canyon, and Echo Canyon) are for the most part within Zion Wilderness. Within the wilderness areas there are no visitor facilities to maintain. Wilderness staff patrols the areas on a regularly.

East Fork Virgin River and Tributary

The entire segment is within the Zion Wilderness. The area was also designated as a research natural area in the Zion National Park General Management Plan (2001). Research natural areas are field ecological areas designated primarily for research and education and/or to maintain biological diversity. In order to protect these areas all research natural areas in Zion are closed to recreational use. The only access is by researchers or park staff. Research currently occurring on the East Fork includes riparian vegetation sampling, fish monitoring, bat survey, and breeding bird survey. The area is also rich in archeological resources. The park monitors and, as needed, stabilizes existing archeological structures. The vegetation crew hikes through the canyon every few years to eradicate tamarisk and other invasive plant species. The inventory and monitoring program has established a stream gauge in the canyon to monitor river flow. The gauge is visited every few months to gather data and perform maintenance. There are no visitor facilities on the canyon.

North Creek and Tributaries

Most of North Creek and the tributaries are within Zion Wilderness. Those areas within wilderness have constructed and nonconstructed trails. The constructed trails need occasional maintenance by the trail crew. The routes (nonconstructed trails) through the canyons are monitored by wilderness staff to determine if the routes are in compliance with the standard identified in the backcountry management plan. Overnight use in the area requires a permit. Day use in some of the canyons also requires a permit. Wilderness staff patrols the area regularly.

Pine Springs Wash and Wolf Springs Wash are partially within wilderness. Grapevine Wash is entirely outside wilderness. These washes begin on park lands and flow in and out of private inholdings. There are no visitor facilities to maintain in the area, but there are fences to maintain around the private inholdings. There are also spring developments that need occasional maintenance.

La Verkin Creek and Tributaries

The majority of La Verkin Creek and its tributaries are within wilderness. There are 17 miles of constructed trails that are maintained and monitored as needed. There are also 15 designated campsites that are monitored by the wilderness staff. The wilderness staff also patrols the area on a regular basis. The vegetation crew hikes through the canyon every few years to eradicate tamarisk and other invasive plant species.

Hop Valley Creek, Currant Creek, and Cane Creek flow through private inholdings. There are no developments along Currant or Cane creeks. The private property owner on Hop Valley Creek grazes livestock along the creek in the summer. The Hop Valley Trail winds in and out of the private inholdings. Maintenance staff must repair fences yearly to keep livestock out of the park. Maintenance staff also maintains the trail through Hop Valley as needed.

Taylor Creek and Tributaries

The majority of the Taylor Creek tributaries are within Zion Wilderness. There is one constructed trail in the Middle Fork of Taylor Creek that is maintained as needed. There are also three historic cabins in Taylor Creek. The cultural resource staff stabilizes these structures as needed. The wilderness staff patrols the area throughout the visitor use season. A portion of the Kolob Canyon Scenic Drive is within the wild and scenic river boundary. Park staff maintains the road throughout the year. Including resurfacing, patching holes, chip seal, and snow removal.

ST. GEORGE FIELD OFFICE OPERATIONS IN GENERAL AND BY RIVER SEGMENT

The St. George Field Office, Bureau of Land Management, administers over 629,000 acres of public land in Washington County, Utah. Overall direction for management of public lands is provided by the Federal Land Policy and Management Act of October 21, 1976. The St. George Field Office staff is responsible for the management of a variety of uses, activities, and resources including:

- recreation management
- vegetation management
- livestock grazing
- energy and mineral management
- fish and wildlife habitat management
- visual resource management
- wilderness management
- cultural resource management
- transportation (OHV and mountain bike use)
- fire management
- forestry management
- lands and realty (rights-of-way)

The uses, activities, and resources that are specific to this plan include: wilderness, OHV and mountain bike use, energy and minerals, rights-of-way, and livestock grazing. These topics are described in general below.

Wilderness: There are seven wilderness areas that overlay the BLM wild and scenic river segments. A description of each wilderness area follows:

Taylor Creek Wilderness is 32 acres and its western boundary is Zion National Park. This wilderness encumbers just a portion of an isolated public land parcel managed by the Bureau of Land Management. BLM-managed lands are contiguous on its eastern boundary, while private lands share its northern and southern boundary. In this area, the Taylor Creek stream channel is narrow and steep-sided, with dense stands of scrub oak, pinyon pine, and Utah juniper on the mesa top.

La Verkin Creek Wilderness is 445 acres. Its southern boundary with the park is over 1.25 miles long. Access to this wilderness is difficult as the area is surrounded by private property on its western, eastern, and northern borders. The habitat value of La Verkin Creek Wilderness is greatly enhanced by its proximity to Zion National Park and the thousands of acres of remote, private wildlands surrounding it. The wilderness sits at an elevation of 6,800. Dense vegetation including pines, juniper, and scrub oak; canyon wall creating shade and nesting locations; access to water; and other factors create an environment suitable for many animal species.

Black Ridge Wilderness contains approximately 13,000 acres of public land along the steep escarpment of the Hurricane Fault. Interstate I-15 is a prominent human-made feature below the western boundary of this wilderness. Approximately 7.6 miles of LaVerkin

Creek and 1.3 miles of Smith Creek, both newly designated "wild" rivers in the National Wild and Scenic River System, flow through the wilderness. These streams are bounded by lush riparian zones of willows and Fremont cottonwood trees. The slopes above the stream channels are heavily wooded with pinyon pine, Utah juniper, and some ponderosa pine at higher elevations.

Beartrap Canyon Wilderness is small (40 acres), but shares a common boundary with designated wilderness in the Kolob Canyons portion of Zion National Park. Largely a rugged, steeply sloped area, this wilderness contains the headwater areas for many tributaries that flow through Beartrap Canyon. This wilderness area is an isolated parcel of BLM land; its western boundary is contiguous with Zion National Park, its northern, southern, and eastern boundaries border private land. At a top elevation of 7,500 feet, both the mesa top and canyon bottom sustain Utah juniper and ponderosa and pinyon pine trees.

Goose Creek Wilderness is 98 acres of remote and rugged country. Over 1,000 feet of elevation change occurs from the top of the wilderness to where the canyon connects to the North Fork Virgin River in Zion National Park. The park borders the wilderness area to the west and south. Private lands surround its eastern and southern borders. Sitting at about 6,800 feet, the landscape is typical of high elevation desert: dense tree stands on the slopes and thick riparian vegetation thriving in the canyon's steep-walled shade. A mix of ponderosa and pinyon pine and Utah juniper grow on top of the sandstone cliffs. Birds such as hawks and golden eagles ride the air currents above the canyon walls, while a variety of mammals use both the uplands and the canyon bottoms.

Deep Creek Wilderness contains 3,320 acres of public land and is near the northeast corner of Zion National Park. The wilderness shares its 3-mile southern border with the park. The perennial stream of Deep Creek flows for approximately 4.8 miles through Deep Creek Wilderness. Approximately 1.2 miles of two tributaries to the North Fork of the Virgin River also flow through Deep Creek Wilderness. This extensive cover, availability of water, and a contiguous landscape of wildlands creates habitat for a wide variety of wildlife. Mule deer, elk, mountain lion, and bobcat are the larger animals that make a home here. A few of the smaller mammals include badgers, marmots, and ringtail cats. The remote canyons of the wilderness provide suitable nesting habitat for the Mexican spotted owl.

Canaan Mountain Wilderness is approximately 44,500 acres of public land adjacent to the southwest boundary of Zion National Park. The wilderness area encompasses a Navajo Sandstone mountain surrounded by 2,000-foot-high cliffs. The area has been sculpted by wind and water over time into a landscape of soaring cliff walls, natural arches, and slot canyons. On the highest plateaus, stands of ponderosa pine are surrounded by cream-colored slickrock. Pinyon pine, Utah juniper, scrub oak, and sagebrush cover the mountain slopes at lower elevations. Seeps in the canyon walls provide moisture for hanging gardens. Hawks, falcons, and golden eagles nest along the sandstone walls, while ringtail cats, deer, cougar, and black bear live on the plateaus and on the canyon bottoms. Shunes Creek begins in the wilderness area.

GENERAL MANAGEMENT AND USES

OHV and Mountain Bike Use: The Bureau of Land Management designated all lands they administer as open to off-highway vehicle use, open for use on existing roads and trails, open for use on designated roads and trails, or closed for use.

Fluid Mineral Leasing: Oil and gas potential is low throughout most of Washington County. Even with low potential, the Bureau of Land Management is required to manage for this use. To assist in the management of oil and gas leasing, the St. George Field Office Resource Management Plan identified fluid leasing categories to all lands managed by the Bureau of Land Management in Washington County. These leasing categories include: category 1 – open with standard stipulations; category 2 – open with special stipulations; category 3 – open with no surface occupancy stipulations; or category 4 – closed to fluid mineral leasing. By law all public lands within wilderness are closed to leasing.

The wild and scenic river segments on BLM lands are in category 2, 3, or 4. All of the segments within designated wilderness are closed to leasing (category 4). Special stipulations (category 2) could include timing of the activity to protect wildlife; requiring strategies and plans to mitigate impacts to fragile soils, surface or groundwater, etc. The no-surface occupancy (category 3) stipulation would protect scenic views, primitive recreation, wildlife, riparian areas, surface and underground water quality.

Locatable Minerals: Mining location under the General Mining Act of 1872 and other applicable regulations. Areas are either open, open with restrictions, open with a plan of operation, or withdrawn from mineral location (closed to mineral location subject to valid existing rights).

Mineral Materials: These are generally sand, gravel, or decorative rock gathering sites used by the public for a small fee. Areas are designated as open, restricted (protect bird nesting, etc.), or closed.

Rights-of-Way: Public lands in Washington County provide essential routes for a variety of rights-of-way including transportation routes, transmission lines, utilities, communication sites, and local access. Through the RMP, BLM lands in the county have been defined as open to new rights-of-way, avoidance areas that encourage alternate locations to reduce adverse impacts or land use impacts or closed to new rights-of-way (exclusion areas) to protect critical resources, scenic values, or designated wilderness.

RIVER SEGMENT-SPECIFIC MANAGEMENT

La Verkin Creek North of the Park and Middle Fork of Taylor Creek

Wilderness: Within the La Verkin Creek Wilderness and Taylor Creek Wilderness – except Willis Creek

OHV and Mountain Bike Use: Closed

Fluid Mineral Leasing: Closed

Locatable Minerals: Within wilderness-withdrawn and there are no existing valid existing rights; outside wilderness (Willis Creek) category 3 – no surface occupancy

Mineral Materials: Closed

Rights-of-Way: Exclusion Area

Livestock Grazing: The Middle Fork of Taylor Creek lies within the Cedar Mountain Allotment. La Verkin Creek forms the eastern boundary of the allotment. The allotment is composed of BLM, private, and state lands. The allotment is licensed for five cattle (20 AUMs) from 6/16 through 10/15. The majority of livestock grazing occurs on private lands. Livestock likely don't graze within the wild and scenic river boundary because of the steep-walled canyons.

La Verkin Creek and Smith Creek South of the Park

Wilderness: Entirely within Black Ridge Wilderness

OHV and Mountain Bike Use: Closed

Fluid Mineral Leasing Closed

Locatable Minerals: Withdrawn and there are no existing valid existing rights

Mineral Materials: Closed

Rights-of-Way: Exclusion Area

Livestock Grazing: La Verkin Creek and Smith Creek are within the Black Ridge Allotment. The term of the permit is effective through 5/31/2017. Historically the allotment was used for trailing livestock from the lower elevation to higher elevation in the spring and then back to the lower elevation in the fall. For years the route of the livestock trailing was along La Verkin Creek through Zion National Park. Cattle no longer trail through the park so the allotment has been in nonuse for almost 30 years.

Kolob Creek and Oak Creek

Wilderness: A portion of Kolob Creek is within the Deep Creek Wilderness, Oak Creek is not in wilderness

OHV and Mountain Bike Use: Closed
Fluid Mineral Leasing: within wilderness—Closed; outside wilderness—Category 3-no surface occupancy

Locatable Minerals: Within wilderness – withdrawn and there are no existing valid existing rights; outside wilderness-open with plan of operation

Mineral Materials: closed

Rights-of-Way: Within wilderness-exclusion area, outside wilderness-avoidance area

Livestock Grazing: Kolob Creek and Oak Creek form the western boundary of the West Deep Creek Allotment. The allotment is composed of BLM and private lands. The West Deep Creek Allotment is licensed for 200 cattle (310 AUMs) and has a season of use from 6/1 through 9/15. There are no range improvements within the wild and scenic river boundary.

The terms and conditions of the grazing permits state: Livestock use and management activities will be conducted in conformance with the Wild and Scenic Rivers Act to preserve the free-flowing, undeveloped condition, water quality, and the outstandingly remarkable values of Kolob Creek.

Deep Creek

Wilderness: Entirely within Deep Creek Wilderness

OHV and Mountain Bike Use: Closed

Fluid Mineral Leasing: Closed

Locatable Minerals: Withdrawn and there are no existing valid existing rights

Mineral Materials: Closed

Rights-of-Way: Exclusion Area

Livestock Grazing: Deep Creek forms the boundary between the West Deep Creek allotment and the East Deep Creek allotment. Both allotments are composed of BLM and private lands. The West Deep Creek allotment is licensed for 200 cattle (310 AUMs) and has a season of use from 6/1 through 9/15. The East Deep Creek Allotment is licensed for 45 cattle (203 AUMs) and has a season of use from 6/1-10/15. The majority of livestock grazing on the allotment takes place on private lands. There are no range improvements within the wild and scenic river boundary.

The terms and conditions of the grazing permits state: Livestock use and management activities will be conducted in conformance with the Wild and Scenic Rivers Act to preserve the free-flowing, undeveloped condition, water quality, and the outstandingly remarkable values of Deep Creek.

SOCIOECONOMICS

REGIONAL CONTEXT

Zion National Park and the St. George Field Office are within Washington and western Kane counties, Utah. Rockville and Springdale, both in Washington County, are the closest gateway communities to the park that provide visitor services for those entering the park through the South Entrance. Other Washington County communities that provide tourism-related services include Hurricane, La Verkin, Virgin, and St. George. St. George, with a population 73,000, is the largest community in Washington County, accounting for over 50% of the total county population. Although farther from Zion, the communities of Orderville, Kanab, and Glendale also provide visitor services to travelers using the East Entrance (in Kane County) to Zion National Park.

Zion National Park is one of the many destination parks in southern Utah and northern Arizona, far from the major population centers of the country. However, tens of thousands of U.S. and foreign visitors visit the park each year. Interstate 15 (I-15), which runs north to south, is the major highway connecting the southwestern corner of Utah to the rest of the nation. Via I-15, Zion National Park and the BLM river segments are 42 miles from St. George, and St. George is connected to Salt Lake City to the north and Las Vegas to the south. I-15 also intersects I-70 about 125 miles north of St. George, which in turn connects to Denver, Colorado, to the east. Access to the Kolob Canyons area of the park is directly off I-15. To get to the south entrance of the park, visitors take I-15 through St. George to Utah Route 9 and drive 42 miles to Springdale. To reach the east entrance of the park, visitors use Utah Routes 89 and 9 via Panguitch or Kanab.

POPULATION

With a 2010 population of 138,115, Washington County has been one of the fastest growing counties in Utah over the last two decades (State of Utah 2010). The mild climate, community facilities and services, and proximity to several national parks and other public lands offering a wide variety of outdoor recreation opportunities have all contributed to the areas growth (BEBR 2008). The counties in which the park and the St. George Field Office lie, include Washington, Iron, and Kane counties, are all projected to grow faster than the state of Utah as a whole. County population projections and growth rates are shown in table 12.

TABLE 12. ZION AREA COUNTIES—PROJECTED POPULATION GROWTH 2010–2060

County	2010	2020	2040	2060	Average Annual Growth Rate, 2010–2060
Iron County	50,601	68,315	110,257	168,383	2.4%
Kane County	6,893	8,746	12,034	17,276	1.9%
Washington County	168,078	279,864	559,670	860,378	3.3%
State of Utah	2,927,643	3,652,547	5,171,391	6,840,187	1.7%

Source: Utah Governor's Office of Planning and Budget (2008)

ECONOMY

The top four sectors of the Washington County economy are trades / transportation / utilities, education / health / social services, government, and leisure / hospitality, as shown in table 13. Much of the employment in the transportation sector is driven by a Wal-Mart Stores, Inc., distribution center, SkyWest Airlines, and Andrus Transportation. The major healthcare and education employers include IHC Hospital and Dixie State College of Utah.

Between 2004 and 2007, employment levels in Washington County increased by 25% (figure 20). More recently, however, local economic growth has been tempered by the national downturn in the housing market, which has hit Washington County harder than any other Utah county. Prior to the recent economic downturn, much of the county's employment growth was driven by construction, including residential construction. Between 2008 and 2010, employment in the construction sector was down 54%, which made a significant contribution to the county's overall 11% reduction in employment levels during this time period (State of Utah 2010).

Employment projections for Washington County indicate that education and health services are to remain the strongest industrial sectors, followed by construction, trades / transportation / utilities, leisure and hospitality, and government (figure 17).

TABLE 13. WASHINGTON COUNTY LABOR FORCE BY INDUSTRY

Industry	Number of Labor Force
Trades / Transportation/Utilities	11,360
Education / Health / Social Services	7,836
Government	7,080
Leisure / Hospitality	6,696
Construction	3,922
Profess / Business Services	3,503
Manufacturing	2,419
Financial Activities	1,967
Other Services	1,253
Information	746
Mining	213

Source: Utah Department of Workforce Services 2009

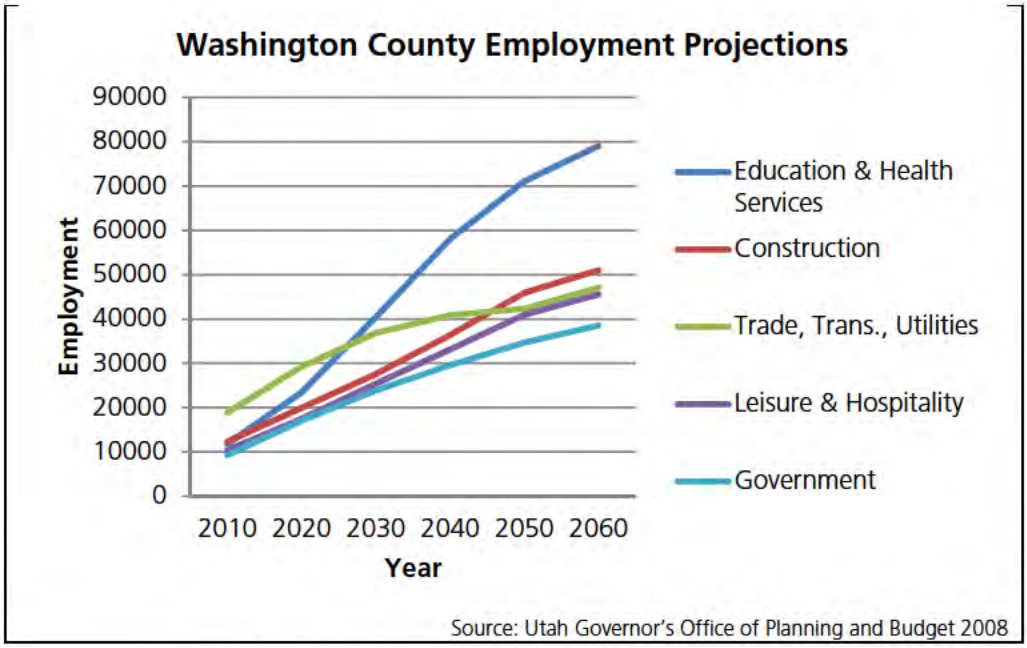


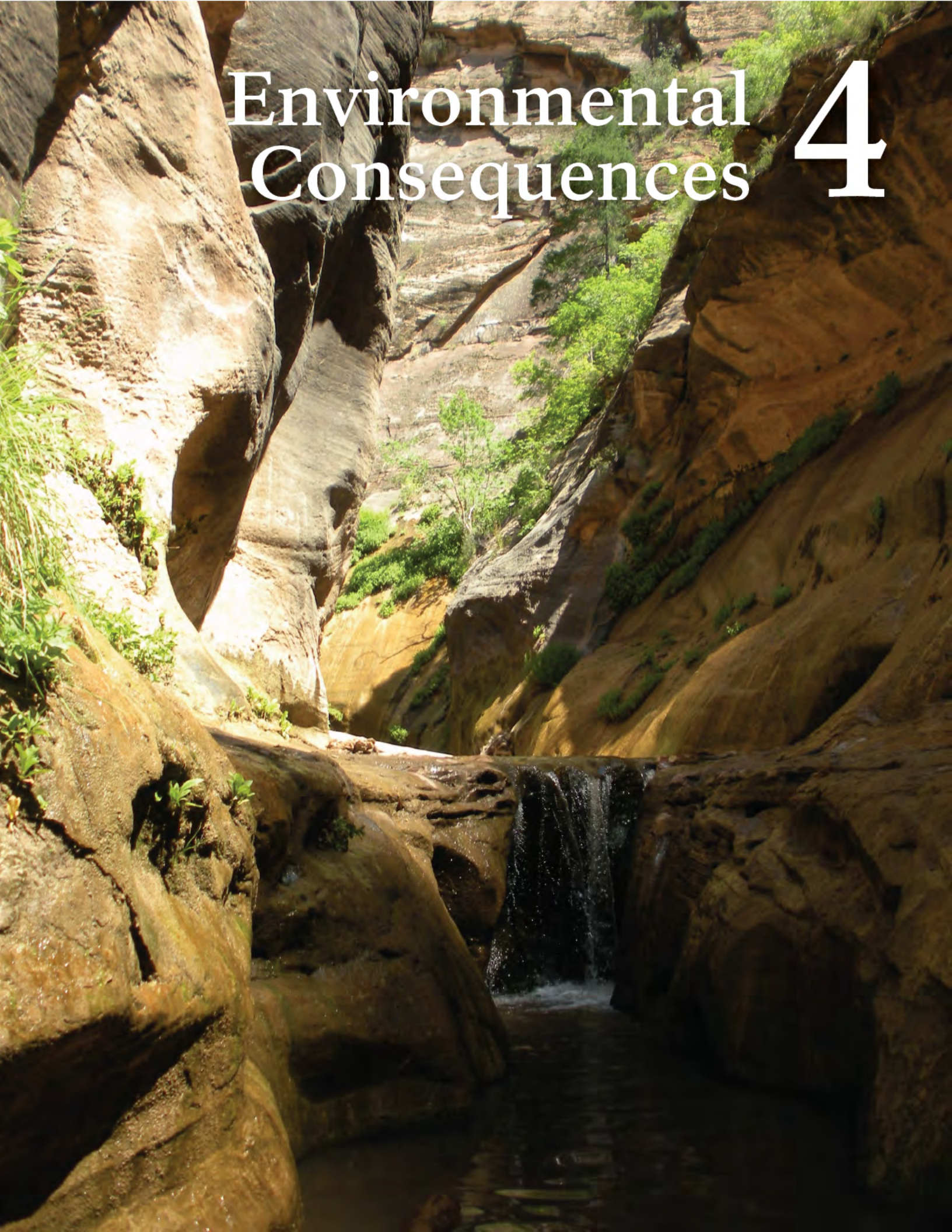
FIGURE 17. WASHINGTON COUNTY EMPLOYMENT PROJECTIONS

ECONOMIC EFFECT OF TOURISM AT ZION NATIONAL PARK

Zion National Park receives nearly 3 million visitors annually, and the local (Zion Canyon) economy is largely dependent on tourism. While the town of Springdale contains just under 300 residential units, there are over 700 rooms available for rent in addition to campsites and RV facilities. The other tourism-related businesses in Springdale include numerous souvenir shops, art galleries, and 20 restaurants.

Local area tourism resulted in spending of $123 million directly attributable to park visitors (Stynes 2011). The average visitor group from this study consisted of 2.7 people that spent $246 within a 1-hour drive of the park. Of the total spending, 35% was for lodging, 23% was for restaurant meals and bar expenses, 12% was for local transportation, 9% was for oil and gas, 6% was for groceries, and 13% was for souvenirs (Stynes 2008). Direct and secondary effects related to tourism-related spending attributable to park visitation creates about 2,100 jobs, with $53 million in labor income and $85 million in total value added to the local economy (Stynes 2011).

Environmental Consequences 4



INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. Herein, the proposed federal action would be the adoption of a comprehensive management plan for the designated wild and scenic Virgin River and its tributaries. The following analyzes the environmental impacts of implementing the three alternatives on natural resources, cultural resources, visitor experience, park and BLM operations, and socioeconomic environment. The analysis is the basis for comparing the beneficial and adverse effects of implementing the alternatives.

This environmental assessment should be considered a programmatic analysis. If and when site-specific developments or other actions are proposed for implementation subsequent to this comprehensive river management plan, appropriate detailed environmental and cultural compliance documentation would be prepared in accordance with NEPA and NHPA requirements.

Each alternative discussion also describes cumulative impacts and presents a conclusion. The impacts of each alternative are briefly summarized in table 5, at the end of "Chapter 2: Alternatives, Including the Preferred Alternative."

METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

The planning team based the impact analysis and the conclusions in this chapter largely on the review of existing literature and studies, information provided by experts in the National Park Service and other agencies and park and BLM staff insights and professional judgment. The team's method of analyzing impacts is further explained below. It is important to remember that all the impacts have been assessed assuming mitigating measures have been implemented to minimize or avoid impacts. If mitigating measures described in the "Alternatives Including the Preferred Alternative" chapter were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, presents an approach to identifying the duration (short- or long-term), type (adverse or beneficial), and intensity or magnitude (e.g., negligible, minor, moderate, or major) of the impact(s), and that approach has been used in this document. Direct and indirect effects caused by an action were considered in the analysis. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed from the place, but are still reasonably foreseeable.

The impact analysis for the action alternatives (alternatives B and C) compare the action alternatives to the no-action alternative (alternative A). Impacts of the action alternatives describe the *difference between* implementing the no-action alternative and implementing the action alternatives. To understand the whole picture of the impacts of implementing any of the action alternatives, the reader must also take into consideration the impacts that would occur under the no-action alternative.

As listed in "Chapter 3, Types and Levels of Development," past actions within the corridor include construction of transportation infrastructure such as roads, bridges, shuttle stops, and trails along with bank hardening to protect these items; visitor amenities including picnic areas, turnouts, trailheads, campgrounds, and interpretive areas; and administrative uses including entrance stations, maintenance, utility installations, housing, offices, and support. The level of development varies from almost no development on the wild segments of La Verkin Creek, North Creek, and the East and North Forks (above the Temple of Sinawava) of the Virgin River to more substantial development on the recreational segment of the North Fork Virgin River. These past actions and development are long-standing and, in some cases, historic. Some actions pre-date the creation of the park (including diversions resulting in water rights) and the majority of the remaining actions and development occurred prior to the WSR designation. There are also existing private operations and small diversions within and outside the park and BLM-managed lands. These past actions provide a portion of the baseline of the no-action alternative. The focus of the cumulative actions and analysis is on more recent and potential future actions inside and outside the corridor.

CUMULATIVE IMPACT ANALYSIS

A cumulative impact is described in CEQ regulation 1508.7 as follows:

> *Cumulative impacts* are incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions,

> regardless of what agency (federal or nonfederal) or person undertakes such other action. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

To determine which actions within the area may have cumulative impacts, the planning team identified projects and programs that have occurred in the past, are currently being implemented, or would likely be implemented over the next 20 years—the typical life of a comprehensive river management plan. Combined, these actions are referred to as the cumulative scenario. The area included is Washington County, Utah. Projects were identified by discussions with park staff, federal land managers, and representatives of county and town governments. Potential projects identified as cumulative actions included any planning or development activity that is currently being implemented or would be implemented in the reasonably foreseeable future. Impacts of past actions were also considered in the analysis.

Further, in this chapter these actions are evaluated in conjunction with the impacts of each alternative to determine if they have any cumulative effects on a particular resource. Because most of these cumulative actions are in the early planning stages, the qualitative evaluation of cumulative impacts was based on a general description of the project.

FUTURE IMPROVEMENTS TO INFRASTRUCTURE IN ZION NATIONAL PARK

Kolob Terrace Road Rehabilitation

The National Park Service is planning to rehabilitate approximately 9.8 miles of Kolob Terrace Road. The project area is within the North Creek drainage. Tributaries of North Creek near the project area include Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, and Little Creek. All of these segments have intermittent water flow during snowmelt and heavy rains.

The transport of sediment to Grapevine Wash, Wolf Springs Wash, Pine Spring Wash, Little Creek, or other ephemeral drainages is possible during construction, although soil and erosion control best management practices would be used to contain and control erosion. No measurable effects on water quality would occur because of the use of best management practices and because any sediment contributions to these mostly ephemeral streams would be negligible in relation to the supply of sediment and erosion naturally occurring in this watershed. The road is generally not close to these washes, and therefore, negligible amounts of soil movement are unlikely to reach the washes. There would be a negligible increase in impervious surfaces from widening the road by 2 to 4 feet in select locations and paving four turnouts. The removal and revegetation of approximately 16 gravel turnouts would result in a slight decrease in runoff. The proposed drainage improvements would better collect and dissipate runoff and reduce the potential for erosion and stream sedimentation.

Flanigan Diversion Dam

The National Park Service is planning to change the Flanigan diversion dam, irrigation pipes, and ditches to make pressurized irrigation possible. This change would involve constructing a new water intake in the existing concrete wall of the dam (next to the existing intake), new sluice structure adjacent to the intake, settling tank east of the bridge to Watchman housing, pump and filter station, holding tank in the storage area by Oak Creek, and pipelines connecting to these facilities. An environmental assessment for this project has been completed and a finding of no significant impact was signed in February 2012. Changes to this diversion would affect a small portion of the overall corridor on the North Fork Virgin River below the Temple. The section 7 analysis for

this project determined that the proposed action would not result in direct and adverse affects to river values. This is based on an analysis of the effects of the proposed action on the river's free-flowing condition, water quality, and the ORVs for the river segments potentially affected. Construction would begin when funding becomes available.

South Entrance Reconfiguration and Rehabilitation

The park is in the early stages of planning to reconfigure traffic flow into the park through the South Entrance and to rehabilitate the south campground. In 2011, approximately 620,600 vehicles entered the park through the South Entrance. During the busy season (April through October), an average of 67,400 vehicles per day enter the park through the South Entrance.

In this area, there is a need to adjust traffic patterns to relieve congestion, promote safety, and improve wayfinding for visitors. The conceptual South Entrance proposal includes moving the entrance stations, building a new bridge across the Virgin River to allow safe vehicle and pedestrian use, building two new parking areas, expanding two existing parking areas, and building new roads. These projects would require site-specific environmental impact analysis (environmental assessment or environmental impact statement). This would include WSRA section 7 determinations. The campground proposal includes building new restrooms, replacing underground electric, sewer, and water lines, and reconfiguring and rehabilitating individual campsites. The existing vehicle and pedestrian bridge over the Virgin River, which provides access to the Watchman Campground and the Zion Canyon Visitor Center, would either be demolished or modified. The planning for these projects is conceptual, so specific information on facility design and soil disturbance are unknown at this time.

Past Projects, Existing Infrastructure, and Ongoing Maintenance in Zion National Park

A substantial amount of infrastructure has been developed over the years in the park to support visitor use and park operations. These are most prevalent in Zion Canyon and along road corridors in Kolob Canyons, Kolob Terrace, and Zion-Mount Carmel Highway. The following list describes the major infrastructure components that are in place at this time. It is expected that the majority of these would undergo cyclic maintenance, repair, and replacement in kind, with an assessment of impacts conducted with each activity. A detailed GIS database of infrastructure within the corridor has been developed, but due to security concerns for water supply and other utility systems, this level of detail is not being provided as part of this plan.

All of the following infrastructure and associated actions occur within the boundary of the wild and scenic river:

- In 2005, the main road in Zion Canyon was rehabilitated, which included replacing the existing pavement, reconfiguring culverts and side ditches to improve drainage, and replacing curbing. In 2010, the Zion-Mount Carmel Highway was rehabilitated and repaved. Resurfacing the road extended the life of the pavement and improved vehicle traction; routine road maintenance would continue into the future.

- In the fall of 2010, an 85-kilowatt hour solar panel system was installed at park headquarters. This system provides energy to park headquarters, the Zion Human History Museum, and the emergency operations center.
- In the fall of 2010, new restrooms were constructed, campsites were rehabilitated and utilities were improved at Watchman Campground.

The project consisted of reconstructing and delineating 69 campsites with new site furnishings, resurfacing the road system, installing new irrigation lines, improving water and sewerlines, and revegetating.

- The park is currently working on a project to upgrade comfort stations in Watchman Campground, which includes removing four existing comfort stations and replacing them with three new comfort stations in more strategically accessible locations with a similar number of fixtures, stalls, and square footage.
- The Sand Bench Trail is used by a vendor who provides horseback riding under a concession contract. The nearby Emerald Pools area includes an office, corral, trails, and outhouse, while the Birch Creek area includes a corral, stables, trail, and housing.
- The park has three water storage tanks within the boundary of the Virgin River—Temple of Sinawava, The Grotto, and Birch Creek.
- Buried utilities in the wild and scenic river corridor include electric, telephone, cable, water, sewer, and propane. These utilities would continue to be maintained, repaired, and upgraded. They may also be relocated along with the removal of the river revetments.
- Foot bridges in the wild and scenic river corridor include:
  - West Rim Trail at The Grotto
  - Emerald Pools Trail
  - Echo Canyon / Weeping Rock
  - Birch Creek Trail to Sand Bench
  - Pa'rus Trail (3 bridges)
  - Watchman Campground entrance
  - East Rim Trail – bridge over Clear Creek
- Vehicle bridges and low water crossings in the wild and scenic river corridor crossings include:
  - North Fork Virgin River (3)—Canyon Junction, Watchman Housing, and Zion Canyon Visitor Center / Watchman
  - Pine Creek (3)—Pine Creek Bridge, east portal of the tunnel, and confluence with Clear Creek
  - Clear Creek (1)—Checkerboard Mesa
  - South Fork of Taylor Creek (1)—Kolob Canyons Scenic Drive
  - Oak Creek (5)—park headquarters, Oak Creek residential area, maintenance area, and dirt service road (two low water crossings)
  - Echo Canyon (1)—Zion Canyon Scenic Drive
- Revetments
  - There is currently 4,500 feet of armored levees between The Grotto and Birch Creek that are currently being allowed to deteriorate; active removal of these armored levees is proposed.
  - There is armoring along the Zion Canyon Scenic Drive between the Temple of Sinawava and Big Bend, downstream of Echo Canyon, at Sentinel Landslide, and at the visitors center and Watchman Campground. These armoring installments are planned for retention with cyclic maintenance, repair, and replacement. New installations will be required along this road in the vicinity of Zion Lodge when the riverside levees in this area are removed.
- Spring diversions and wells for administrative use

- Birch Creek (2 springs)
- North Fork Virgin River—Temple of Sinawava spring, upper and lower Grotto spring, Wylie Retreat spring
- Taylor Creek—Taylor Creek well
- Clear Creek—east entrance well

Bureau of Land Management Actions

The majority of the river segments on BLM-administered lands are within designated wilderness. Currently there are no developments along any of the designated river segments, and there are no proposals for developments along any of the segments.

Designated wilderness confers a high level of protection from human-caused impacts for the ORVs of these segments. Management of wilderness generally eliminates motorized and mechanized vehicle and equipment usage, lessening the potential for water quality impacts, soil erosion, vegetation loss, and impacts on riparian values. Developments, structures, and facilities cannot be authorized that would impair wilderness values, thereby protecting the naturalness, scenic qualities, cultural, and other resources of the river segments. Recreational, scenic, scientific, education, conservation, and historic uses must be conducted so as not to impair wilderness values. While livestock grazing may continue in designated wilderness on public lands, management actions must be conducted by the operators using nonmotorized and nonmechanized methods, unless specifically authorized through an approved wilderness management plan or on a case-by-case basis. These restrictions on land uses and activities will provide long-term protection of the river segments' ORVs.

Non-Federal Management Actions

The following actions are among those that could contribute to cumulative impacts:

Washington County

The Vision Dixie land use and transportation plan provides a single cohesive vision for growth within Washington County. While implementation of Vision Dixie is voluntarily accomplished by the individual communities within the county, it sets the stage for the development of a common and integrated land use and transportation strategy.

On the whole, the principles set forth in Vision Dixie include focusing growth toward existing city centers rather than outward into undeveloped portions of the county to help protect numerous outstandingly remarkable values associated with the Virgin River, both within and outside designated wild and scenic portions. The plan proposes a countywide commitment to the protection of signature landscapes that define the character of the area, including the Virgin River.

St. George Airport

In January 2011, the City of St. George opened a new regional airport about 30 miles southwest of the designated river. This facility replaced the airport that was at the top of a small mesa in the center of St. George. The new facility is at the outskirts of town and has a longer runway to accommodate larger aircraft. One commercial carrier (SkyWest) at the airport provides passenger flights out of St. George. SkyWest is a connector carrier for Delta and United and provides daily flights to Salt Lake City and one flight per day to Los Angeles (Sunday through Friday). The airport also supports general aviation and cargo services. This new airport has not seen a measurable increase in the volume and size of planes.

The long-term plan for airport development includes future roadways for connecting the airport directly with smaller adjacent towns, e.g., Washington City and Hurricane. Highway expansions and new interchanges—the major concept of the Dixie Beltway, an expressway loop designed to connect St. George and the surrounding cities to each other, and the new airport—are identified in the St. George comprehensive plan. New roadways such as Southern Parkway, currently under construction, would directly connect Washington City with the new airport. Increased tourism from the expanded airport would likely result in higher visitation levels within the county.

Water-related Resource Projects on Private Lands

Much of the Virgin River headwaters are privately owned. The majority of these parcels are upstream of the boundary of Zion National Park on most segments of the Virgin River. Land uses vary from rural residential to agricultural. Water-related resource projects include instream channel modifications for water withdrawals and bank stabilizations. Livestock grazing and riparian habitat modifications are also common. Although typically small in scale, the combined effects from these land and water uses could contribute to cumulative impacts on wild and scenic resources and values. The National Park Service and Bureau of Land Management would work with private landowners to encourage best practices to avoid undue adverse impacts. If the project involves federal assistance, then site-specific impact analysis and a section 7 determination would be conducted.

Virgin River Resource Management and Recovery Program

Zion National Park and the Bureau of Land Management are partners in the Virgin River Resource Management and Recovery Program for the recovery of federally listed fish and riparian bird species in the Virgin River basin. The federal listing of fish species does not pertain to the designated segments of the Virgin River, the listing pertains to the section of the Virgin River from the confluence of La Verkin Creek to Halfway Wash, which is southwest of the park boundary. Other partners include the U.S. Fish and Wildlife Service, Utah Department of Natural Resources, Nevada Department of Wildlife, Arizona Game and Fish Department, Washington County Water Conservancy District, and Dixie National Forest, each of which has specific statutory responsibilities with respect to the management and conservation of wildlife.

The goals of the Virgin River Resource Management and Recovery Program are to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity while ensuring that water development for human needs can continue. Ultimately, in the case of species presently on the endangered species list, achieving the goals would require a long-term commitment to determine the cause of population declines and find equitable solutions to problems. Species that are the focus of the program include (1) endangered species—woundfin (*Plagopterus argentissimus*), Virgin River chub (*Gila seminuda*), southwestern willow flycatcher (*Empidonax trailii extimus*); (2) species managed under conservation agreements to avoid federal listing—flannelmouth sucker (*Catostomus latipinnis*) and Virgin River spinedace (*Lepidomeda mollispinis mollispinis*); and state species of special concern—desert sucker (*Catostomus clarkii*). Of these, the Virgin River spinedace, flannelmouth sucker, and desert sucker are found in sustaining populations in Zion National Park.

Recovery activities conducted by the program include documenting the status of the species and their habitats, taking actions to protect habitats and to eliminate invasive nonnative species, supplementing depleted populations with captive-reared fish,

conducting research to determine habitat requirements and limiting factors, protecting streamflows, and providing public education regarding these species. Fish populations are monitored annually on the North and East Forks of the Virgin River in Zion National Park.

CULTURAL RESOURCES

SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT AND IMPACTS ON CULTURAL RESOURCES

In this environmental assessment, impacts on cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. In accordance with the Advisory Council on Historic Preservation (ACHP) regulations implementing section 106 of the National Historic Preservation Act (26 CFR 800, *Protection of Historic Properties*), impacts on historic properties were identified and evaluated by (1) determining the area of potential effects, (2) identifying cultural resources present in the area of potential effect that were either listed in or eligible to be listed in the National Register of Historic Places, (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the national register, and (4) considering ways to avoid, minimize, or mitigate adverse impacts. Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religio116
us and cultural importance to an

Indian tribe or Native Hawaiian organization and that meet the national register criteria

Under ACHP regulations, a determination of either adverse effect or no adverse effect must also be made for affected national register-eligible cultural resources. An adverse effect occurs when an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the national register (e.g., diminishing the integrity of the location, design, setting, materials, workmanship, feeling, or association of the resource). Adverse effects also include reasonable foreseeable effects caused by the action alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resources that qualify it for inclusion in the national register.

CEQ regulations and NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by section 106 is similarly reduced. Although adverse effects under section 106 may be mitigated, the effect remains adverse.

The actions of this plan will result in no historic properties affected, defined by section 106. Therefore, cultural resources have been dismissed from further analysis.

FREE-FLOWING CONDITION AND FLOODPLAINS

The impact assessment for free-flowing condition is focused on natural river processes and flooding potential and frequency. Data were derived from GIS mapping, hydraulic models of the Virgin River and tributaries near major park developments, and floodplain maps of major development areas. There are no major developments on the BLM-managed portions of the river. The *U.S. Water Resources Council Floodplain Management Guidelines* (NPS 1993) and the extent of alteration to natural river processes were used to define the intensity of impacts.

- **Negligible**—impacts would occur outside the regulatory floodplain as defined by the floodplain management guidelines (100- or 500-year floodplain, depending on the type of action) or no measurable or perceptible change in natural river processes or aquatic habitat would occur.
- **Minor**—actions within the regulatory floodplain would potentially interfere with or improve river processes or aquatic habitat in a limited way or in a localized area. Levee maintenance and streambank manipulations that would protect development areas from flooding are examples of actions that would result in minor, adverse impacts. Removing flood protection devices or small facilities would result in beneficial impacts.
- **Moderate**—actions within the regulatory floodplain would interfere with or enhance river processes or aquatic habitat in a substantial way or in a large area. Examples of adverse, moderate impacts would include substantial modification of streambanks to protect roads in multiple locations or to protect large developments. A finding of this level of impact would lead to a section 7 assessment.
- **Major**—an action would permanently alter or improve a floodplain or significantly alter or improve natural river processes or aquatic habitat. An example might include permanent hardening and/or relocation of a braided river channel that prevents the river from meandering over time. A finding of this level of impact would lead to a section 7 assessment.

Impacts of Implementing Alternative A

Analysis. Implementation of this alternative would likely not result in any new or changed impacts on the free-flowing condition or floodplains, although any new water resource projects would undergo a section 7 determination of impacts. Existing management strategies and activities involving water resources would continue. This means that all existing instream and riverbank structures would remain. Structures such as the historic levees and rock-filled gabions along the North Fork Virgin River would be maintained by the park and continue to adversely impact free-flowing condition and natural stream meandering, which in turn would adversely impact floodplains in that area by either inhibiting natural seasonal flooding to support riparian vegetation and wildlife or creating bottlenecks within the river system and causing excessive inundation of the floodplains. This would be a continuation of a long-term, minor, adverse impact on free-flowing condition and floodplains due to the continued existence and management of instream and riverbank structures affecting natural flows and floodplains. Natural flows and floodplains would be affected due to the

inhibition of natural seasonal flooding to support aquatic species habitat, riparian vegetation, and wildlife or causing excessive inundation of the floodplains.

Cumulative Impacts. Past actions such as the construction of weirs, water diversions, streambank hardening (e.g., riprapping), and berms or levees have altered the natural, free-flowing characteristic of several river segments. These structures and minor diversions are found primarily on the North Fork of the Virgin River above and below the Temple of Sinawava and their associated tributaries. Where these structures inhibit natural seasonal flooding, they adversely affect floodplains. Most of the designated segments have limited or no structures or diversions that impact free-flowing condition. When looking at the entire Virgin River wild and scenic river system, structures and diversions have caused a long-term, minor, adverse impact on free-flowing condition and floodplains.

Wilderness designation of the BLM lands adjacent to about 20 miles of wild and scenic river segments conferred permanent protection of these floodplains, eliminating the potential for developments and structures that might adversely affect river processes in a relatively large area. This would have a long-term, moderate beneficial impact on free-flowing condition and floodplains for these segments.

Present actions include withdrawal of water from the river system for domestic use, livestock watering, and irrigation of maintained landscapes and other vegetation. There is a dam and reservoir upstream from the designated segments as well. The potential future actions that could impact free-flowing condition and floodplains include improvements to Kolob Terrace Road, changes to the Flanigan diversion dam, the Virgin River Resource Management and Recovery Program, and the South Entrance Project. While improvements to Kolob Terrace Road may have localized, short-term, negligible, adverse impacts on hydrology and floodplains during construction, the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Further, changes to the Flanigan diversion dam would have minor beneficial impacts to water quality due to improved control of diversion on the North Fork Virgin River below the Temple of Sinawava. The Virgin River Resource Management and Recovery Program is a collaborative effort to protect riparian and fish species and includes protecting stream flows and therefore could have a minor beneficial impact on free-flowing condition. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to free flowing condition and floodplains on the North Fork Virgin River below the Temple cannot be determined at this time. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

This alternative would allow the continuation of these adverse and beneficial impacts on the designated river segments and when combined with other past, present, and future actions would result in a cumulative effect that is minor and adverse. This alternative would contribute a continuing slight increment to the overall cumulative effect.

Conclusion. Implementation of this alternative would result in continued minor and adverse effects on the free-flowing condition or floodplains. Existing instream and riverbank structures would remain and continue to adversely impact free-flowing condition and natural stream meandering, which in turn would adversely impact floodplains in that area. This would be a continuation of a long-term, minor, adverse impact on free-flowing condition and floodplains along some of the designated segments. The cumulative effect on free-flowing condition would be minor and adverse.

Impacts of Implementing Alternative B

Analysis. Under this alternative, the existing wire rock-filled gabions and earthen levees would be allowed to deteriorate along the North Fork Virgin River below the Temple of Sinawava. The eventual loss of these structures would result in a long-term, minor, beneficial effect on both free-flowing condition and floodplains as more natural stream dynamics (meandering and seasonal flooding) would return to this segment.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B, and would have the same effects on the Virgin River wild and scenic river system's free-flowing condition and floodplains. The potential future actions that could impact free-flow and floodplains include improvements to the Kolob Terrace Road, changes to the Flanigan diversion dam, and the Virgin River Resource Management and Recovery Program and the South Entrance Project. While improvements to Kolob Terrace Road may have localized short-term, minor, adverse impacts on hydrology and water quality during construction, the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Further, the changes to the Flanigan diversion dam will have minor beneficial impacts to water quality due to improved control of the water diversion on North Fork Virgin River below the Temple of Sinawava. The Virgin River Resource Management and Recovery Program is a collaborative effort to protect riparian and fish species and includes protecting stream flows and therefore could have a minor beneficial impact on free-flowing condition. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to free flowing condition and floodplains cannot be determined at this time. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

This alternative would allow the eventual reduction of some of the existing adverse impacts on a few designated river segments with the allowed deterioration of the existing wire rock-filled gabions and earthen levees and, when combined with other past, present, and future actions, would result in a cumulative effect that is minor and beneficial. This alternative would contribute an appreciable, beneficial increment to the overall cumulative effect.

Conclusion. Implementation of alternative B would result in the eventual loss of some gabions and levees in one segment resulting in long-term, minor, beneficial impacts on the free-flowing condition and floodplains. Implementing alternative B would protect and enhance the free-flowing condition of the designated river segments. The cumulative effect on free-flowing condition would be minor and beneficial.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. Under this alternative, the existing wire rock-filled gabions and earthen levees would be allowed to deteriorate along the North Fork Virgin River below the Temple of Sinawava. The eventual loss of these structures would result in a long-term, minor, beneficial effect on both free-flowing condition and floodplains as more natural stream dynamics (meandering and seasonal flooding) would return to this segment.

Cumulative Impacts. As previously noted, the majority of past actions are included in the baseline for the no-action alternative. The potential future actions that could impact free-flow and floodplains include improvements to Kolob Terrace Road, changes to the Flanigan diversion dam, the Virgin River Resource Management and Recovery Program, and the South Entrance Project. While improvements to Kolob Terrace Road may have localized short-term, minor, adverse

impacts on hydrology and water quality during construction, the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Further, the changes to the Flanigan diversion dam would have minor beneficial impacts to water quality due to improved control of the water diversion on North Fork Virgin River below the Temple of Sinawava. The Virgin River Resource Management and Recovery Program is a collaborative effort to protect riparian and fish species and includes protecting stream flows and therefore could have a minor beneficial impact on free-flowing condition. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to free-flowing condition and floodplains cannot be determined at this time. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

This alternative would allow the eventual reduction of some of the existing adverse impacts on a few designated river segments with the allowed deterioration of the existing wire rock-filled gabions and earthen levees and, when combined with other past, present, and future actions, would result in a cumulative effect that is minor and beneficial. This alternative would contribute an appreciable, beneficial increment to the overall cumulative effect.

Conclusion. Implementation of alternative C would result in the eventual loss of some gabions and levees in one segment resulting in long-term, minor, beneficial impacts on the free-flowing condition and floodplains. Implementing alternative C would protect and enhance the free-flowing condition of the designated river segments. The cumulative effect on free-flowing condition would be minor and beneficial.

WATER QUALITY

The relationship of pollution sources to existing water quality in the Virgin River and its tributaries has not been sufficiently studied and modeled to quantitatively assess impacts. In addition, potential impacts of actions comprising the alternatives for the most part cannot be defined relative to site-specific locations. Consequently, water quality impacts of the alternatives were assessed qualitatively.

- **Negligible**—an action would have no measurable or detectable effect on water quality or the timing or intensity of flows as they affect water quality.
- **Minor**—an action would have detectable effects on water quality or the timing or intensity of flows as they affect water quality. Water quality effects could include increased or decreased loads of sediment, debris, chemical or toxic substances, or pathogenic organisms.
- **Moderate**—an action would have clearly detectable effects on water quality or the timing or intensity of flows as they affect water quality and potentially would affect organisms or natural ecological processes. Alternatively, an impact would be visible to visitors.
- **Major**—an action would have substantial effects on water quality or the timing or intensity of flows as they affect water quality and potentially would affect organisms or natural ecological processes. Alternatively, an impact would be easily visible to visitors

Impacts of Implementing Alternative A

Analysis. Implementation of this alternative would not result in any new changes to the quality of water in the designated segments.

Existing management strategies and activities conducted by the National Park Service, the Bureau of Land Management, and other agencies to address water quality in the Virgin River and its tributaries would continue, as would livestock grazing on some areas upstream of the designated segments. Water quality on most segments is good (within state standards). On those segments where there is a problem, the National Park Service and Bureau of Land Management would work with adjacent landowners and permittees to address any deficiencies. Thus, this alternative would have a long-term, negligible, adverse effect on water quality.

Cumulative Impacts. Overall, water quality within the designated segments of the Virgin River is considered natural and high quality, and human actions have had minimal impact on water quality. The exception is the upper reaches of the North Fork Virgin River above the Temple of Sinawava. Here, past and present actions involving the raising of livestock and cultivation of crops upstream of the designated segments have resulted in the degradation of water quality within this segment. Livestock excrement is deposited or washed into streams and contaminates the water with *E. coli* and other pathogens. Runoff water from cultivated fields often contains fertilizer, pesticides, and other pollutants when it returns to the streams. Nutrients introduced from these actions also adversely affect water quality and the organisms living in it, resulting in minor, adverse impacts to water quality in these segments.

Another effect on water quality that has become a recent concern is human excrement. Because there are no restrooms along the narrow slot canyons, which are popular visitor destinations, human waste is deposited on the ground out of the water. When a flood occurs, this waste is carried downstream, adding a short-term, minor, adverse impact on water quality.

The potential future actions that could impact water quality include improvements to Kolob Terrace Road and the South Entrance Project. Improvements to Kolob Terrace Road may have localized short-term, minor, adverse impacts on water quality during construction, but the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to water quality on the North Fork Virgin River below the Temple of Sinawava cannot be determined at this time, but would most likely be short term for the duration of construction. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

The minor, adverse impacts of this alternative, in conjunction with the effects of other actions on water quality, would result in a minor, adverse, cumulative effect to water quality.

Conclusion. Implementation of this alternative would continue to have a long-term, negligible, adverse effect on water quality. There would be a long-term, minor, adverse, cumulative effect on water quality.

Impacts of Implementing Alternative B

Analysis. Under this alternative, park and Bureau of Land Management staff would consult with adjacent permit holders and landowners to work on methods of reducing the impact of livestock and agricultural operations on water quality. In addition, the park and Bureau of Land Management would implement a visitor use management program and Leave No Trace principles, which are methods of monitoring and reducing the impact of humans on the backcountry throughout the river corridor. The effect of implementing these actions would be a long-term, minor, beneficial impact on the water quality ORV in the designated segments due to greater protection and maintenance of water quality.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B, and would have the same effects on water quality of segments of the Virgin River wild and scenic river system. The potential future actions that could impact water quality include improvements to Kolob Terrace Road and the South Entrance Project. Improvements to Kolob Terrace Road may have localized short-term, minor, adverse impacts on water quality during construction, but the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to water quality on the North Fork Virgin River below the Temple of Sinawava cannot be determined at this time, but would most likely be short-term for the duration of construction. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

The minor, beneficial impacts of this alternative, in conjunction with the effects of other actions on water quality, would result in a minor, beneficial, cumulative effect to water quality. Implementing alternative B would contribute a modest increment to the overall cumulative effects.

Conclusion. Implementing alternative B would result in a long-term, minor, beneficial impact on water quality due to changes in operations and enhanced partnerships with adjacent landowners. Implementing alternative B would protect and enhance the water quality of the designated river segments. The cumulative effect would be minor and beneficial.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. Under this alternative, park and BLM staff would consult with adjacent permit holders and landowners to work on methods of reducing the impact of livestock and agricultural operations on water quality. In addition, the park and Bureau of Land Management would implement a visitor use management program and Leave No Trace principles, which are methods of monitoring and reducing the impact of humans on the backcountry throughout the river corridor. The effect of implementing these actions would be a long-term, minor, beneficial impact on water quality in the designated segments due to greater protection and maintenance of water quality.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative C, and would have the same effects on water quality of segments of the Virgin River wild and scenic river system. The potential future actions that could impact water quality include improvements to Kolob Terrace Road and the South Entrance Project. Improvements to Kolob Terrace Road may have localized, short-term, minor, adverse impacts on water quality during construction, but the long-term effect on the North Creek drainage would be slightly beneficial because of improvements in drainage and the condition of the road surface. Since the future South Entrance Reconfiguration and Rehabilitation Project is only conceptual, the potential impacts to water quality on the North Fork Virgin River below the Temple of Sinawava cannot be determined at this time, but would most likely be short-term for the duration of construction. It should be noted that this project would be required to complete a section 7 WSRA analysis and appropriate mitigation, if needed.

The minor, beneficial impacts of this alternative, in conjunction with the effects of

other actions, would result in a minor, beneficial cumulative effect to water quality. Implementing alternative C would contribute a modest increment to the overall cumulative effects.

Conclusion. Implementing alternative C would result in a long-term, minor, beneficial impact on water quality due to changes in operations and enhanced partnerships with adjacent landowners. Implementing alternative C would protect and enhance the water quality of the designated river segments. The cumulative effect on water quality would be minor and beneficial.

ECOLOGICAL PROCESSES ORV (INCLUDING VEGETATION)

Impacts were assessed qualitatively. Information on site-specific areas and on specific resources, such as hanging gardens, was obtained from existing studies and documents, such as park and BLM resource management plan, and results of site-specific surveys were used. For impacts to timing or intensity of stream flows, see the water quality section.

- **Negligible**—the impact on vegetation communities would not be measurable. The abundance or distribution of individuals would not be affected or would be slightly affected. Ecological processes and biological productivity would not be affected.
- **Minor**—an action would not necessarily decrease or increase the area's overall biological productivity. An action would affect the abundance or distribution of individuals in a localized area, but would not affect the viability of local or regional populations or communities.
- **Moderate**—an action would result in a change in overall biological productivity in a small area. An action would affect a local community sufficiently to cause a change in abundance or distribution, but it would not affect the viability of the regional population or communities. Changes to ecological processes would be limited.
- **Major**—an action would result in a substantial change to overall biological productivity in a relatively large area. An action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the communities would not be likely to return to their former level (adverse) or would return to a sustainable level (beneficial). Significant ecological processes would be altered.

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, existing resource management activities and strategies would continue; including eliminating nonnative plant species within the riparian areas. This alternative would have no new effect on ecological processes ORV along the designated segments, but there would continue to be long-term, negligible beneficial effects from [actions].

Cumulative Impacts. There have been many actions that have affected natural ecological processes, including increased levels of visitor use and park development. Changes to natural water quantity and timing or water quality also have affected many aspects of ecological processes. These past actions result in long-term, minor to moderate, adverse impacts.

Wilderness designation of the BLM lands adjacent to about 20 miles of wild and scenic river segments conferred permanent protection of soils, vegetation communities, and ecological processes for these segments, eliminating the potential for developments and structures and generally eliminating

motorized vehicle and equipment usage that might adversely affect these resources. (However, wilderness designation did not affect livestock grazing on BLM lands, which as noted previously, has adversely affected water quality.) This would have a long-term, moderate beneficial impact on vegetation and ecological processes for these segments.

Present actions that affect river-related ecology include restoration of previously disturbed areas and ongoing control of nonnative species. These actions result in both short- and long-term, minor, beneficial impacts.

The National Park Service and the Bureau of Land Management are continuously working to improve its resource management and visitor use management. Reasonably foreseeable future actions could include more effective means of nonnative species control or less impacting types of visitor use, as described in the Broad Based Management Strategies for alternative A. These actions include controlling tamarisk and Russian olive to promote native riparian vegetation; continuing to implement seasonal visitor use closures for nesting peregrine falcons; and monitoring native fish populations and responding to threats to those populations some of which are part of the Virgin River Resource Management and Recovery Program. The goals of the Virgin River Resource Management and Recovery Program are to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity while ensuring that water development for human needs can continue. Actions in this program that benefit the ecological processes ORV include researching habitat requirements and limiting factors, protecting streamflows, and educating the public about these species and their needs. These actions are expected to result in short- and long-term, minor, beneficial impacts on ecological process and other resources. The effects of other past, present, and future actions would be both adverse and beneficial, but on the whole minor adverse.

Implementing alternative A would contribute a small increment to the overall cumulative effects.

Conclusion. Implementation of this alternative would have a long-term, negligible, beneficial effect on ecological processes and vegetation. There would be a long-term, minor, adverse, cumulative effect on ecological processes.

Impacts of Implementing Alternative B

Analysis. If implemented, several actions in alternative B would affect the ecological processes ORV throughout the river corridor by limiting access to hanging gardens and supporting natural cottonwood and riparian recruitment. The park and Bureau of Land Management would implement a visitor use management program and Leave No Trace principles, which are methods of monitoring and reducing the environmental impact of humans on the backcountry. The effect of implementing these actions would be a long-term, minor to moderate, beneficial impact on aquatic ecosystems and vegetation in the designated segments.

Further, natural flooding would occur when the gabions and levees deteriorate along the North Fork Virgin River below the Temple of Sinawava. This would be a long-term, moderate, beneficial impact on the cottonwood gallery, which relies on seasonal flooding to propagate.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B and would have the same effects on natural ecological processes of the Virgin River wild and scenic river system. In particular, the National Park Service and the Bureau of Land Management, along with other partners, are collaborating on the Virgin River Resource Management and Recovery Program. The goals of the Virgin River Resource Management and

Recovery Program are to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity while ensuring that water development for human needs can continue. Actions in this program that benefit the ecological processes ORV include researching habitat requirements and limiting factors, protecting streamflows and educating the public about these species and their needs. The result of the program would be short- and long-term, minor, beneficial impacts on ecological process and other resources.

The long-term, minor to moderate, beneficial impacts of this alternative, in conjunction with the effects of other actions on ecological processes, would result in short- and long-term, minor to moderate, beneficial, cumulative effect to ecological processes and vegetation.

Conclusion. Implementing alternative B would result in a short- and long-term, moderate, beneficial impacts on ecological processes and vegetation from various resource protection and enhancement programs. The cumulative effect on the ecological processes ORV would be short- and long-term, minor to moderate, and beneficial. Implementing alternative B would protect and enhance the ecological processes ORV.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. If implemented, some actions in alternative C would affect ecological processes ORV throughout the river corridor, including limiting access to hanging gardens and supporting natural cottonwood and riparian recruitment. The National Park Service and Bureau of Land Management would implement a visitor use management program and Leave No Trace principles, which are methods of monitoring and reducing the environmental impact of humans on the backcountry. The effect of implementing these actions would be a long-term, minor to moderate, beneficial impact on aquatic ecosystems and vegetation in the designated segments. Ecological processes is an ORV.

Further, natural flooding would be allowed to occur when the gabions and levees along the North Fork Virgin River below the Temple of Sinawava deteriorate. This would be a long-term, moderate, beneficial impact on the cottonwood gallery, which relies on seasonal flooding to propagate.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative C and would have the same effects on natural ecological processes of the Virgin River wild and scenic river system. In particular, the National Park Service and the Bureau of Land Management, along with other partners, are collaborating on the Virgin River Resource Management and Recovery Program. The goals of the Virgin River Resource Management and Recovery Program are to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity while ensuring that water development for human needs can continue. Actions in this program that benefit the ecological processes ORV include researching habitat requirements and limiting factors, protecting streamflows, and educating the public about these species and their needs. The result of the program would be short- and long-term, minor, beneficial impacts on ecological processes and other resources.

The long-term, minor to moderate, beneficial impacts of this alternative, in conjunction with the effects of other actions on ecological processes, would result in short- and long-term, minor to moderate, beneficial, cumulative effects to ecological processes and vegetation.

Conclusion. Implementing alternative C would result in short- and long-term, moderate, beneficial impacts on ecological

processes and vegetation from various resource protection and enhancement programs. The cumulative effect on the ecological processes ORV would be short and long term, minor to moderate, and beneficial. Implementing alternative C would protect and enhance this ORV.

FISH ORV

Impacts on fish are closely related to the impacts on water quality, water quantity, and aquatic habitat. The evaluation considered whether actions would be likely to displace some or all individuals of a species in the corridor or would result in loss or creation of habitat conditions needed for the viability of local or regional populations. Impacts associated with fish might include any change in nesting/egg laying areas, food supply, protective cover, or distribution or abundance of species. For impacts to timing or intensity of stream flows, see the water quality section.

- **Negligible**—the impact would not be measurable on individuals, and the local populations would not be affected.
- **Minor**—an action would affect the abundance or distribution of individuals in a localized area, but would not affect the viability of local or regional populations.
- **Moderate**—an action would affect a local population sufficiently to cause a minor change in abundance or distribution, but would not affect the viability of the regional population.
- **Major**—an action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse) or would return to a sustainable level (beneficial).

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, existing fish management activities and strategies in and around Zion National Park and adjacent BLM-managed lands would continue. The current volume of water diversions would continue and existing rock gabions and other structures would remain within the bed and banks of the river. This alternative would continue to have a minor beneficial effect on fish communities in the designated segments. Fish is an ORV for the Virgin River.

Cumulative Impacts. In the past, there have been many actions that have affected natural fish and fish habitat, including increased levels of visitor use and park development. Changes to natural water quantity and timing or water quality also have affected many aquatic species. Small dams, weirs, and diversions in the streams have affected the movement of fish species and changed the timing and duration of high flows. Changes in land use such as livestock grazing, crop irrigation, and withdrawal of water for domestic and commercial use have also caused adverse impacts on aquatic habitat through the introduction of chemical and biological pollutants. These past actions result in long-term, minor to moderate, adverse impacts.

Wilderness designation of the BLM lands adjacent to approximately 20 miles of wild and scenic river segments conferred permanent protection of fish habitat and communities for these segments, eliminating the potential for developments and structures and generally eliminating motorized vehicle and equipment usage that might adversely affect these resources. (However, wilderness designation did not affect livestock grazing on BLM lands, which as noted previously has adversely affected water quality, which in turn affects fish.) This would have a long-term, moderate, beneficial impact on fish communities for these segments.

Present actions that affect fish include the ongoing control of nonnative species and recovery activities for listed species. In particular, the collaborative Virgin River Resource Management and Recovery Program has goals to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity. Actions in this program that benefit the Fish ORV include researching habitat requirements and limiting factors, protecting streamflows and educating the public about these species and their needs. These actions would result in improved fish habitat and healthy populations and have both short and long-term, minor to moderate, beneficial impacts.

When combined with the minor beneficial impacts of implementing this alternative, there would be long-term, beneficial, and adverse effects on fish, but on the whole, minor beneficial effects. Implementing alternative A would contribute a small effect to overall cumulative effects.

Conclusion. Implementing alternative A would have minor beneficial effects on native fish, including in the designated river segments. Therefore, there would continue to be long-term, minor, beneficial, cumulative effects on the fish ORV.

Impacts of Implementing Alternative B

Analysis. Park and BLM staff would consult with adjacent permit holders and landowners to collaborate on methods of reducing the impact of livestock grazing and agricultural operations on water quality. Efforts to improve water quality would have a long-term, minor, beneficial impact on fish populations.

The eventual deterioration of gabions and levees along the North Fork Virgin River below the Temple of Sinawava would reduce channelization of the river and allow natural river habitat features (runs, riffles, pools) to develop. This would be a long-term, minor, beneficial impact on native fish, which is an ORV.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B and would have the same effects on fish and their habitats in the Virgin River wild and scenic river system. In particular, the collaborative Virgin River Resource Management and Recovery Program has goals to ensure that populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity. Actions in this program that benefit the Fish ORV include researching habitat requirements and limiting factors, protecting stream flows, and educating the public about these species and their needs. These actions would result in improved fish habitat and healthy populations and have both short- and long-term, minor to moderate, beneficial impacts.

When combined with the minor, beneficial impacts of this alternative, there would be a long-term, minor to moderate, beneficial, cumulative effect on native fish. This alternative would contribute a minimal effect to overall cumulative effects.

Conclusion. Implementing alternative B would have long-term, minor, beneficial impacts on native fish in the designated river segments due to improvements in habitat and would protect and enhance this ORV. For the native fish ORV, there would be a long-term, minor to moderate, beneficial, cumulative effect.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. Park and BLM staff would consult with adjacent permit holders and landowners to work on methods of reducing the impact of livestock grazing and agricultural operations on water quality. If effective, efforts to

improve water quality would have a long-term, minor, beneficial impact on fish populations.

The eventual deterioration of gabions and levees along the North Fork Virgin River below the Temple of Sinawava would reduce channelization of the river and allow natural river habitat features (runs, riffles, pools) to develop. This would be a long-term, minor, beneficial impact on native fish, which is an ORV.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B, and would have the same effects on fish and their habitats in the Virgin River wild and scenic river system. In particular, the collaborative Virgin River Resource Management and Recovery Program has goals to ensure that the populations of fish and bird species native to the Virgin River basin continue to be present and stable in perpetuity. Actions in this program that benefit the Fish ORV include researching habitat requirements and limiting factors, protecting stream flows and educating the public about these species and their needs. These actions would result in improved fish habitat and healthy populations and have both short- and long-term, beneficial impacts.

When combined with the minor, beneficial impacts of this alternative, there would be a minor to moderate, beneficial, cumulative effect on native fish. This alternative would contribute a minimal effect to the overall cumulative effects.

Conclusion. Implementing alternative C would have a long-term, minor, beneficial impact on native fish in the designated river segments due to improvements in habitat and would protect and enhance this ORV. There would be a long-term, minor to moderate, beneficial, cumulative effect on the ORV of native fish.

WILDLIFE ORV (INCLUDING THREATENED AND ENDANGERED SPECIES)

Impacts on wildlife are closely related to the impacts on habitat. The evaluation considered whether actions would be likely to displace some or all individuals of a species in the park and adjacent BLM-managed lands or would result in loss or creation of habitat conditions needed for the viability of local or regional populations. Impacts associated with wildlife might include any change in roosting or foraging areas, food supply, protective cover, or distribution or abundance of species.

- **Negligible**—the impact would not be measurable on individuals, and the local populations would not be affected.
- **Minor**—an action would affect the abundance or distribution of individuals in a localized area but would not affect the viability of local or regional populations.
- **Moderate**—an action would affect a local population sufficiently to cause a minor change in abundance or distribution, but would not affect the viability of the regional population.
- **Major**—an action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse) or would return to a sustainable level (beneficial).

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, existing wildlife and threatened and endangered species management activities and strategies in and around Zion National Park and adjacent BLM-managed lands would continue. Interagency efforts to recover

federally listed and state-listed species would also continue. This alternative would continue to have a minor beneficial effect on wildlife and threatened and endangered species communities in the designated segments. Wildlife was found to be an ORV for the Virgin River.

Cumulative Impacts. There have been many actions that have affected wildlife and threatened and endangered species and their habitats within the park and adjacent BLM lands, including increased levels of visitor use and park development. Park development (roads, trails, buildings) has fragmented habitat and disrupted natural wildlife movement. Concentrated human presence has been increasing in Zion Canyon (North Fork Virgin River) and has displaced individuals and resulted in the direct loss of individuals (vehicle-animal collisions). These past actions resulted in long-term, minor, adverse impacts.

Wilderness designation of the BLM lands adjacent to about 20 miles of wild and scenic river segments conferred permanent protection of wildlife and threatened and endangered species habitat and populations for these segments, eliminating the potential for developments and structures and generally eliminating motorized vehicle and equipment usage that might adversely affect these resources. This would have a long-term, moderate beneficial impact on wildlife populations and habitats for these segments.

Present actions that affect wildlife and threatened and endangered species include the ongoing control of nonnative species and recovery activities for listed species. Further, there are seasonal closures to protect nesting areas for Mexican spotted owls and recreational access closure for East Fork Virgin River protects critical lambing grounds for desert bighorn sheep. These actions are intended to promote healthy and sustainable populations of native wildlife and threatened and endangered species and result in both short- and long-term, minor to moderate, beneficial impacts.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor, beneficial, cumulative effects on native wildlife and threatened and endangered species.

Conclusion. Implementing alternative A would have minor beneficial effect on native wildlife and threatened and endangered species and their habitats, including federally listed species. There would be long-term, minor, beneficial, cumulative effects on native wildlife and threatened and endangered species, which is an ORV.

Impacts of Implementing Alternative B

Analysis. Implementing this alternative would have very little effect on wildlife and threatened and endangered species populations and habitat. There would be a minimum of new ground- disturbance. Employing best management practices and general resource management efforts such as the control of nonnative plants and animals and the restoration of habitat would continue to have a long-term, minor, beneficial impact on wildlife and threatened and endangered species which are outstandingly remarkable values.

The implementation of adaptive visitor use management strategies including Leave No Trace principles could have a long-term, minor, beneficial effect on wildlife and threatened and endangered species as the impacts of humans in the backcountry are reduced.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B, and would have the same effects on wildlife and listed species and their habitats in the Virgin River wild and scenic river system. Actions listed in the

cumulative scenario would have negligible impacts on wildlife and threatened and endangered species populations and habitat.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor, beneficial, cumulative effects on native wildlife and threatened and endangered species.

Conclusion. Implementing alternative B would have long-term, minor, beneficial impacts on native wildlife and threatened and endangered species from various protection programs. The cumulative effects would be long-term, minor, and beneficial. Implementing this alternative would protect and enhance the wildlife ORV.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. Implementing this alternative would have very little effect on wildlife and threatened and endangered species populations and their habitats. General resource management efforts such as the control of nonnative plants and animals and the restoration of habitat would continue to have a long-term, minor, beneficial impact on wildlife and threatened and endangered species, species including species that are listed as the ORV.

The implementation of adaptive visitor use management strategies including Leave No Trace principles could have a long-term, minor, beneficial effect on wildlife and threatened and endangered species as the impacts of humans in the backcountry are reduced.

Cumulative Impacts. The same past and present actions described in alternative A would occur in alternative B, and would have the same effects on wildlife and listed species and their habitats in the Virgin River wild and scenic river system. Actions listed in the cumulative scenario would have negligible impacts on wildlife and threatened and endangered species populations and habitat.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor, beneficial, cumulative effects on native wildlife and threatened and endangered species.

Conclusion. Implementing alternative C would have long-term, minor, beneficial impacts on native wildlife and threatened and endangered species from various protection programs. The cumulative effects would be long-term, minor, and beneficial. Implementing this alternative would protect and enhance the wildlife ORV.

SCENIC ORV / VISUAL RESOURCES / VIEWSHEDS

Scenic values were found to be an ORV for the Virgin River. The scenic value, visual resources and viewsheds are inter-related and will be addressed as one impact topic. The impact intensity of a development on a visual resource, scenic value, or viewshed depends on the type of development, where it is, and what mitigation is applied. For example, a development in the foreground of a viewshed has a much larger impact than the same development 3 miles farther away. Mitigation could involve unobtrusive design or colors. To determine the level of impact a proposed development would have, all three factors are evaluated together.

For the purposes of this analysis, a *viewshed* is defined as the landscape seen from key observation points identified in the "Affected Environment" chapter of this plan. The *foreground* is defined as that part of the viewshed from the observation point to the first horizon / line of sight (e.g., ridgetop) or a line 2 miles away, whichever is closer. *Middle ground* is defined as that part of the viewshed 2 miles to 5 miles from the observation point. The *background* is everything more than 5 miles from the observation point.

Assessments of potential impacts on visual resource, scenic value and viewsheds were based on comparisons between the no-action alternative and the action alternative. The following intensity definitions were used:

- **Negligible**—the action would not detract from existing natural views; proposed development in the foreground, middle ground, or background would be essentially unnoticeable.
- **Minor**—the action would be noticeable to some observers, but would not detract from natural views. There could be small changes to existing form, line, texture, or color in the background.
- **Moderate**—the action would be noticeable to most observers and may detract from natural views in a limited portion of a viewshed. There could be modest changes to existing form, line, texture, or color in the middle ground or background.
- **Major**—the action would be immediately noticeable and would detract from the natural setting in most of a viewshed. It would result in large changes to existing form, line, texture, or color in the foreground, middle ground, or background; or portions of the natural viewscape would be obstructed.

Impacts of Implementing Alternative A

Analysis. The Virgin River corridor offers stunning visual experiences, and the visual resources are one of the most important aspects of visiting this area. The visual resources within the corridor provide long-term, moderate, beneficial effects for visitors. While each of the river segments offers unique viewing opportunities, there is currently no formal guidance for protecting the scenic viewshed within the corridor. Under alternative A, the visual scenery of the corridor would continue to be managed without guidelines. Because of this, there is potential for continued and future impacts to the visual resources of this area. Current impacts include social trails and vehicle parking alongside roadways in some areas; some of these have caused vegetation impacts that have been found to negatively impact the aesthetics of an area. If continued, these actions could cause long-term, minor, adverse

effects to the visual resources ORV within the corridor.

Cumulative Impacts. The Virgin River corridor offers stunning visual experiences that provide long-term, moderate, beneficial effects for visitors. However, the lack of formal guidance for protecting the scenic viewshed within the corridor may jeopardize the protection of these resources in the future. Under alternative A, the visual scenery of the corridor would continue to be managed without guidelines. There is a possibility that the visual environment would incur long-term, minor, adverse impacts in the future under alternative A.

Increased population and developments outside of the corridor may increase light pollution, which could produce long-term, minor, adverse impacts to the night sky experience. The National Park Service is considering site improvements at the South Entrance, adjacent to the North Fork Virgin River. This potential project involves redesigning vehicle and pedestrian traffic adjacent to the visitor center and within the Watchman Campground area. The improvements would likely enhance the visual resources within this segment by improving resources conditions to a more natural state. Short-term, this project would have visual impacts from machinery and construction processes that would likely result in moderate, adverse impacts to the visual resources within this location. Overall, this action would likely result in long-term, moderate, beneficial effects on the visual environment within this river segment, but long-term, minor, beneficial effects for the overall river corridor.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole minor beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor beneficial effects on the scenic ORV.

Conclusion. Implementing Alternative A would result in long-term, minor, adverse impacts to the visual resources found within the river corridor due to lack of formal guidance for protecting the scenic viewshed. There would be a long-term, minor, beneficial cumulative impact.

Impacts of Implementing Alternative B

Analysis. Under alternative B, the visual scenery of the corridor would be managed based on the scenery conservation best practices, which should reduce the potential for continued and future impacts to the visual resources of this area. Further, implementing adaptive management to lessen visitor impacts such as social trails will reduce visual impacts. This would have a long-term, minor to moderate, beneficial effect on visual resources. Other actions that could be taken as part of this plan include revegetation of excess visitor-created trails and formalizing of a few trails, and supporting natural recruitment of the cottonwood gallery along portions of the Virgin River, which would have overall long-term, minor, beneficial impacts to visual resources.

Cumulative Impacts. From the cumulative scenario, regional development and the potential changes to the South Entrance and Watchman Campground area could affect the visual experience.

Increased population and developments outside of the corridor may increase light pollution, which could produce long-term, minor, adverse impacts to the night sky viewshed. The National Park Service is considering site improvements at the South Entrance, adjacent to the North Fork Virgin River. This potential project involves redesigning vehicle and pedestrian traffic adjacent to the visitor center and within the Watchman Campground area. The improvements would likely enhance the visual resources within this segment by improving resource conditions to a more natural state. Short-term, this project would have visual impacts from machinery and construction processes that would likely result in moderate,

adverse impacts to the visual resources within this location. Overall, this action would likely result in long-term, moderate, beneficial effects on the visual environment within this river segment.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole minor beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor beneficial effects on the scenic ORV.

Conclusion. Alternative B would result in long-term, minor, beneficial impacts to the visual resources found within the river corridor as a result of the scenery conservation best practices protecting the scenic viewshed and limiting new construction within the corridor. There would be a long-term, minor, beneficial cumulative impact.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Analysis. Under alternative C, the visual scenery of the corridor would be managed based on the scenery conservation best practices, which should reduce the potential for continued and future impacts to the visual resources of this area. Further, implementing adaptive management to lessen visitor impacts such as social trails would reduce visual impacts. This would have a long-term, minor to moderate, beneficial effect on visual resources. Other actions that could be taken as part of this plan include revegetation of excess visitor-created trails and formalizing of a few trails, and supporting natural recruitment of the cottonwood gallery along portions of the Virgin River, which would have overall long-term, minor, beneficial impacts to visual resources.

Cumulative Impacts. From the cumulative scenario, regional development and the potential changes to the South Entrance and Watchman Campground area could affect the visual experience.

Increased population and developments outside the corridor may increase light pollution, which could produce long-term, minor, adverse impacts to the night sky viewshed. The National Park Service is considering site improvements at the South Entrance, adjacent to the North Fork Virgin River. This potential project involves redesigning vehicle and pedestrian traffic adjacent to the visitor center and within the Watchman Campground area. The improvements would likely enhance the visual resources within this segment by improving resource conditions to a more natural state. Short-term, this project would have visual impacts from machinery and construction processes that would likely result in moderate, adverse impacts to the visual resources within this location. Overall, this action would likely result in long-term, moderate, beneficial effects on the visual environment within this river segment.

The effects of past, present, and future actions would be both adverse and beneficial, but on the whole minor beneficial. Because this alternative would have a small contribution to these other effects, there would be long-term, minor beneficial effects on the scenic ORV.

Conclusion. Alternative C would result in long-term, minor, beneficial impacts to the visual resources found within the river corridor as a result of the scenery conservation best practices protecting the scenic viewshed and limiting new construction within the corridor. There would be a long-term, minor, beneficial cumulative impact.

RECREATIONAL ORV / RIVER-RELATED VISITOR USE AND EXPERIENCE

This section describes the effect of alternatives A, B, and C on the recreational ORV including river-related visitor use and experiences on the Virgin River and its tributaries that have recreational ORVs. This section also describes the effect of alternatives A, B, and C on river-related visitor use and experiences for segments that do not have recreational ORVs. For an overview of the segments that have recreational ORVs, please review table 2. The analysis is based on the best professional judgment of Zion National Park and BLM staff, NPS planners, and research results from other specialists.

The following impact thresholds have been developed for analyzing the effects of the alternatives on the recreational value including river-related visitor use and experiences. The intensity refers to the significance or degree of the impact on the recreational ORV, including river-related visitor use and experiences. The impact intensities are measured as negligible, minor, moderate, and major. To provide a metric for quantifying the intensity of the impacts, the definitions for the impact intensity and thresholds are as follows:

- **Negligible**—most visitors would likely be unaware of any effects associated with implementation of the alternative.
- **Minor**—changes in visitor opportunities and/or setting conditions would be slight but detectable, would affect a few visitors, and would not appreciably limit or enhance experiences identified as critical for appreciation of the recreational outstandingly remarkable value.
- **Moderate**—changes in visitor opportunities and/or setting conditions would be noticeable, would affect many visitors, and would result in some changes to experiences identified as critical for appreciation of the recreational outstandingly remarkable value.
- **Major**—changes in visitor opportunities and/or setting conditions would be highly apparent, would affect most visitors, and would result in several changes to experiences identified as critical for appreciation of the recreational outstandingly remarkable value.

Duration of an impact is defined as follows:

- **Short-term** – impacts would last less than three years
- **Long-term** – impacts would persist for three or more years, or may be permanent

Impacts on recreational ORV and river-related visitor use and experiences within the Virgin River corridor were determined through an assessment of changes in access and opportunities to river uses, as well as the character of visitor experience while recreating in the river corridors. These were addressed by evaluating the following visitor uses and associated experiences, where most relevant:

ACCESS AND OPPORTUNITIES

This topic includes impacts on the recreational ORV and river-related access and the types of recreational opportunities that can be experienced within the wild and scenic river boundaries, which can include activities such as camping, bicycling, scenic driving, hiking, canyoneering, boating, climbing, backpacking, horseback riding, photography, wildlife viewing and bird-watching, and other activities conducted either privately or through concessioner services.

QUALITY OF EXPERIENCE

This topic includes impacts on characteristics associated with the recreational ORV and river-related visitor experience within the wild and scenic river boundaries and consists of elements pertaining to perceived crowding, satisfaction with facilities and services, trail and campsite condition, and opportunities to experience solitude and natural quiet.

INTERPRETATION AND EDUCATION

This topic includes impacts on the recreational ORV and opportunities for visitors to experience river-related interpretation and education within the wild and scenic river boundaries, as related to river values and other important topics.

SAFETY

This topic includes impacts on river-related visitor safety within the wild and scenic river boundaries. Issues such as rock climbing, flow limits, and human waste management would be discussed under this category.

Impacts of Implementing Alternative A

Analysis. Visitor use management would continue according to other park plans, NPS management policies, and the Wild and Scenic Rivers Act. Key differences in alternative management strategies and adaptive management strategies are segment and tributary specific. Therefore, the impact analysis has been organized by segments and their associated tributaries. Additionally, site-specific issues are noted for high use areas when it is necessary to differentiate impacts occurring in localized areas on a river segment or tributary.

Taylor Creek

Under alternative A, education and interpretation would continue without specific focus on river values, leading to long-term, negligible, adverse impacts on visitor understanding of river values. Adaptive management strategies for maintaining wilderness character would continue, yet would not be specific to the protection of river values. Using adaptive management strategies from the backcountry management plan, levels of use would be managed on the North Fork of Taylor Creek and the South Fork of Taylor Creek. Current use is low on these segments. However, extensive crowding on the Middle Fork of Taylor Creek has resulted in exceeded crowding-based standards. Therefore, use levels would be decreased by adaptively reducing the Taylor Creek parking lot size to bring crowding issues back into standard. This reduction in use would cause short-term, moderate, adverse impacts on visitor access in the Taylor Creek area. However, these changes would ultimately lead to long-term, moderate, beneficial impacts for all visitors because the quality of river-related visitor experience would be improved through reduced crowding and increased opportunities to experience solitude.

La Verkin Creek

Under alternative A, use limits (permits) would continue to be used for overnight use only. Unlike the action alternatives, day use limits based on indicators and standards would not be considered under alternative A. Permits would continue to be required for overnight use only, and day use would be managed based on indicators and standards that are protective of wilderness values, but special consideration would not be given to the protection of river values. Day use standards for encounter rates are currently being exceeded on La Verkin Creek. Therefore, adaptively managing use according to wilderness standards would result in long-term, negligible to minor, beneficial impacts on the quality of river-related visitor experience for La Verkin Creek once

encounter rates are brought back into standard.

North Creek

Under alternative A, the level of recreational activity would be monitored under the guidance of the backcountry management plan, and there would not be additional focus on the protection river values. Using adaptive management strategies, current use levels would be maintained for all tributaries of the North Creek segment. Where current use limits and standards are protective of wilderness values, there would be no adjustments to the kinds and amounts of use. Additional adjustments would not be made for protection of river values. Maintaining current direction for visitor use management would lead to long-term, negligible, beneficial impacts on river-related visitor experience on North Creek due to the high quality conditions that are maintained with the direction of the backcountry management plan.

North Fork Virgin River above the Temple of Sinawava

Under alternative A, visitor use management would continue according to other park plans, NPS management policies, and the Wild and Scenic Rivers Act. Existing flow limits would be carried forward from the Superintendent's Compendium. Adaptive management strategies from the backcountry management plan would be carried forward for segments that overlap with wilderness zones to maintain consistency in monitoring and management efforts across plans, but would not be specific to the protection of river values. Because many tributaries for this segment are in wilderness zones and have use limits, which are managed through the permitting system, current use levels would be maintained where guidance from the backcountry management plan exists. On those tributaries, maintaining current kinds and amounts of use would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access and there would be long-term, negligible to minor, beneficial impacts on the quality of river-related visitor experience for visitors to pristine tributaries on this segment due to the high quality conditions that are maintained according to the backcountry management plan.

The Narrows. Unlike other tributaries on the North Fork Virgin River above the Temple of Sinawava, the main segment of the North Fork Virgin River above the temple and below Orderville Canyon is in a frontcountry zone and receives extensive use. This section of the river includes the riverside walk and extends 1.5 miles up the canyon into the popular area The Narrows. Impacts caused by visitors in this area include crowding, inappropriate disposal of human waste, trail widening, visitor-created trails, and noise. Based on results from the Manning et al. (2003) study and NPS (2011) staff efforts to cross-test this methodology, it is clear that visitors have opinions about when management action should occur to reduce crowding (limit use) and therefore improve the quality of visitor experience. Findings showed that 24 people at one time was the average visitor-based standard for when management action should occur. The 2011 monitoring results showed that current use was an average of 36 people at one time, indicating that use levels were exceeding the crowding-based standards for The Narrows during peak season. Because crowding in the frontcountry area has not been addressed in other planning efforts, crowding issues are not addressed under alternative A. There would continue to be no limitation on visitor access to The Narrows during peak times even if trends in visitation continue to increase, which could lead to increased crowding, congestion, human waste impacts, trail impacts, and noise impacts. The lack of management strategies to address crowding under alternative A would continue to result in long-term, moderate, adverse impacts on the quality of river-related visitor experience in The Narrows, as related to crowding during peak season. Education and outreach methods would not be tailored to improve disposal of human waste or for education of outstandingly remarkable values,

resulting in long-term, moderate, adverse impacts on opportunities for specific interpretation and education on The Narrows.

North Fork Virgin River below the Temple of Sinawava

Because the segments on the North Fork Virgin River below the temple have diversity in both the kinds and amounts of use, this section has been organized for segment-, tributary-, and site-specific impacts where appropriate.

Low Use Areas in the Wilderness. Under alternative A, visitor use management would continue according to other park plans, NPS management policies, and the Wild and Scenic Rivers Act. Adaptive management strategies from the backcountry management plan would be carried forward for segments that overlap with wilderness zones to maintain consistency in monitoring and management efforts across plans, but would not be specific to the protection of river values. Because these tributaries are in wilderness zones and have use limits, which are managed through the permitting system, current use levels would be maintained where guidance from the backcountry management plan exists. On those tributaries, maintaining current kinds and amounts of use would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access, and managing levels of use would result in long-term, negligible to minor, beneficial impacts on the quality of river-related visitor experience for visitors to pristine and primitive tributaries on this segment due to the high quality conditions that are maintained according to the backcountry management plan. Other important strategies in low use areas include closing canyons during critical wildlife periods (i.e., nesting, breeding, migration) and education. Closing areas for protection of wildlife would result in short-term, negligible, adverse impacts on access, yet would expand visitor knowledge of the importance of wildlife habitat protection. Continued education would result in long-term, negligible, beneficial impacts on opportunities for education and interpretation.

Low Use Area in the Frontcountry. Birch Creek provides access to the park water supply and climbing routes, and observations indicate that use is low on this tributary. Impacts from visitor use on this segment include climbing bolts, visitor-created hiking trails, and human waste. However, issues with visitor-created trails are of lower magnitude on Birch Creek than impacts near Emerald Pools on the Heaps Canyon tributary. Alternative A would not call for changes in visitor use management strategies, and there would be no changes in access to the area. A lack of trail management strategies could result in continued long-term, minor, adverse impacts on the quality of the hiking experience in this area due to the presence of visitor-created trail and human waste.

Moderate Use in the Frontcountry. Pine Creek and Clear Creek both receive moderate levels of use. Possible concerns for the Pine Creek tributary include disturbing wildlife, crowding, and using visitor-created trails below the Canyon Overlook Trail. Concerns for the Clear Creek tributary are associated with its close proximity to the road and visitor-created trails. Alternative A would not call for changes in visitor use management strategies, there would be no changes in access to the area, and education would not focus on river values. Therefore, the lack of specific visitor use management strategies could lead to long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience due to possible crowding and continued use of visitor-created trails below the Canyon Overlook Trail section.

Main Segment North Fork Virgin River below the Temple of Sinawava

Under alternative A, visitor use management would continue according to other park plans, NPS management policies, and the Wild and Scenic Rivers Act. Under alternative A, no changes would be made pertaining to the evaluation of permit renewal for the horseback riding concession. Impacts on this area include visitor-created trails and human waste near shuttle stops, in-river disturbance, horse waste issues, horse trail damage, and facility impacts based on high visitation. Under alternative A, there would be no new visitor use management strategies to deal with these impacts. Therefore, there would be long-term, minor, adverse impacts on opportunities for interpretation and education due to the lack of outreach pertaining to visitor expectations and awareness of crowding conditions during high use times. There would also be long-term, minor to moderate, adverse impacts on the quality of experiences for visitors exploring this area due to continued crowding levels during peak season and improper disposal of human and stock waste.

Heaps Canyon including Emerald Pools. The Heaps Canyon tributary is in a frontcountry zone and encompasses the Upper and Lower Emerald Pools, which receive extensive use. Impacts caused by visitors in this area include crowding, improper disposal of human waste, and visitor-created trails. Visitor-created trails are an important issue of concern in this tributary. For example, on the Emerald Pools (Heaps Canyon) trails from the bridge to the Upper pools, which is 1.5 miles of paved and unpaved trails, 68 visitor-created trails have been counted. This is approximately 34 visitor-created trails per trail mile or four times that of what the park deems acceptable in wilderness transition zones. In general, backcountry visitors seek trails that do not show a lot of recreation-related impacts; in fact, opportunities to avoid such conditions were rated as "very important" or "important" by 71.4% (nonpermitted) and 77.8% (permitted) of day users survey respondents and by 80.3% of permitted overnight users (Manning et al. 2003). Because of these issues, in 2011, the management team conducted staff observations and trail counts and compared results to similar segment findings from the Manning et al. (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for when management action should be taken to prevent crowding issues. Findings showed that current levels of use are above the visitor-based standard (Manning et al. 2003). Bringing these rates down to an acceptable level would require a 15% reduction in encounter rates for visitors hiking to the Upper and Lower Emerald Pools. This would mean decreasing use for hikers to the lower pools from an average of 135 encountered in 20 minutes to 115 encountered. Encounter rates would also need to be reduced from an average of 95 encountered in 30 minutes to 81 encountered at the upper pools. Under alternative A, there would be no new visitor use management strategies implemented to deal with these issues, leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on these trails due to continued crowding and congestion and excessive visitor-created trails in the area. Lack of outreach to inform visitors about river values would also lead to long-term, moderate, adverse impacts on visitor opportunities for interpretation and education on river values, including geologic and wildlife values.

Echo Canyon including Weeping Rock. The Echo Canyon tributary is in a frontcountry zone and encompasses the Weeping Rock area, which receives extensive use. To assess impacts for this area, this analysis specifically focuses on the short trail that goes to Weeping Rock and does not refer to the longer trail that extends to Observation Point. Impacts caused by visitors in this area include crowding and visitor-created trails. In 2011, the management team made staff observations and trail counts and compared

them to the findings from Manning et al. (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for acceptability of crowding. In 2011, an average of 69 people were encountered in 10 minutes on the way to Weeping Rock and 33 were encountered in 50 minutes for East Rim through Echo Canyon. Results from the 2011 trail counts indicated that use levels were still within the management action threshold reported in the 2003 Manning et al. research. However, use levels were higher than the visitor-based standard for acceptability. Although there are not current impacts associated with crowding at this location, alternative A would offer no new visitor use management strategies to deal with future issues, leading to long-term, negligible to moderate, adverse impacts on the quality of river-related visitor experience on these trails due to possible crowding and congestion and increased visitor-created trails in the area. Lack of outreach to inform visitors about river values would also lead to long-term, negligible to moderate, adverse impacts due to limited visitor opportunities for interpretation and education on river values, including geologic and wildlife values.

East Fork Virgin River

Under alternative A, the East Fork Virgin River segment would continue to be closed to recreational access to protect sensitive wildlife breeding grounds and habitat. Additionally, no new interpretive efforts would occur in this area. Because alternative A would provide limited interpretive opportunities for East Creek and no recreational access, there would be long-term, minor, adverse impacts on opportunities for interpretation and long-term, minor, adverse impacts on visitor opportunities to access the East Fork Virgin River segment.

In summary, under alternative A there would continue to be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. The adaptive management strategies set forth in the backcountry management plan would be protective of river values by default, thereby allowing for high quality river-related visitor experience on the low use segments of the Virgin River that are within wilderness boundaries. In contrast, the lack of management strategies to address crowding under alternative A would continue to result in long-term, moderate, adverse impacts on visitor experience in the high use frontcountry areas during peak season.

Cumulative Impacts. Past, present, or reasonably foreseeable actions may affect the recreational ORV / river-related visitor use and experiences in the Virgin River corridor.

Cumulative impacts that have caused or could cause **adverse impacts** on the overall recreational ORV / river-related visitor experience includes:

- adverse impacts on visitor access due to the removal of 16 gravel turnouts on Kolob Terrace Road within the North Creek drainage
- adverse impacts on the quality of river-related visitor experience due to noise from the St. George airport
- adverse impacts on the quality of river-related visitor experience due to possible increase in visitation from the St. George airport, which could lead to higher demand for use on the Virgin River segments that are already experiencing crowding during peak times
- adverse impacts on the quality of river-related visitor experience and safety due to livestock grazing leading to decreased water quality on the Virgin River segments, which are downstream from livestock waste

Cumulative impacts that have caused or could cause **beneficial impacts** on the overall

recreational ORV / river-related visitor experience including:

- beneficial impacts on the quality of river-related visitor experience due to rehabilitation of Kolob Terrace Road and improved driving conditions
- beneficial impacts on the quality of river-related visitor experience and safety due to reconfiguration of traffic flow through the south entrance to relieve traffic congestion, promote safety, and improve visitor wayfinding
- beneficial impacts on the quality of river-related visitor experience at the Watchman Campground due to facility improvements
- beneficial impacts on traffic flow and driving experiences due to a variety of past and ongoing projects that require cyclic maintenance.

There would be adverse impacts on river-related visitor experience due to the reduction of parking on Kolob Terrace Road, noise from the St. George airport, higher demand for use from the St. George airport, and the effects of livestock grazing on visitors using the Virgin River. There would be beneficial impacts on river-related visitor experience due to enhanced driving experiences on Kolob Terrace Road, improved traffic flow at the south entrance, facility improvements at Watchman Campground, and ongoing visitor improvement projects throughout the park. Overall, there would be long-term, moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative A are added to the effects of higher demand for use from the St. George Airport. In particular, The Narrows and Emerald Pools are already experiencing unacceptable levels of crowding, and there is no room for increased use in these areas during peak visitation times. Overall, there would be long-term, negligible to minor, beneficial impacts on river-related visitor experience when the impacts from alternative A are added to the effects of improved entrance, road, and campground conditions throughout the Virgin River corridor.

Conclusion. Under alternative A, there would continue to be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. The adaptive management strategies set forth in the backcountry management plan would be protective of river values by default, thereby allowing a high quality river-related visitor experience on the low use segments of the Virgin River that are within wilderness boundaries. In contrast, the lack of management strategies to address crowding under alternative A would continue to result in long-term, moderate, adverse impacts on river-related visitor experience in the high use frontcountry areas during peak season.

Overall, there would be long-term, moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative A are added to the effects of higher demand for use from the St. George airport. In particular, The Narrows and Emerald Pools are experiencing unacceptable levels of crowding, and there is no room for increased use in these areas during peak visitation times. Overall, there would be long-term, negligible to minor, beneficial impacts on river-related visitor experience when the impacts from alternative A are added to the effects of improved entrance, road, and campground conditions throughout the Virgin River corridor.

Impacts of Implementing Alternative B

Visitor use management would focus on protecting natural processes. Key differences in alternative management strategies and adaptive management strategies are segment and tributary specific. Therefore, the impact analysis has been organized by segments and

their associated tributaries. Additionally, site-specific issues are noted for high use areas when it is necessary to differentiate impacts occurring in localized areas on a river segment or tributary.

It should be noted that there are preexisting crowding related impacts in some localized frontcountry areas that are adversely impacting river values (including the recreational value). This plan notes adaptive management strategies that could be used to protect and enhance river values and improve those conditions. However, determining numeric capacities for frontcountry segments of the river will continue to require additional discussion and investigation. The frontcountry transportation and visitor study underway in 2013 will provide further guidance on managing visitor capacity in the frontcountry. In the meantime, guidance from the general management plan and this plan would be followed to direct management of the kinds and amounts of use. This plan notes the spectrum of river-related uses and experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, to viewing scenery or camping, to opportunities to experience serenity, solitude, and general enjoyment along the river corridor. The general management plan also provides direction for the types of experiences that visitors can expect in different areas of the park. As noted in the general management plan, in the frontcountry, the recreational experience would be highly social with frequent interaction among visitors and between visitors and park staff. However, crowding levels would not keep visitors from reaching their desired destination or viewing outstanding park features. There may be opportunities for visitors to experience solitude at certain times of the day, especially during the off-peak season. Upcoming transportation and capacity research efforts will lead to a higher level of certainty about current use and impacts in the frontcountry and transitions zones (and related issues in the backcountry), allowing for a higher level of certainty for management decisions about visitor capacity in those zones (see appendix E).

Taylor Creek

Under alternative B, education and interpretation would be focused on personal connections to natural resources. Expanded focus on natural resources interpretation would lead to long-term, minor, beneficial impacts on river-related visitor experience and increased understanding of river values specific to Taylor Creek, including geologic and wildlife values. Day use limits (permits) based on indicators and standards would be considered. Under the adaptive management strategy, levels of use would be managed on the North Fork of Taylor Creek and the South Fork of Taylor Creek. Current use is low on these segments. However, extensive crowding on the Middle Fork of Taylor Creek has resulted in exceeded crowding-based standards. Therefore, use levels would be decreased by adaptively reducing the Taylor Creek parking lot size to bring crowding back into standard. This reduction in use would cause short-term, moderate, adverse impacts on visitor access in the Taylor Creek area. Additionally, use routes may be constructed into the North and South Forks of Taylor Creek to disperse use and allow additional recreational opportunities. These changes would ultimately lead to long-term, moderate, beneficial impacts for all visitors because the quality of visitor experience would be improved through reduced crowding and increased opportunities to experience solitude.

La Verkin Creek

Under alternative B, day use limits (permits) based on indicators and standards would be considered. Using adaptive management strategies, current use levels would be maintained for all tributary segments on La Verkin Creek. Permits would continue to be required for overnight use only, and day use would be managed based on indicators and standards that are protective of both wilderness and river values. Therefore,

adaptively managing use according to wilderness standards would result in long-term, negligible to moderate, beneficial impacts on the quality of river-related visitor experience for La Verkin Creek once encounter rates are brought back into standard.

North Creek

Under alternative B, the level of recreational activity would be monitored to ensure river values are not negatively impacted and would be adjusted as needed. Using adaptive management strategies, current use levels would be maintained for most tributaries of the North Creek segment. Where current use limits and standards are protective of river values, there would be no need for adjustments. Left Fork of North Creek and Russell Gulch are most likely to reach crowding-based standards for this segment, and decreased use levels would be necessary to ensure continued opportunities for solitude, challenging experiences of canyoneering, and self-reliant recreation. Reducing use on these tributaries would lead to long-term, minor, adverse impacts on a few visitors unable to access these tributaries during peak times. However, the quality of a river-related visitor experience would be enhanced, leading to long-term, moderate, beneficial impacts for all visitors in this area.

North Fork Virgin River above the Temple of Sinawava

Under alternative B, a formalized approval process would be initiated to establish flow limits for boating and would lead to long-term, moderate, beneficial impacts on safety for visitors recreating on the North Fork Virgin River above the Temple of Sinawava. Using adaptive management strategies, standards would be protective of all river values and would be carried forward from the backcountry management plan for segments that overlap with wilderness zones to ensure consistency in monitoring and management efforts across plans. Because many tributaries for this segment are in wilderness zones and already have use limits, which are managed through the permitting system, current use levels would be maintained for most tributaries. On those tributaries, maintaining current kinds and amounts of use would allow continued protection of outstandingly remarkable values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access and there would be long-term, negligible to moderate, beneficial impacts on the quality of river-related visitor experience for visitors to pristine tributaries on this segment due to the high quality conditions that would be maintained with the direction of the backcountry management plan.

The Narrows. Unlike other tributaries on the North Fork Virgin River above the Temple of Sinawava, the main segment of the North Fork above the temple and below Orderville Canyon is in a frontcountry zone and receives extensive use. This section of the river includes the riverside walk and extends 1.5 miles up the canyon into the popular area The Narrows. Impacts caused by visitors in this area include crowding, inappropriate disposal of human waste, trail widening, visitor-created trails, and noise. However, crowding was the most limiting factor for developing standards that are protective of river values. Based on results from the Manning et al. (2003) study and NPS (2011) staff efforts to cross-test this methodology, it is clear that visitors have opinions about when management action should occur to reduce crowding (limit use) and therefore improve the quality of visitor experience. Findings showed that an average of 24 people at one time was the visitor-based standard for when management action should occur. The 2011 monitoring results showed that current use levels were an average of 36 people at one time; indicating that use levels were exceeding the crowding-based standards for The Narrows during peak season. Adaptive management strategies for alternative B include decreasing use in The Narrows to improve the overall quality of visitor experience in this area. Other adaptive management strategies include adjustments to the shuttle schedule to disperse use, tour bus

limitations, increased education on expectations, increased staff presence and contact stations, signs on shuttle bus to aid visitor understanding of how to properly dispose of waste, and recommendations or requirements to carry waste disposal bags while hiking in this area. See table 6 for adaptive management strategies. If trends in visitation continue to increase, there would be long-term, minor to moderate, adverse impacts on visitor access to this area during peak times because use levels would be decreased. However, adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of river-related visitor experience for visitors exploring this area due to proper waste disposal and a reduction in crowding levels during peak season.

North Fork Virgin River below the Temple of Sinawava

Because each segment on the North Fork Virgin River below the temple has diversity in both the kinds and amounts of use, this section has been organized for segment-, tributary-, and site-specific impacts where appropriate.

Low Use Areas in the Wilderness. Using adaptive management strategies under alterative B, standards would be protective of all river values and would be carried forward from the backcountry management plan for segments that overlap with wilderness zones to ensure consistency in monitoring and management efforts across plans. Because some of the tributaries for this segment are in wilderness zones and have use limits, which are managed through the permitting system, current use levels would be maintained for those tributaries. Maintaining current kinds and amounts of use would allow continued protection of river values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access and managing levels of use would result in long-term, negligible, beneficial impacts on the quality of visitor experience for visitors to pristine and primitive tributaries on this segment. Other important strategies in low use areas include closing canyons during critical wildlife periods (i.e., nesting, breeding, migration), reducing group size where necessary, reducing encounter rates where needed, and education on river values. Closing areas for protection of wildlife would result in short-term, negligible, adverse impacts on access, yet would expand visitor knowledge of the importance of wildlife habitat protection. Enhanced education on river values, including wildlife, would result in long-term, minor, beneficial impacts on opportunities for education and interpretation. Managing group size would be based on encounter rate standards set forth in the backcountry management plan to protect and enhance visitor experience and would result in long-term, moderate, beneficial impacts on the quality of visitor experience.

Low Use Area in the Frontcountry. Birch Creek provides access to the park water supply and climbing routes, and observations indicate that use is low on this tributary. Impacts from visitor use on this segment include climbing bolts, visitor-created hiking trails, and human waste. The most limiting factor for considering the appropriate amount of use the area could sustain is visitor-created trails. However, it should be noted that issues with visitor-created trails are of lower magnitude on Birch Creek than impacts near Emerald Pools on the Heaps Canyon tributary. Adaptive management strategies under alternative B include a moderate increase in use to help disperse use from Heaps Canyon. Therefore, a standard of 20 people encountered per day was established for this segment and is considered to be protective of river values. Other adaptive management strategies include adding erosion-control devices, improving routes, building new trails, and eliminating excess visitor-created trails. Slightly increased amounts of use for this segment would result in long-term, minor, beneficial impacts on

access and opportunities for visitors who are unable to obtain access to other areas of the park during high use times. Improved trail conditions would also lead to long-term, moderate, beneficial impacts on the quality of the hiking experience in this area.

Moderate Use in the Frontcountry. Pine Creek and Clear Creek both receive moderate levels of use. On Pine Creek, maintaining current kinds and amounts of use would allow continued protection of river values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Maintaining use on Clear Creek would allow a positive visitor experience without impacting resources or river values. Possible concerns for the Pine Creek tributary include disturbing wildlife, crowding, and using visitor-created trails below the Canyon Overlook Trail. The most limiting factors for determining the kinds and amount of use is wildlife, and crowding. Concerns for the Clear Creek tributary are associated with its close proximity to the road, and visitor-created trails are the most limiting factor for determining the kinds and amounts of use that can be sustained in this tributary while also protecting river values. Alternative B adaptive management strategies for both tributaries include managing levels of use, increased education on river values, addition of erosion-control devices, building new trails, closing trails if needed, and eliminating excess visitor-created trails. Adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education on river values including geologic and wildlife values. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of visitor experience on this trail due to preventive strategies to address future crowding and improved trail conditions.

Main Segment North Fork Virgin River below the Temple of Sinawava

Under alternative B strategies, the park would consider riverbank conditions, water quality, trail maintenance requirements, and the diversity of recreational experiences in evaluating the horseback riding concession for permit renewal in the main segment of North Fork Virgin River below the temple. Compared to alternative A, alternative B would place more emphasis on protecting resources when considering the permit renewal for horseback riding concessions. The park would manage horse use, use levels, and trail locations based on indicators and standards for visitor-created trails (table 6). Impacts on this area include visitor-created trails and human waste near shuttle stops, in-river disturbance, horse waste issues, horse trail damage, and facility impacts based on high visitation. Adaptive management strategies for alternative B include a slight decrease in use with increased management intensity of facilities to improve the overall quality of visitor experience in this area. Other adaptive management strategies include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on expectations, increased staff presence, increased education on restroom locations, encouragement of dispersed use, and contact stations outside of the park. If trends in visitation continue to increase over the years, there would be long-term, minor, adverse impacts on visitor access to this area during peak times because use levels would be slightly decreased. However, adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education due to improved visitor expectations and awareness of crowding conditions during high use times. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of river-related visitor experience for visitors exploring this area due to proper waste disposal and a reduction in crowding levels during peak season.

Heaps Canyon including Emerald Pools. The Heaps Canyon tributary is in a frontcountry zone and encompasses the Upper and Lower Emerald Pools, which receive extensive use. Impacts caused by

visitors in this area include crowding, improper disposal of human waste, and visitor-created trails. Visitor-created trails are an important issue of concern in this tributary. For example, on the Emerald Pools (Heaps Canyon) trails from the bridge to the upper pools, which is 1.5 miles of paved and unpaved trails, 68 visitor-created trails have been counted. This is approximately 34 visitor-created trails per trail mile or four times that of what the park deems acceptable in wilderness transition zones. In general, backcountry visitors seek trails that do not show a lot of recreation-related impacts; in fact, opportunities to avoid such conditions were rated as "very important" or "important" by 71.4% (nonpermitted) and 77.8% (permitted) of day users survey respondents and by 80.3% of permitted overnight users (Manning et al. 2003). Because crowding is the most limiting factor for considering the appropriate amount of use that can be sustained on this tributary, the management team determined that when crowding issues were addressed as a first priority, then issues associated with visitor-created trails would also be adequately addressed. To establish indicators, standards, and adaptive management strategies for this tributary, the management team used the 2011 staff observations and trail counts extrapolated from similar segments during research by Manning et al. (2003) on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for when management action should be taken to prevent crowding issues. Through careful consideration of these findings, adaptive management strategies for alternative B include a 15% reduction in encounter rates for visitors hiking to the Upper and Lower Emerald Pools. This would mean decreasing use for hikers to the lower pools from an average of 135 encountered in 20 minutes to 115 encountered. Encounter rates would be reduced from an average of 95 encountered in 30 minutes to 81 encountered. Other adaptive management strategies include increased education, the addition of erosion-control devices, improved trails, and eliminating excess visitor-created trails. Additional adaptive management strategies could include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on expectations, and increased staff presence and contact stations. See table 6 for adaptive management strategies. The reduction of the number of people encountered on the trail would lead to long-term, minor to moderate, adverse impacts for visitors trying to access this trail during peak times. However, this change would ultimately result in long-term, moderate, beneficial impacts on the quality of visitor experience on this trail due to decreased crowding and congestion and improved trail conditions. Improved education on river values would lead to long-term, minor, beneficial impacts on visitor opportunities for interpretation and education on river values, including geologic and wildlife values.

Echo Canyon including Weeping Rock. The Echo Canyon tributary is in a frontcountry zone and encompasses the Weeping Rock area, which receives extensive use. To assess impacts for this area, this analysis specifically focuses on the short trail that goes to Weeping Rock and does not refer to the longer trail that extends to Observation Point. Impacts caused by visitors in this area include crowding and visitor-created trails. To establish indicators, standards, and adaptive management strategies for this tributary, the management team used the 2011 staff observations and trail counts and compared them to the finding from Manning (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for acceptability of crowding. In 2011, an average of 69 people were encountered in 10 minutes on the way to Weeping Rock, and 33 were encountered in 50 minutes for East Rim through Echo Canyon. Results from the 2011 trail counts indicated that use levels were still within the management action threshold reported in the 2003 research. However, use levels were higher than the visitor-based standard for acceptability. Therefore, adaptive management strategies include managing current levels of use, education, addition of erosion-

control devices, and eliminating excess visitor-created trails. Maintaining the number of people encountered on the trail would lead to long-term, negligible to minor, adverse impacts for visitors trying to access this trail during peak times. Additionally, this change would ultimately result in long-term, moderate, beneficial impacts on the quality of visitor experience on this trail due to preventive strategies for crowding and congestion and improved trail conditions. Improved education on river values would lead to long-term, minor, beneficial impacts on visitor opportunities for interpretation and education on river values, including geologic and wildlife values.

East Fork Virgin River

Under alternative B, modern technology would be used to provide virtual access to education on cultural history and natural processes. Like alternative A, there would continue to be no recreational access to the East Fork segment. Enhanced interpretation through virtual learning methods would lead to improved visitor understanding of outstandingly remarkable values, particularly cultural, geologic, ecological processes, wildlife, and fish, represented in the East Fork Virgin River segment. Therefore, alternative B would lead to long-term, minor, beneficial impacts on opportunities for interpretation and education for this segment.

In summary, under alternative B there would be long-term, negligible to moderate, beneficial impacts on visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. Therefore, the adaptive management strategies to address crowding under alternative B would result in long-term, minor to moderate, beneficial impacts on visitor experience in the high use frontcountry areas during peak season.

Impacts of Implementing Indirect and Direct Adaptive Management Strategies

The U.S. Department of the Interior Application Guide for Adaptive Management draws on the National Research Council's definition of adaptive management as "a decision process with . . .flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process" (Williams and Brown 2012). Table 6 provides a summary of adaptive management strategies that would be implemented if standards were exceeded along the river corridor. The adaptive management strategies in table 6 range from indirect to direct strategies and fall into five broad categories: (1) visitor education, (2) site management, (3) deterrence and enforcement, (4) regulations, and (5) rationing and allocation. Direct management strategies directly influence visitor behavior and may restrict behavior in some way. Indirect management strategies target the visitor decision processes that influence behavior and persuade visitors to behave appropriately (Anderson et al. 1998). Therefore, most of the indirect adaptive management strategies could be implemented at any time without additional planning or compliance. However, some of the direct management strategies may require additional planning and compliance due to possible restrictions, and any proposed visitor use policy changes would be available for public review and comment. The adaptive strategies selected would depend on the management goals and objectives to be achieved and whether conditions are unacceptable or approaching unacceptable levels for specific areas within the river corridor.

Examples of indirect management strategies listed in this planning effort include visitor education such as Leave No Trace, education on the removal of human waste, and education about busy visitation times along the river corridor to encourage voluntary dispersal of use. Implementation of these education- and outreach-oriented strategies would allow visitors to have a better understanding of their own impacts on the land and could improve their sense of stewardship for river values. These strategies would also allow visitors to make informed decisions about which river segments to visit during busy times, allowing them to better match their desired experiences with conditions along the river corridor. Therefore, implementation of education- and outreach-related strategies would likely have short-term, minor to moderate, beneficial impacts on the recreational ORV due to improved understanding of river-related visitor opportunities and impacts.

Subtle management tactics tend to preserve freedom of choice because visitors do not perceive that their behavior is being directed by management (Anderson et al. 1998). Examples of direct management strategies that would likely require subtle management tactics include placement of physical barriers around sites to direct visitor travel patterns, delineation of sites, campsite relocation, removal of excess trails, improvements to or rehabilitation of trails, and adjustments to shuttle timing. Subtle management strategies such as these would likely have short-term, minor to moderate, beneficial impacts on the recreational ORV due to improved river-related visitor experience and enhanced resource conditions that would result from implementation of adaptive management strategies. These strategies could help improve resource and social conditions by minimizing the amount of area impacted by visitor use, redirecting use to less sensitive areas, and reducing the severity of impacts in any one place.

Examples of direct management strategies that would be more noticeable to visitors include deterrence and enforcement, regulations, and rationing and allocation. These strategies are noticeable to visitors because they are aware that their behavior is being directed, and these strategies would only be used when the less direct strategies are not effective in improving conditions. Examples listed in this planning effort include requiring that visitors carry out solid waste disposal systems, providing directional signs for visitors to stay on trials, limiting visitor access to certain areas, and closing routes or trails. These adaptive management strategies would have both beneficial and adverse impacts on the recreational ORV and on river-related visitor use and experience in general. There would be short-term, minor to moderate, adverse impacts to visitors that perceive their freedom is being limited because they are not able to access some opportunities on their preferred date or time, possibly minimizing their ability to attain the desired river-related experiences that they anticipated when planning their trip. However, there would also be short-term, minor to moderate, beneficial impacts for those visitors who have a higher quality experience due to the overall improved social and resource conditions that would occur with implementation of adaptive management strategies. Many studies have shown that visitors support access management to areas when there is a direct benefit through the protection of resources and enhanced quality of visitor experience.

Cumulative Impacts. Past, present, or reasonably foreseeable actions may affect river-related visitor use and experience in the Virgin River corridor.

Cumulative impacts that have caused or could cause **adverse impacts** on the overall recreational ORV / river-related visitor experience include

- adverse impacts on visitor access due to the removal of 16 gravel turnouts on Kolob Terrace Road within the North Creek drainage

- adverse impacts on the quality of river-related visitor experience due to noise from the St. George airport
- adverse impacts on the quality of river-related visitor experience due to possible increased visitation from the St. George airport, which could lead to higher demand for use on Virgin River segments that are already experiencing crowding during peak times
- adverse impacts on the quality of river-related visitor experience and safety due to livestock grazing leading to decreased water quality on Virgin River segments, which are downstream from livestock waste

Cumulative impacts that have caused or could cause **beneficial impacts** on the overall recreational ORV / river related visitor experience include

- beneficial impacts on the quality of river-related visitor experience due to rehabilitation of Kolob Terrace Road and improved driving conditions
- beneficial impacts on the quality of river-related visitor experience and safety due to reconfiguration of traffic flow through the south entrance to relieve traffic congestion, promote safety, and improve visitor wayfinding
- beneficial impacts on the quality of river-related visitor experience at the Watchman Campground due to facility improvements
- beneficial impacts on traffic flow and driving experiences due to a variety of past and ongoing projects that require cyclic maintenance

There would be adverse impacts on river-related visitor experience due to the reduction of parking on Kolob Terrace Road, noise from the St. George airport, higher demand for use from the St. George airport and the effects of livestock grazing on visitors using the Virgin River. There would be beneficial impacts on river-related visitor experience due to an enhanced driving experience on Kolob Terrace Road, improved traffic flow at the south entrance, facility improvements at the Watchman Campground, and ongoing visitor improvement projects throughout the park. Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative B are added to the effects of higher demand for use from the St. George airport. In particular, The Narrows and Emerald Pools are already experiencing unacceptable levels of crowding, and there is no room for increased use in these areas during peak visitation times. However, adaptive management strategies under alternative B would ensure that crowding levels do not reach unacceptable levels during peak visitation times. Overall, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience when the impacts from alternative B are added to the effects of improved entrance, road, and campgrounds conditions throughout the Virgin River corridor.

Conclusion. Under alternative B, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. Therefore, the adaptive management strategies to address crowding under alternative B would result in long-term, minor to moderate, beneficial impacts on river-related visitor experience in the high use frontcountry areas during peak season.

Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative B are added to the effects of higher

demand for use from the St. George airport. Overall, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience when the impacts from alternative B are added to the effects of improved entrance, road, and campground conditions throughout the Virgin River corridor.

Impacts of Implementing Alternative C (NPS and BLM Preferred Alternative)

Under alternative C, visitor use management would focus on enhancing river-related visitor experience and protecting natural processes. Key differences in alternative management strategies and adaptive management strategies are segment and tributary specific. Therefore, the impact analysis has been organized by segments and their associated tributaries. Additionally, site-specific issues are noted for high use areas when it is necessary to differentiate impacts occurring in localized areas on a river segment or tributary.

It should be noted that there are preexisting crowding related impacts in some localized frontcountry areas that are adversely impacting river values (including the recreational value). This plan notes adaptive management strategies that could be used to protect and enhance river values and improve those conditions. However, determining numeric capacities for frontcountry segments of the river will continue to require additional discussion and investigation. The frontcountry transportation and visitor study underway in 2013 will provide further guidance on managing visitor capacity in the frontcountry. In the meantime, guidance from the general management plan and this plan would be followed to direct management of the kinds and amounts of use. This plan notes the spectrum of river-related uses and experiences—from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, to viewing scenery or camping, to opportunities to experience serenity, solitude, and general enjoyment along the river corridor. The general management plan also provides direction for the types of experiences that visitors can expect in different areas of the park. As noted in the general management plan, in the frontcountry, the recreational experience would be highly social with frequent interaction among visitors and between visitors and park staff. However, crowding levels would not keep visitors from reaching their desired destination or viewing outstanding park features. There may be opportunities for visitors to experience solitude at certain times of the day, especially during the off-peak season. Upcoming transportation and capacity research efforts will lead to a higher level of certainty about current use and impacts in the frontcountry and transitions zones (and related issues in the backcountry), allowing for a higher level of certainty for management decisions about visitor capacity in those zones (see appendix E).

Taylor Creek

Under alternative C, education and interpretation would focus on history and connection to natural resources. Expanded focus on history and natural resources interpretation would lead to long-term, minor, beneficial impacts on river-related visitor experience and increased understanding of river values specific to Taylor creek, including geologic and wildlife values. Day use limits (permits) based on indicators and standards would be considered. Under the adaptive management strategy, current levels of use would be managed on the North Fork of Taylor Creek and South Fork of Taylor Creek. Current use is low on these segments. However, extensive crowding on the Middle Fork of Taylor Creek has resulted in exceeded crowding-based standards. Therefore, use levels would be decreased by adaptively reducing the Taylor Creek parking lot size to bring crowding issues back into standard. This reduction in use would cause short-term, moderate, adverse impacts on visitor access in the Taylor Creek area. Additionally, use routes may be

constructed into the North and South Forks of Taylor Creek to disperse use and allow additional recreational opportunities. These changes would ultimately lead to long-term, moderate, beneficial impacts for all visitors because the quality of river-related visitor experience would be improved through reduced crowding and increased opportunities to experience solitude.

La Verkin Creek

Under alternative C, day use limits (permits) based on indicators and standards would be considered. Using adaptive management strategies, current use levels would be maintained for all tributary segments on La Verkin Creek. Permits would continue to be required for overnight use only, and day use would be managed based on indicators and standards that are protective of both wilderness and river values. Day use standards for encounter rates are currently being exceeded for day use on La Verkin Creek. Therefore, adaptively managing use according to standards would result in long-term, negligible, beneficial impacts on the quality of river-related visitor experience for La Verkin Creek.

North Creek

Under alternative C, the level of recreational activity would be monitored to ensure river values are not negatively impacted and would be adjusted as needed. Using adaptive management strategies, current use levels would be maintained for most tributaries of the North Creek segment. Where current use limits and standards are protective of river values, there would be no need for adjustments. Because use is currently very low for the Right Fork of North Creek below Barrier Falls, there would be room for increased use of this tributary under alternative C. This increase would continue to be protective of river values and visitors would continue to experience solitude, challenging experiences, and self-reliant recreation. An increase in use to this tributary would lead to long-term, minor, beneficial impacts on visitor access and opportunities on the North Creek segment.

North Fork Virgin River above the Temple of Sinawava

Under alternative C, the same as with alternative B, a formalized approval process would be initiated to establish flow limits for boating and would lead to long-term, moderate, beneficial impacts on safety for visitors recreating on the North Fork Virgin River above the Temple of Sinawava. Using adaptive management strategies, standards would be protective of all river values and would be carried forward from the backcountry management plan for segments that overlap with wilderness zones to ensure consistency in monitoring and management efforts across plans. Because many tributaries for this segment are in wilderness zones and have use limits, which are managed through the permitting system, current use levels would be maintained. On those tributaries, maintaining current kinds and amounts of use would allow continued protection of outstandingly remarkable values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access and there would be long-term, negligible, beneficial impacts on the quality of river-related visitor experience for visitors to pristine tributaries on this segment.

Unlike other tributaries on the North Fork Virgin River above the Temple of Sinawava, the main segment of the North Fork Virgin River above the temple and below Orderville Canyon is in a frontcountry zone and receives extensive use. This section of the river includes the riverside walk and extends 1.5 miles up the canyon into the popular area The Narrows. Impacts caused by visitors in this area include crowding, inappropriate disposal of human waste, trail widening, visitor-created trails, and noise. However, crowding was the most limiting factor for developing standards that are protective of river values. Based on results from the Manning et al. (2003) study and NPS (2011) staff efforts to cross-test this

methodology, it is clear that visitors have opinions about when management action should occur to reduce crowding (limit use) and therefore improve the quality of visitor experience. Findings showed that 24 people at one time was the visitor-based standard for when management action should occur. The 2011 monitoring results showed that current use levels were at 36 people at one time, indicating that use levels were exceeding the crowding-based standards for The Narrows during peak season. Adaptive management strategies for alternative C include maintaining use levels in The Narrows. Other adaptive management strategies include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on expectations, increased staff presence and contact stations, signs on shuttle bus to aid visitor understanding of how to properly dispose of waste, and recommendations or requirements to carry waste disposal bags while hiking in this area. If trends in visitation continue to increase over the years, there would be long-term, minor to moderate, adverse impacts on visitor access to this area during peak times because use levels would be maintained at current levels. However, adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of river-related visitor experience due to proper waste disposal. Because adaptive management strategies call for maintaining use levels in The Narrows given that the crowding-based standard has been reached and exceeded during peak season, there would continue to be long-term, moderate, adverse impacts on the quality of visitor experience in The Narrows during peak season.

North Fork Virgin River below the Temple of Sinawava

Because the each segment on the North Fork Virgin River below the temple has diversity in both the kinds and amounts of use, this section has been organized for segment-, tributary-, and site-specific impacts where appropriate.

Low Use Areas in the Wilderness. Using adaptive management strategies under alterative C, standards would be protective of all river values and would be carried forward from the backcountry management plan for segments that overlap with wilderness zones to ensure consistency in monitoring and management efforts across plans. Because some of the tributaries for this segment are in wilderness zones and have use limits, which are managed through the permitting system, current use levels would be maintained for those tributaries. Maintaining current kinds and amounts of use would allow continued protection of river values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. There would be no changes to access and managing current levels of use would result in long-term, negligible, beneficial impacts on the quality of river-related visitor experience for visitors to pristine and primitive tributaries on this segment. Other important strategies in low use areas include closing canyons during critical wildlife periods (i.e., nesting, breeding, migration), reducing group size where necessary, reducing encounter rates where needed, and education on river values. Closing areas for protection of wildlife would result in short-term, negligible, adverse impacts on access, yet would expand visitor knowledge of the importance of wildlife habitat protection. Enhanced education on river values, including wildlife, would result in long-term, minor, beneficial impacts for education and interpretation. Managing group size would be based on encounter rate standards set forth in the backcountry management plan which would also protect and enhance the river-related visitor experience and would result in long-term, moderate, beneficial impacts on the quality of river-related visitor experience due to the high quality conditions that are maintained with the direction of the backcountry management plan.

Low Use Areas in the Frontcountry. Birch Creek provides access to the park water supply and climbing routes, and observations indicate that use is low on this tributary. Impacts from visitor use on this segment include climbing bolts, visitor-created trails, and human waste. The most limiting factor for considering the appropriate amount of use the area could sustain is visitor-created trails. However, issues with visitor-created trails are of lower magnitude on Birch Creek than impacts near Emerald Pools on the Heaps Canyon tributary. Adaptive management strategies under alternative C include allowing for a moderate increase in use to help disperse use from Heaps Canyon. Therefore, a standard of 20 people encountered per day was established for this segment and is considered to be protective of river values. Other adaptive management strategies include adding erosion-control devices, improving routes, building new trails, and eliminating excess visitor-created trails. Slightly increasing the amount of use for this segment would result in long-term, minor, beneficial impacts on access and opportunities for visitors who are unable to obtain access to other areas of the park during high use times. Improved trail conditions would also lead to long-term, moderate, beneficial impacts on the quality of the hiking experience in this area.

Moderate Use in the Frontcountry. Pine Creek and Clear Creek both receive moderate levels of use. On Pine Creek, maintaining current kinds and amounts of use would allow continued protection of river values and would provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Maintaining use on Clear Creek would allow a positive river-related visitor experience without impacting resources or river values. Possible concerns for the Pine Creek tributary include disturbing wildlife, crowding, and using visitor-created trails below the Canyon Overlook Trail. The most limiting factors for determining the kinds and amount of use is wildlife, and crowding. Concerns for the Clear Creek tributary are associated with its close proximity to the road, and visitor-created trails are the most limiting factor for determining the kinds and amounts of use that can be sustained in this tributary while also protecting river values. Alternative C adaptive management strategies for both tributaries include managing current levels of use, increased education on river values, addition of erosion-control devices, building new trails, closing trails if needed, and eliminating excess visitor-created trails. Adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education on river values including geologic and wildlife values. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of river-related visitor experience on this trail due to preventive strategies to address future crowding and improved trail conditions.

Main Segment North Fork Virgin River below the Temple of Sinawava

Under alternative C, the park would consider riverbank conditions, water quality, trail maintenance requirements, and the diversity of recreational experiences in evaluating the horseback riding concession for permit renewal in the main segment of North Fork Virgin River below the temple. Compared to alternative A, alternative C would place more emphasis on ensuring opportunities for recreational experiences when evaluating the horseback riding concession for renewal. The park would manage horse use, use levels, and trail locations based on indicators and standards for visitor-created trails (table 6). Impacts on this area include visitor-created trails and human waste near shuttle stops, in-river disturbance, horse waste issues, horse trail damage, and facility impacts based on high visitation. Adaptive management strategies for alternative C include maintaining use levels with increased management intensity of facilities to improve the overall quality of the river-related visitor experience in this area. Other adaptive management strategies include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on

expectations, increased staff presence, increased education on restroom locations, encouragement of dispersed use, and contact stations outside of the park. If trends in visitation continue to increase over the years, there would be long-term, negligible, adverse impacts on visitor access to this area during peak times because use levels would be maintained at current levels. However, adaptive management strategies would cause long-term, moderate, beneficial impacts on opportunities for interpretation and education due to improved visitor expectations and awareness of crowding conditions during high use times. Implementation of these strategies would also lead to long-term, moderate, beneficial impacts on the quality of experiences for visitors exploring this area due to proper waste disposal, management of crowding levels during peak season.

Heaps Canyon including Emerald Pools. The Heaps Canyon tributary is in a frontcountry zone and encompasses the Upper and Lower Emerald Pools, which receive extensive use. Impacts caused by visitors in this area include crowding, improper disposal of human waste, and visitor-created trails. Visitor-created trails are an important issue of concern in this tributary. For example, on the Emerald Pools (Heaps Canyon) trail from the bridge to the upper pools, which is 1.5 miles of paved and unpaved trails, 68 visitor-created trails have been counted. This is approximately 34 visitor-created trails per trail mile or four times that of what the park deems acceptable in wilderness transition zones. In general, backcountry visitors seek trails that do not show a lot of recreation-related impacts; in fact, opportunities to avoid such conditions were rated as "very important" or "important" by 71.4% (nonpermitted) and 77.8% (permitted) of day user survey respondents and by 80.3% of permitted overnight users (Manning et al. 2003). Because crowding is the most limiting factor for considering the appropriate amount of use that could be sustained on this tributary, the management team determined that when crowding issues were addressed as a first priority, then issued associated with visitor-created trails would also be adequately addressed. To establish indicators, standards, and adaptive management strategies for this tributary, the management team used the 2011 staff observations and trail counts extrapolated from similar segments during Manning et al. (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for when management action should be taken to prevent crowding issues. Findings showed that current levels of use are above the visitor-based standard (Manning 2003). Bringing these rates down to an acceptable level would require a 15% reduction in encounter rates for visitors hiking to the Upper and Lower Emerald Pools. This would mean decreasing use for hikers to the lower pools from an average of 135 encountered in 20 minutes to 115 encountered. Encounter rates would also need to be reduced from an average of 95 encountered in 30 minutes to 81 encountered at the upper pools. Under alternative C, up to current levels of use would be maintained. A reduction in use levels would not occur under alternative C, thereby leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience due to continued crowding and congestion on the trail during peak times. Other adaptive management strategies include increased education, the addition of erosion-control devices, improved trails, and eliminating excess visitor-created trails. Additional adaptive management strategies could include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on expectations, increased staff presence and contact stations. See the Kinds and Amounts of Use table for adaptive management strategies. Improved education on river values would lead to long-term, minor, beneficial impacts on visitor opportunities for interpretation and education on river values, including geologic and wildlife values. Improved trail conditions would lead to long-term, minor to moderate, beneficial impacts on the quality of the hiking experience along this trail.

Echo Canyon including Weeping Rock. The Echo Canyon tributary is in the frontcountry zone and encompasses the Weeping Rock area, which receives extensive use. To assess impacts for this area, this analysis specifically focuses on the short trail that goes to Weeping Rock and does not refer to the longer trail that extends to Observation Point. Impacts caused by visitors in this area include crowding and visitor-created trails. To establish indicators, standards, and adaptive management strategies for this tributary, the management team used the 2011 staff observations and trail counts and compared them to the findings from Manning et al. (2003) research on visitor-based standards for encounter rates. Results indicated visitor-based thresholds for acceptability of crowding. In 2011, an average of 69 people were encountered in 10 minutes on the way to Weeping Rock, and 33 were encountered in 50 minutes for East Rim through Echo Canyon. Results from the 2011 trail counts indicated that use levels were still within the management action threshold reported in the 2002/2003 research. However, use levels were higher than the visitor-based standard for acceptability. Therefore, adaptive management strategies include managing levels of use, education, addition of erosion-control devices, and eliminating excess visitor-created trails. Additional adaptive management strategies could include adjustments to the shuttle schedule to disperse use, tour bus limitations, increased education on expectations, increased staff presence and contact stations. See the Kinds and Amounts of Use table for adaptive management strategies. Maintaining the number of people encountered on the trail would lead to long-term, negligible to minor, adverse impacts for visitors trying to access this trail during peak times. Additionally, this change would ultimately result in long-term, moderate, beneficial impacts on the quality of river-related visitor experience on this trail due to preventive strategies for crowding and congestion and improved trail conditions. Improved education on river values would lead to long-term, minor, beneficial impacts on visitor opportunities for interpretation and education on river values, including geologic and wildlife values.

East Fork Virgin River

Under alternative C, physical access would remain limited to approved researchers. Modern technology would be used to provide virtual access to education on cultural history and natural processes and Southern Paiute members would be invited to tell their stories as part of the interpretation. Ranger-guided trips for cultural history and natural processes education would be considered. Unlike alternative A, there may be opportunities for guided access to the area leading to long-term, minor, beneficial impacts on visitor access to East Fork. Enhanced interpretation through virtual learning methods and Southern Paiute member interpretation would lead to improved visitor understanding of outstandingly remarkable values, particularly cultural, geologic, ecological processes, wildlife, and fish outstandingly remarkable values represented in the East Fork Virgin River segment. Therefore, there would be long-term, moderate, beneficial impacts on opportunities for interpretation and education for this segment.

In summary, under alternative C there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. Therefore, the adaptive management strategies to address crowding under alternative C would result in long-term, negligible to moderate, beneficial impacts on river-related visitor experience in the high use frontcountry areas during peak season. However, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related

visitor experience on the trail during peak times.

Impacts of Implementing Indirect and Direct Adaptive Management Strategies

Same as alternative B.

Cumulative Impacts. Past, present, or reasonably foreseeable actions may affect the recreational ORV / river-related visitor use and experience in the Virgin River corridor.

Cumulative impacts that have caused or could cause **adverse impacts** on the overall recreational ORV / river-related visitor experience include

- adverse impacts on visitor access due to the removal of 16 gravel turnouts on Kolob Terrace Road within the North Creek drainage
- adverse impacts on the quality of river-related visitor experience due to noise from the St. George airport
- adverse impacts on the quality of river-related visitor experience due possible increased visitation from the St. George airport, which could lead to higher demand for use on the Virgin River segments that are experiencing crowding during peak times
- adverse impacts on the quality of river-related visitor experience and safety due to livestock grazing leading to decreased water quality on the Virgin River segments that are downstream from livestock waste

Cumulative impacts that have caused or could cause **beneficial impacts** on the overall recreational ORV / river related visitor experience include

- beneficial impacts on the quality of river-related visitor experience due to rehabilitation of Kolob Terrace Road and improved driving conditions
- beneficial impacts on the quality of river-related visitor experience and safety due to reconfiguration of traffic flow through the south entrance to relieve traffic congestion, promote safety, and improve visitor wayfinding
- beneficial impacts on the quality of river-related visitor experience at the Watchman Campground due to facility improvements
- beneficial impacts on traffic flow and driving experience due to a variety of past and ongoing projects that require cyclic maintenance

There would be adverse impacts on the river-related visitor experience due to the reduction of parking on Kolob Terrace Road, noise from the St. George airport, higher demand for use from St. George airport, and the effects of livestock grazing on visitors using the Virgin River. There would be beneficial impacts on the river-related visitor experience due to enhanced driving experiences on Kolob Terrace Road, improved traffic flow at the south entrance, facility improvements at Watchman Campground, and ongoing visitor improvement projects throughout the park. Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative C are added to the effects of higher demand for use from the St. George airport. In particular, The Narrows and Emerald Pools are experiencing unacceptable levels of crowding, and there is no room for increased use in these areas during peak visitation times. However, adaptive management strategies under alternative C help prevent crowding levels from reaching unacceptable levels during peak visitation times. Under alternative C, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on this trail during peak times. Overall, there would be long-term, negligible

to moderate, beneficial impacts on river-related visitor experience when the impacts from alternative C are added to the effects of improved entrance, road, and campground conditions throughout the Virgin River corridor.

Conclusion. Under alternative C, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience on low use segments of the Virgin River where strategies from the backcountry management plan were carried forward to provide for solitude, challenging experiences of canyoneering, and self-reliant recreation. Additionally, the new adaptive management strategies would be protective of river values including the recreational outstandingly remarkable value. Therefore, the adaptive management strategies to address crowding under alternative C would result in long-term, negligible to moderate, beneficial impacts on river-related visitor experience in the high use frontcountry areas during peak season. However, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on these trails during peak times. This level of impact is not acceptable. Therefore, adaptive management and future research pertaining to transportation and capacity are being applied to correct issues related to the recreation ORV in high use frontcountry areas.

Overall, there would be long-term, minor to moderate, adverse impacts on the quality of river-related visitor experience in high use areas during peak times when the effects of alternative C are added to the effects of higher demand for use from the St. George airport. Under alternative C, Emerald Pools and The Narrows would receive unacceptable levels of crowding leading to long-term, moderate, adverse impacts on the quality of river-related visitor experience on this trail during peak times. Overall, there would be long-term, negligible to moderate, beneficial impacts on river-related visitor experience when the impacts from alternative C are added to the effects of improved entrance, road, and campgrounds conditions throughout the Virgin River corridor.

NPS AND BLM OPERATIONS AND FACILITIES

NATIONAL PARK SERVICE OPERATIONS AND FACILITIES

The impact analysis evaluated the effects of the alternatives on the following aspects of park operations:

- staffing, infrastructure, and visitor facilities and services
- operations of non-NPS entities, including the Zion Natural History Association, concessioners, commercial permittees, and partners

The analysis was conducted in terms of how operations and facilities may vary under the different management alternatives. The analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact.

Short-term impacts would be less than one year because most construction is generally completed within a one-year time frame and would last only until all construction-related action items are completed. Long-term impacts would extend beyond one year and have a permanent effect on operations.

- **Negligible**—the effect of an action on park operations would be at or below the lower levels of detection and would not have an appreciable effect on park operations.
- **Minor**—the effects would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations.
- **Moderate**—the effects would be readily apparent and would result in a substantial change in park operations in a manner noticeable to staff and the public.
- **Major**—the effects would be readily apparent and would result in a substantial change in park operations in a manner noticeable to staff and the public and be markedly different from existing operations.

Beneficial impacts would improve operations and/or facilities. Adverse impacts would negatively affect operations and/or facilities and could hinder ability of the staff to provide adequate services and facilities to visitors and staff. Some impacts could be beneficial for some operations or facilities and adverse or neutral for others.

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, the National Park Service would continue to manage the Virgin River and its tributaries in the same manner in which they are currently managed. This alternative would have no new effect on park operations along the designated segments.

Under the existing management strategy, park staff time would continue to be devoted to human waste cleanup and mitigation in The Narrows. While health and safety hazards associated with this activity are removed or significantly reduced through the use of personal protective equipment, the time and resources required to carry out this activity would continue to impact park operations. In addition, the continuation of resource restoration activities due to impacts from visitor-created trails would also have an effect on park operations. Continuation of these activities would result in long-term, negligible adverse impacts on park operations.

Cumulative Impacts. The no-action alternative would generally call for the continuation of current management, programs, operations, funded construction projects, and current levels of annual operating funds. No actions in the reasonably foreseeable future would require staffing beyond current levels and staffing would continue to fluctuate based on need and funding availability. Existing concessioner permits would continue to be evaluated on a case-by-case basis following the strategy set forth in the commercial services plan.

Overall, the effects of other past, present, and reasonably foreseeable future actions on park operations would be negligible. However, when combined with the continued adverse impacts on park operations from human waste cleanup and restoration activities, the cumulative effect would be in long-term, moderate, and adverse.

Conclusion. By continuing to preserve wild and scenic river values and provide several opportunities for outdoor recreation, interpretation, and education in the headwaters area, Zion National Park would continue to provide the same level of protection, monitoring, and visitor services. However, continued exposure to human waste, and increased operational demands associated with restoration activities would result in impacts on park operations that are long-term, moderate, and adverse.

Impacts of Implementing Alternative B

Analysis. The Wild and Scenic Rivers Act requires managing the river corridor kinds and amounts of use to protect river values. To implement this plan, there is an increased need for more intense monitoring and for resource and visitor protection. However, the increased monitoring should allow the parks to respond quickly via the adaptive management strategy, which may reduce overall operational requirements to respond to changes in condition of river values.

Alternative B includes a more robust resource monitoring framework and potential actions to mitigate impacts on resources, and improve free-flowing conditions and water quality. These actions would include educating visitors on river values, as well as formalizing and restoring some visitor-created trails. There may also be additional demands on staff workload and park resources for flood cleanup and to develop solutions to protect critical infrastructure from the increased potential for flooding associated with restoring free-flowing conditions. Alternative B would require additional staff time or investment to educate visitors on resource impacts in high use areas.

The increased need for monitoring, protection, interpretation, and education, as well as the increased potential for flooding under alternative B (relative to alternative A) would place additional demand on staff time and park operations. However, the implementation of the adaptive management strategies in alternative B would allow park staff to quickly respond to activities that are negatively impacting river values. In the long-term, this would reduce overall operational requirements for resource restoration and mitigation, resulting in an overall long-term, minor, and beneficial impact on park operations.

Cumulative Impacts. The past, current and reasonably foreseeable projects and actions described above in the cumulative scenario would have both beneficial and adverse impacts on park operations. Therefore, the overall cumulative impact from these projects and actions would be negligible. When the beneficial impacts of alternative B are added to the effects of the other past, present, and reasonably foreseeable actions described above in the cumulative scenario, the cumulative impact on park operations would be long-term, minor, and beneficial.

Conclusion. Implementing alternative B would have long-term, minor, beneficial impacts on park operations, due to increased need for monitoring, protection, interpretation, and education, as well as the ability to respond quickly to issues affecting river values. There would be a negligible, beneficial, cumulative effect.

Impacts of Implementing Alternative C

Analysis. The Wild and Scenic Rivers Act requires managing the river corridor kinds and amounts of use to protect river values. To implement this plan, there is an increased need for more intense monitoring and for resource and visitor protection. However, the increased monitoring should allow the parks to respond quickly via the adaptive management strategy, which may reduce overall operational requirements to respond to changes in condition of river values.

As with alternative B, alternative C includes a more robust resource monitoring framework and potential actions to mitigate impacts on resources, and improve free-flowing condition and water quality. These actions would include educating visitors on river values, as well as formalizing and restoring some visitor-created trails. As with alternative B, there may also be additional demands on staff workload and park resources for flood cleanup and to develop solutions to protect critical infrastructure from the increased potential for flooding associated with restoring free-flowing conditions.

The increased need for monitoring and protection, as well as the increased potential for flooding under alternative C (relative to alternative A) would place additional demand on staff time and park operations. Implementing trail hardening and other measures to mitigate visitor impacts would also require additional investment for initial construction and maintenance. However, the implemen-tation of the adaptive management strategies in alternative C would allow park staff to quickly respond to activities that are negatively impacting river values. Site improvements such as trail hardening would also reduce the staff time required for resource restoration. In the long-term, this would reduce overall operational requirements for resource restoration and mitigation resulting in an overall long-term, minor, and beneficial impact on park operations.

Cumulative Impacts. The past, current, and reasonably foreseeable projects and actions described above in the cumulative scenario would have both beneficial and adverse impacts on park operations. Therefore, the overall cumulative impact from these projects and actions would be negligible. When the beneficial impacts of alternative Care added to the effects of the other past, present, and reasonably foreseeable actions described above in the cumulative scenario, the cumulative impact on park operations would be long-term, minor, and beneficial.

Conclusion. Implementing alternative C would have long-term, minor, beneficial impacts on park operations, due to increased need for monitoring, protection, interpretation, and education, as well as the ability to respond quickly to issues affecting river values. Site improvements would also reduce the staff time required for resource restoration. There would be a negligible, beneficial, cumulative effect.

BLM OPERATIONS AND FACILITIES

The impact analysis evaluated the effects of the alternatives on the following aspects of BLM operations:

- staffing, infrastructure, and visitor facilities and services
- operations of permittees and partners

The analysis was conducted in terms of how operations and facilities may vary under the different management alternatives. The

analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact.

Short-term impacts would be less than one year. Long-term impacts would extend beyond one year and have a permanent effect on operations.

- **Negligible**—the effect of an action on BLM operations would be at or below the lower levels of detection.
- **Minor**—the effects would be detectable, but would be of a magnitude that would not have an appreciable effect on BLM operations.
- **Moderate**—the effects would be readily apparent and would result in a substantial change in BLM operations in a manner noticeable to staff and the public.
- **Major**—the effects would be readily apparent and would result in a substantial change in BLM operations in a manner noticeable to staff and the public and be markedly different from existing operations.

Beneficial impacts would improve operations and/or facilities. Adverse impacts would negatively affect operations and/or facilities and could hinder ability of the staff to provide adequate services and facilities to visitors and staff. Some impacts could be beneficial for some operations or facilities and adverse or neutral for others.

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, there would be no change in the management of the wild and scenic river segments. The majority of the segments are within designated wilderness. They would continue to be managed in accordance with the Wilderness Act of 1964, the Wild and Scenic River Act of 1968, and BLM policy and guidance for wilderness and wild and scenic river management. The segments within wilderness would continue to be closed to OHV and mountain bike use, fluid mineral leasing, mineral material site development, withdrawn from locatable mineral development, and would be exclude from any rights-of-way development. The segments outside wilderness (Willis Creek, Oak Creek, and a portion of Kolob Creek) would continue to be closed to OHV and mountain bike use, managed for no-surface occupancy for fluid minerals, closed to mineral material development, and managed as an avoidance area for rights-of-way. The areas would be open to mineral location with a plan of operation that could provide mitigation protective of river values. Livestock grazing, as authorized in the existing grazing permits, would continue on portions of Kolob Creek, Deep Creek, LaVerkin Creek, and the Middle Fork of Taylor Creek. There are no recreation or livestock facilities or developments along any of the river segments. Under the existing management strategies, BLM staff would continue to monitor for rangeland health and wilderness values and characteristics. Continuation of these activities would result in negligible, beneficial long-term impacts on BLM operations.

Cumulative Impacts. The no-action alternative would continue current management. No actions in the reasonably foreseeable future would require staffing beyond current levels and staffing would continue to fluctuate based on need and funding availability. Existing livestock grazing permits and commercial guiding permits would continue to be evaluated and issued on a case-by-case basis. Overall, the effects of other past, present, and reasonably foreseeable future actions on BLM operations would be beneficial, long-term and negligible.

Conclusion. The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because

management actions would not change. Cumulative effects would also remain unchanged be existing management would continue, which would result in beneficial, long-term and negligible effects.

Impacts of Implementing Alternative B

Analysis. Alternative B would be the same as alternative A, there would be no change in the management of the wild and scenic river segments. The majority of the segments are within designated wilderness. They would continue to be managed in accordance with the Wilderness Act of 1964, the Wild and Scenic River Act of 1968, and BLM policy and guidance for wilderness and wild and scenic river management. The segments within wilderness would continue to be closed to OHV and mountain bike use, fluid mineral leasing, mineral material site development, withdrawn from locatable mineral development, and would be exclude from any rights-of-way development. The segments outside wilderness (Willis Creek, Oak Creek, and a portion of Kolob Creek) would continue to be closed to OHV and mountain bike use, managed for no-surface occupancy for fluid minerals, closed to mineral material development, and managed as an avoidance area for rights-of-way. The areas would be open to mineral location with a plan of operation that could provide mitigation protective of river values. Livestock grazing, as authorized in the existing grazing permits, would continue on portions of Kolob Creek, Deep Creek, LaVerkin Creek, and the Middle Fork of Taylor Creek. There are no recreation or livestock facilities or developments along any of the river segments. Under the existing management strategies, BLM staff would continue to monitor for rangeland health and wilderness values and characteristics. Continuation of these activities would result in negligible, beneficial long-term impacts on BLM operations.

Cumulative Impacts. The no-action alternative would continue current management. No actions in the reasonably foreseeable future would require staffing beyond current levels and staffing would continue to fluctuate based on need and funding availability. Existing livestock grazing permits and commercial guiding permits would continue to be evaluated and issued on a case-by-case basis. Overall, the effects of other past, present, and reasonably foreseeable future actions on BLM operations would be beneficial, long-term and negligible.

Conclusion. The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because management actions would not change. Cumulative effects would also remain unchanged be existing management would continue, which would result in beneficial, long-term and negligible effects.

Impacts of Implementing Alternative C

Analysis. Alternative C would be the same as alternative A and B, there would be no change in the management of the wild and scenic river segments. The majority of the segments are within designated wilderness. They would continue to be managed in accordance with the Wilderness Act of 1964, the Wild and Scenic River Act of 1968, and BLM policy and guidance for wilderness and wild and scenic river management. The segments within wilderness would continue to be closed to OHV and mountain bike use, fluid mineral leasing, mineral material site development, withdrawn from locatable mineral development, and would be exclude from any rights-of-way development. The segments outside wilderness (Willis Creek, Oak Creek, and a portion of Kolob Creek) would continue to be closed to OHV and mountain bike use, managed for no-surface occupancy for fluid minerals, closed to mineral material development, and managed as an avoidance area for rights-of-way. The areas would be open to mineral location with a plan of operation that could provide mitigation protective of river values. Livestock grazing, as

authorized in the existing grazing permits, would continue on portions of Kolob Creek, Deep Creek, LaVerkin Creek, and the Middle Fork of Taylor Creek. There are no recreation or livestock facilities or developments along any of the river segments. Under the existing management strategies, BLM staff would continue to monitor for rangeland health and wilderness values and characteristics. Continuation of these activities would result in negligible, beneficial long-term impacts on BLM operations.

Cumulative Impacts. The no-action alternative would continue current management. No actions in the reasonably foreseeable future would require staffing beyond current levels and staffing would continue to fluctuate based on need and funding availability. Existing livestock grazing permits and commercial guiding permits would continue to be evaluated and issued on a case-by-case basis. Overall, the effects of other past, present, and reasonably foreseeable future actions on BLM operations would be beneficial, long-term and negligible.

Conclusion. The no-action alternative would result in beneficial, long-term and negligible effects on BLM operations because management actions would not change. Cumulative effects would also remain unchanged be existing management would continue, which would result in beneficial, long-term and negligible effects.

SOCIOECONOMIC ENVIRONMENT

The planning team applied logic, experience, and professional judgment to analyze the impacts on the social and economic situation resulting from each alternative. Economic data, historic visitor use data, expected future visitor use, and future developments were all considered in identifying, discussing, and evaluating expected impacts.

Assessments of potential socioeconomic impacts were based on comparisons between the no-action alternative and each of the action alternatives.

The evaluation of impacts also included an assessment of duration. Distinguishing between short-term and long-term duration was necessary to understand the extent of the identified effects. In general, short-term impacts are temporary in duration and typically are transitional effects associated with implementation of an action (e.g., related to construction activities) and are less than one year. In contrast, long-term impacts may have a permanent effect on the socioeconomic environment and the effect extends beyond one year (e.g., operational activities).

- **Negligible**—the effects on socioeconomic conditions would be below or at the level of detection.

- **Minor**—the effects on socioeconomic conditions would be slight but detectable and only affect a small number or park services and/or a small portion of the surrounding population.

- **Moderate**—the effects on socioeconomic conditions would be readily apparent. Effects would result in changes to socioeconomic conditions on a local scale in the affected area.

- **Major**—the effects on socioeconomic conditions would be readily apparent. Measurable changes in social or economic conditions at the county level occur. The impact would be severely adverse or exceptionally beneficial in the affected area.

NPS policy calls for the effects of the alternatives to be characterized as being beneficial, adverse, or indeterminate in nature. With respect to economic and social effects, few standards or clear definitions exist as to what constitutes beneficial or positive changes and what is considered adverse or negative. For example, rising unemployment is generally perceived as adverse, while increases in job opportunities and average per capita personal income are regarded as beneficial. In many instances, however, changes viewed as favorable by some members of a community are seen as unfavorable by others. For example, the impact of growth on housing markets and values may be seen as favorable by construction contractors and many homeowners, but adverse by renters and local government officials or community groups concerned with affordability. Consequently, some of the social and economic impacts of the alternatives may be described in such a manner as to allow the individual reviewer to determine whether they would be beneficial or adverse (impact is indeterminate with respect to type).

Impacts of Implementing Alternative A

Analysis. Under the no-action alternative, the National Park Service would continue to

manage the Virgin River in the same way that it is currently managed. Some management elements may be enhanced or broadened as financial and staffing resources become available. By continuing to preserve wild and scenic river values and provide several opportunities for outdoor recreation, interpretation, and education, Zion National Park would continue to contribute to the high quality of life for local residents of the Dixie area. As the St. George / Washington County area continues to experience development and growth into the future, the Virgin River and opportunities to recreate along it would become significantly more valuable to the nearby communities and the quality of life of its residents. This continued NPS management and preservation would result in a quality of life impact on the socioeconomic environment that is long-term, minor to moderate, and beneficial.

The park's overall contribution to the economy of the Washington County area would also be maintained by the no-action alternative. By continuing to provide natural area preservation, numerous recreation opportunities, facilities and park settings for organized group activities, the park would continue to help make the area an attractive place for both residents and businesses to call home. In turn, the area's quality of life becomes a draw for business and economic growth with the help from places like Zion National Park and the Virgin River. Current visitation levels, patterns, and trends would likely continue. This annual visitation would continue to have various direct and indirect effects on the local and regional economy. The no-action alternative would sustain this economic value to the area, which would continue to result in an impact that would be long-term, minor to moderate, and beneficial.

Cumulative Impacts. Areas of Zion National Park, BLM, and USFS lands that are outside the river corridor, as well as other local, state, and non-NPS federal park lands contribute substantially to the quality of life for community residents. The current and future management policies and actions of the local, state, and federal agencies that manage these other public lands would continue to accommodate public access and use in this region. In some cases, management actions would increase the accessibility to some of these lands, which would provide even more opportunities for improved quality of life in neighboring communities. As open space in the area continues to be developed and urbanized into the future, these public lands would become increasingly valuable to the local communities and the quality of life of their residents.

In addition to the direct economic contributions from land management projects on these federal lands, these actions could also result in a large volume of indirect economic contributions from tourism spending. If any of these federal land agencies decide to manage these lands in a way that allows or encourages increased visitation, visitor spending in the local gateway communities (e.g., goods and services) could be expected to increase as well. A reverse effect could occur if these agencies pursue policies or actions that reduce the opportunities for tourism spending.

Numerous actions and policies in the local communities around the parks also contribute to the local regional economy. This diverse local economic activity is driven and guided by town and county comprehensive plans, land use policies, zoning ordinances, and other community development efforts. These plans and policies can guide and encourage direct economic activity such as commercial business growth (e.g., retail, professional, hotel/restaurant), housing growth, tourism, and industrial growth. In turn, the resulting growth and development of residential, commercial, and industrial sectors (i.e., construction projects, commercial sales, housing sales, municipal taxation) of these communities contribute directly to the local economy. If these economic attributes are planned and guided wisely, many of these local actions could yield self-sustaining economic growth in these communities.

Overall, the effects of these other past, present, and reasonably foreseeable future actions associated with quality of life and economy would have a short- to long-term, moderate, beneficial, local to regional impact on the socioeconomic environment.

When the likely effects of implementing alternative A are combined with the effects of other past, present, and reasonably foreseeable actions described above, the cumulative effects on the socioeconomic environment in would be short- to long-term, moderate, and beneficial. Alternative A would contribute a small, long-term, beneficial increment to this cumulative impact.

Conclusion. The overall impact on the socioeconomic environment from the no-action alternative would be long-term, minor to moderate, beneficial, and local to regional. The beneficial impacts would result from maintaining the park's contribution to the local economy and quality of life from ongoing visitor spending for local services and goods, NPS employment, NPS contracting, and concessioner activity and employment.

Impacts of Implementing Alternative B

Analysis. Under alternative B, the continued preservation of the wild and scenic river values of the Virgin River and increased and improved opportunities for outdoor recreation, interpretation, and education (relative to alternative A) would continue and increase its contribution to the high quality of life for local residents of the Dixie area.

Furthermore alternative B would utilize a robust resource monitoring framework that ensures the resources and values of the Virgin River would be maintained, preserved, and kept with the natural character of the area, resulting in long-term preservation of quality of life for local and regional residents. These key elements would result in a long-term, negligible to minor, beneficial impact on local quality of life.

The overall intrinsic contribution of the Virgin River to the economy of the area would also be maintained by alternative B. By continuing to provide natural area preservation, numerous recreation opportunities, facilities, and park settings for organized group activities, the park would continue to help make the area an attractive place for both residents and businesses to call home. In turn, the area's quality of life is a draw for business and economic growth with the help from places such as Zion National Park and the Virgin River. Alternative B would sustain this general economic value to the area. However, relative to the no-action alternative, this would result in an impact that would be long-term, negligible, and beneficial.

The emphases of alternative B on restoration of natural river processes could redistribute access to the river corridor if impacts on the resources meet the resource standards. Alternative B would place limitations on recreational activities and visitor numbers that are negatively impacting resources. These limitations could place restrictions on commercial operations such as the CUA tours and horseback riding concession. This action could result in a short- to long-term, minor to moderate, adverse impact on the socioeconomic environment.

Cumulative Impacts. The other past, present, and reasonably foreseeable future actions described under the "Cumulative Effects" section of the no-action alternative would be the same under this alternative, resulting in short- to long-term, moderate, beneficial impacts on the socioeconomic environment.

When the likely effects of alternative B are added to the effects of these other past, present, and reasonably foreseeable future actions, there would be a long-term, moderate, beneficial cumulative impact on the socioeconomic environment. Alternative

B would contribute a small to appreciable, long-term, beneficial increment to the cumulative effect.

Conclusion. The overall impact on the socioeconomic environment from alternative B would be long-term, minor to moderate, and beneficial. The beneficial impacts would result from protecting river values. These actions would increase the park's contribution to the local economy and quality of life because of visitor spending on local services and goods, NPS employment, NPS contracting, and concessioner activity and employment.

Impacts of Implementing Alternative C

Analysis. Under alternative C, the continued preservation of the wild and scenic river values of the Virgin River and increased and improved opportunities for outdoor recreation, interpretation, and education (relative to alternative A) would continue and increase its contribution to the high quality of life for local residents of the Dixie area.

Furthermore, as with alternative B, alternative C would utilize a robust resource monitoring framework that ensures the resources and values of the Virgin River would be maintained, preserved, and kept with the natural character of the area, resulting in long-term preservation of quality of life for local and regional residents. These key elements would result in a long-term, negligible to minor, beneficial impact on local quality of life.

The overall intrinsic contribution of the Virgin River to the economy of the area would also be maintained by alternative C. By continuing to provide natural area preservation, numerous recreation opportunities, facilities, and park settings for organized group activities, the park would continue to help make the area an attractive place for both residents and businesses to call home. In turn, the area's quality of life is a draw for business and economic growth with the help from places such as Zion National Park and the Virgin River. Alternative C would sustain this general economic value to the area. However, relative to the no-action alternative, this would result in an impact that would be long-term, negligible, and beneficial.

The emphases of alternative C on restoration of natural river processes could redistribute access to the river corridor if impacts on the resources meet the resource standards. Relative to alternative B, alternative C places emphasis on maintaining recreational opportunities and allowing higher visitation numbers through redistribution and site hardening. As with alternative B, alternative C would place limitations on recreational activities and visitor numbers that are negatively impacting resources. These limitations could place restrictions on commercial operations such as the CUA tours and horseback riding concession. This action could result in a short- to long-term, minor to moderate, adverse impact on the socioeconomic environment.

Cumulative Impacts. The other past, present, and reasonably foreseeable future actions described under the "Cumulative Effects" section of the no-action alternative would be the same under this alternative, resulting in short- to long-term, moderate, beneficial impacts on the socioeconomic environment.

When the likely effects of alternative C are added to the effects of these other past, present, and reasonably foreseeable future actions, there would be a long-term, moderate, beneficial cumulative impact on the socioeconomic environment. Alternative C would contribute a small to appreciable, long-term, beneficial increment to the cumulative effect.

Conclusion. The overall impact on the socioeconomic environment from alternative C would be long-term, minor to moderate, and beneficial. The beneficial impacts would

result from protecting river values and maintaining, improving, and increasing access to the river corridor. These actions would increase the park's contribution to the local economy and quality of life because of visitor spending on local services and goods, NPS employment, NPS contracting, and concessioner activity and employment.

Consultation & Coordination 5



PUBLIC INVOLVEMENT

Public involvement for this planning effort began during the scoping phase (an early and open process requesting the public to submit comments, concerns, and suggestions relating to the scope of the project and preliminary issues).

A newsletter describing the related legislation, planning approach, components of the plan, the proposed outstandingly remarkable values, and other pertinent information related to the planning process was mailed to 220 individuals and federal, state, and nongovernmental agencies. Three public workshops were held—(1) October 26, 2010, in Salt Lake City, Utah; (2) October 27, 2010, in Springdale, Utah; and (3) October 28, 2010, in St. George, Utah. There were approximately 26 attendees.

The public meetings were advertised through press releases to local and state media outlets, as well as through postcards that were made available at the visitor center and the BLM field office in St. George, Utah.

Sixty-four pieces of correspondence were received via either by direct input into the PEPC, a completed hardcopy comment form, email, or formal written correspondence. Correspondence was received from 14 different states (Alabama, Arizona, California, Colorado, Idaho, Maryland, Montana, North Carolina, New Jersey, New Mexico, Nevada, Tennessee, Utah, and Wyoming), and two foreign countries (Austria and Germany). Comments were also received from the following governmental and nongovernmental organizations:

- Grand Canyon River Guides, American Rivers
- Pikes Peak Whitewater Club, American Whitewater Association
- San Miguel Whitewater Association
- Utah Division of Water Quality
- Utah Whitewater Club

The Bureau of Land Management and National Park Service sought out public comment on, and identification of any issues or concerns that should be addressed in the comprehensive river management plan. We provided the public with seven questions to help them think about wild and scenic issues, alternative management strategies, etc. The questions were listed in the public scoping newsletter as well as comment cards available at public meetings and on the park planning website. The questions were as follows:

1. Please tell us what makes the Virgin River and its tributaries special to you and why?
2. When you visit the Virgin River and its tributaries, what are the most important activities and experiences for you?
3. What opportunities exist for protecting and enhancing the Virgin River and its tributaries and their outstandingly remarkable values (ORVs)?
4. What issues exist related to protecting and enhancing the Virgin River and its tributaries and their outstandingly remarkable values (ORVs)?
5. When you visit the Virgin River and its tributaries, have you experienced any conflicts with other activities? If so, what was the conflict and circumstance?
6. Imagine you are visiting the Virgin River and its tributaries 20 years from now. What river conditions would you like to see? What experiences would you like to have on or near the river? Would there be any changes from the present?

7. Additional comments or suggestions?

A summary of the comments received during public scoping and organized by these seven questions is as follows:

Question 1. Please tell us what makes the Virgin River and its tributaries special to you and why?

Natural Resources (including hydrology and free-flowing conditions)

- the amount of water flowing through its various streams
- they are undammed, free-flowing rivers
- their banks support a natural riparian ecosystem, except where grazing has impaired that value
- the role that the river played in creating one of the most spectacular landscapes on the planet and the role it continues to play through the plant and animal habitat it provides and the scenic beauty it provides
- most of this region is arid and subject to prolonged droughts, so all natural waterways and associated riparian habitats are rare, precious, and indispensable to maintaining healthy watersheds and many dependent wildlife and plant species
- ensure that state standards for water-related beneficial uses are met in the river

Recreational/Use Opportunities

- offer a unique chance to explore a wild desert slot canyon
- the river is never as beautiful as when it is void of the gaudy neon plastic boats
- combination of reasonable "boatable" length, incredible scenery and solitude, its free-flowing nature, and no multiyear permit application process
- no better way to experience the grandeurs of the canyons than to travel them by boat
- special because of its unique scenery and recreational opportunities
- Virgin River and its tributaries have outstanding geology, hiking, canyoneering, and kayaking

Scenery and Geology

- unique environment in the desert southwest
- most spectacular desert scenery anywhere
- slot canyon of unparalleled beauty
- one of the most beautiful and intimate canyons that one can float down
- scenery is spectacular and the remote and intimate setting are hard to find
- outstanding aesthetic and geologic beauty
- a magical place, like nowhere else in the west both in feeling and geology
- scenic value of the area is remarkable
- remoteness combined with the geologic features make the river system unique
- natural and scenic values of the canyons it carves through, the riparian areas that it supports, and the myriad activities that it invites
- fantastic little river in magnificent surroundings
- totally unique place in the world where a powerful river cuts so narrowly through a beautiful sandstone desert
- an outstanding desert river in a uniquely remarkable environment
- sandstone cliffs, deep canyons, and the water and the vegetation fed by that water, all under beautiful desert skies
- grand scale and beauty of the landscape and its natural features

Remote and Unspoiled

- few human-made impacts
- setting is wild, natural, unspoiled land
- feeling of isolation and wildness can be found in the tributaries and the river itself

Question 2. When you visit the Virgin River and its tributaries, what are the most important activities and experiences for you?

Recreational Activities

- kayaking
- camping
- backpacking
- hiking
- climbing
- canyoneering
- wildlife viewing
- photography
- bird-watching
- sightseeing

Sensory-based Activities/Experiences

- finding peace, tranquility, solitude
- enjoying the natural scenic wonder of this amazing river and canyons
- enjoying the wild and wilderness character of the land bordering these rivers
- enjoying the beauty and quiet of the landscape
- scenic views free of obstructions
- quiet contemplation and spiritual renewal

Question 3. What opportunities exist for protecting and enhancing the Virgin River and its tributaries and their Outstandingly Remarkable Values (ORVs)?

Recreation

- find opportunities for unorganized recreation and exercise
- protect the Virgin River (at least some areas) from recreational overuse
- keep the river open to more types of recreation
- no restrictions to boating in the Zion Narrows
- kayakers should be able to enjoy this canyon just as any other users without any river flow restrictions
- allowing more boating access would make more people aware of the outstandingly remarkable values of the Virgin River
- hope that whitewater kayaking will still be allowed through The Narrows and through the park
- the whitewater-related outstandingly remarkable values would be lost if whitewater kayaking was further restricted
- kayaking is dependent on the river and is the most remarkable recreational activity
- limiting travel methods that degrade the resource for future generations
- ensuring other travels utilize zero impact techniques
- allowing kayaking is greatly enhancing the Virgin River
- most important opportunity is protecting access to the river for people to enjoy the river however they choose
- allowing people to travel through the canyons is a remarkable way to protect the corridors and enhance the love for them
- education through experiences that are lived; the only way to really know how wonderful the rivers are is to go through them

- continuing to allow access to the river inside the park
- opening the river to kayakers above 600 cfs
- The Narrows especially are an incredible place to explore and the kayaking through the narrow slot canyons down from Deep Creek is an exceptional experience
- most important thing to protect the future of kayaking The Narrows section is education about the challenges of the run
- important issue for the protection of The Narrows run is allowing overnight (two day) trips and camping inside The Narrows
- ensure that kayaking continues to be made available through the Virgin River narrows
- if future use diminishes the area, then perhaps reducing the volume of use is needed
- most important thing the National Park Service can do to both protect and enhance the Virgin River and its outstandingly remarkable values is to provide access to the public with a minimum of restrictions—allow more people to experience the outstandingly remarkable values and develop a desire to protect it
- boating in these slot canyons is an outstandingly remarkable value and these canyons offer one of the best wilderness river trips in the world
- giving people a framework of regulations that helps them enjoy their stay safely
- permit system that is designed only to protect the resource from overcrowding
- ability to get a paddling permit the day before to allow an earlier start and minimize forced bivouac and rescues
- low-impact, responsible use
- enforcing the Leave No Trace principles for overnight in The Narrows
- allow people to see the park in the manner they prefer
- revision and clarification of the park regulations concerning kayaking in The Narrows
- current permit system excludes kayakers from quality river usage (because of flow requirements)

Free-flowing Condition

- maintaining its free-flowing nature

Water Quality

- concern about pollution and unnatural erosion at the headwaters
- wastewater runoff and diversion management upstream
- ensure selenium and suspended sediment are not allowed to be dumped into the Virgin River
- stop pollutants from entering the watershed by restricting development
- water quality is not listed as a specific outstandingly remarkable value, but it is noted that it is one of the three pillars of protection under the Wild and Scenic Rivers Act—water quality is generally high for all the segments identified—however, exceedances in fecal bacteria have been measured on the North Fork Virgin River upstream of Zion National Park—there are opportunities to implement best management practices in that upper watershed that would most likely result in fewer or no exceedances; the most significant of those best management practices would be making upgrades to current flood irrigation systems on grazed pastures

Natural Resources

- it is a place one can get excited about for its beauty alone, along with the natural history and human history of the area
- monitoring of native fish populations and reduction of fishing impacts if needed
- the National Park Service has a mandate for protecting resources defined by the wild and scenic river designation—archeological, geologic, recreational use such as kayaking, riparian landscapes, fish and wildlife, and flows to maintain the river's seasonal pulse

Scenic

- protect the scenic values associated with the river views for hikers and not just the land views for boaters

General—Protect River

- keep it remote and wild
- adopt reasonable regulations to protect opportunities for solitude and quiet recreation in the wild canyons of the backcountry zone, so noisy crowds do not spoil the experience for everybody else
- elimination/reduction of invasive plant and animal species
- keep the river and tributaries protected from development, improvements, or abuse
- protection of the headwaters from degradation from mining, grazing, logging, development, ORV use, etc.
- where possible, reducing streambed modifications by private landowners through an education campaign
- creating the largest buffer possible to extractive resource gathering
- limit or restrict deforestation in the watershed
- actively removing harmful salt cedar, Russian olive, and other invasive species
- improve public education of and respect for outstandingly remarkable values
- install temporary fencing to restore riparian habitats and biodiversity harmed by excessive, chronic deer browse pressure
- protecting the Virgin river is critical to protecting one of America's hidden gems
- better management of the river beyond the Zion National Park boundaries

Comments Specific to BLM Lands

- Identify areas where grazing has impaired the riparian and aquatic ecosystems, then remove or reduce grazing, and restore the natural ecosystems
- Identify any areas where off-road vehicles are reaching the river banks; close those areas to vehicles and restore any damaged lands

Access

- preserve access to a variety of uses including whitewater kayaking and rafting
- better access points for the most popular canyons and river areas
- limiting public access and uses that cumulatively can harm or degrade outstandingly remarkable values
- allow access for river runners through The Narrows via all tributaries and on the river through the remainder of the park

Question 4. What issues exist related to protecting and enhancing the Virgin River and

its tributaries and their outstandingly remarkable values (ORVs)?

Recreation

- ultimately a cap on the number of foot visitors allowed in the Virgin will be necessary to preserve the intangible beauty of these gorges, and while some people may argue against it or even try to violate it, it is a necessary evil to maintain it for future generations
- boaters should be allowed to enjoy this magical place as much as the hikers do—no more, no less—only refinement of the current rules and regulations will make this a possibility
- overcrowding
- remove the restriction of 600 cfs for kayaking
- boating restrictions inhibit the majority of boaters from enjoying the Virgin River
- restrictions and registrations are appropriate
- kayaking has very little impact on the surrounding environment because we float on the water
- allowing access to kayakers and all recreational pursuits
- onerous park restrictions prevent access by boaters due to perceived high flows—these flow restrictions prevent use and enjoyment of the resource
- important to make sure the people who do require emergency assistance pay for the costs after the efforts are put forth; if people require the needs of emergency assistance, they must pay
- wilderness should be enjoyed safely by people, respected by people, and protected by people however they can contribute
- too many recreational visitors in the same time and place can spoil the experience for everybody; reasonable regulations are needed
- the more water in the river, the better for kayaking activities—please do not deny access to the river
- would be desirable to have a permit system that would allow spontaneous river descents, considering the river can rise and fall quickly with a change in weather conditions
- would like to see the flow limit raised on the Zion Narrows to 800 cfs for 24 hours—optimal flow for that section is 600–800 cfs
- boating on the streams do not harm the resource at all

Natural Resources

- please emphasize the wildlife values and natural scenery when establishing a management plan and do not let special interest recreation lobbies monopolize use of the river

Types and Levels of Development and Other Nonrecreational Use

- prevent debris disposal into the river from upstream on the East Fork
- cattle often wander fairly deep down into the canyon in a place where domestic cattle have no reason or excuse for being there
- keeping access points free of trash, manure
- upstream water use and impoundments
- resource extraction (i.e., minerals, natural gas)
- the Bureau of Land Management needs to make sure off-road vehicles are not riding in the streams, crossing them, or riding along the banks and damaging the natural ecosystems and wild character of the river

- livestock grazing on BLM-managed lands should be excluded from the riparian zone or limited so it does not impair the riparian and aquatic ecosystems
- activities that harm the resource should be curtailed or prohibited

Interpretation and Education

- park should educate users and encourage them to adequately assess the remoteness of the run and the potential complications and difficulties if unprepared (boaters in The Narrows)
- education of the dangers of kayaking The Narrows, which can be done safely by experienced boaters
- educating the users that are not used to Leave No Trace or treading lightly practices that use each resource
- overuse and development are probably the two biggest threats to protecting the river
- including pack it in / pack it out to developments in the park and Springdale that encroach upon the riverbanks and affect the riverbed

Water—Quality, Quantity, and Free-flowing Condition

- conservation of water is the most pressing issue
- there are opportunities for improvement to be made; however, those improvements are made only on a voluntary basis, meaning landowners must agree to implement the best management practices and assist with funding; currently, landowners do not necessarily agree that there is a problem or that their land management practices may be driving the observed exceedances; Utah Division of Water Quality will continue monitoring and will move ahead with a total maximum daily load study, taking a close look at the fecal bacteria issue, identifying sources and attempting to mitigate them
- the effects of runoff from the roads and parking lots nearby may have a detrimental impact on the river composition

Question 5. When you visit the Virgin River and its tributaries, have you experienced any conflicts with other activities? If so, what was the conflict and circumstance?

Positive

- friendly human contact only
- no conflicts between users - lots of cooperation in fact

Water-based Recreation

- ever-growing number of people in the park and specifically the canyons of the Virgin River
- most people enjoyed watching us paddle the staircase section and the bus drivers were very welcoming to our sport (kayaking)
- overuse of the Virgin River by boats can greatly diminish the feeling of solitude and remoteness
- confusing regulations toward kayakers
- primary conflict would be a lack of permits available to kayak the Virgin River, especially at higher flows—could allow kayakers to do this run at flows over 600 cfs, requiring that one kayaker in the group has done the run at the currently allowed flows
- commercial rafting in The Narrows or the park run could create conflicts
- too many kayakers on these runs could be a conflict
- Chamberlain Ranch access is hard

- chronic degraded water quality and turbidity from excessive crowds hiking the first few miles of The Narrows

Other

- grazing and agricultural use (on BLM and private lands along designated sections)
- toad killed by fast bikers along the paved trail along the Virgin River near the campgrounds

Question 6. Imagine you are visiting the Virgin River and its tributaries 20 years from now. What river conditions would you like to see? What experiences would you like to have on or near the river? Would there be any changes from the present?

Recreational Use

- change in the kayak rules
- a stern cap on the number of hikers in the canyons
- major changes to the access and permitting requirements—allowable "boatable" flows a problem
- major obstacle to kayaking The Narrows at low flows is the time-consuming approach to Deep Creek—when combined with the requirement to get a permit in person, there is no margin for error
- river running options continue to be open to whoever wants to enjoy them
- a small boat ramp at Sinawava and maybe one somewhere below Satan's Staircase
- minimize boat use on some sections of the river
- don't think we need to improve any more trails
- don't think bolting should be allowed on any more on the walls and canyons
- low impact usage should be emphasized to preserve the wilderness nature of the park
- perhaps make rescue insurance required, rather than closing the river; education would be the preferred method
- no more restrictions to kayaking other that the daily user quotas— no "boatable" flow limits
- remove life-threatening logs from The Narrows, which have been a factor in most of the kayaking accidents
- kayaking is compatible with wild and scenic rivers and hopefully in 20 years that designation is secured from this process and that recreational boating is allowed
- would like to see the permit system for kayaking the North Fork changed to accommodate kayak trips in a safe and timely manner
- hope to have the same experience as we did last year
- would hope to see the river as wonderful as it is now
- would love to maintain the experience of kayaking the river in the short window of opportunity that is available, while maintaining Leave No Trace ethics
- would like to have an experience very similar to today
- hope to have enjoyable near wilderness experiences on the river
- Virgin River narrows open for kayaking all the time
- would like to continue to experience the river as a kayaker, threading through those grand walls with water rushing underneath me
- would like to give my children the same opportunity to experience that wild, unhindered state of this desert river as I did as a child

- would like the river conditions to be the same as they are today and have access without restriction based on flows [for boating]
- Would like to see the "boatable" flow limit raised on the Zion Narrows to maybe something like 800 cfs for 24 hours—optimal flow for that section is 600–800 cfs
- would like to see boaters given full access to The Narrows
- continued access to the park and the river
- visitors should be able to find solitude in the backcountry canyons

Natural Resource Conditions

- Virgin River in as good or better conditions as it is now
- regular annual flood seasons with less modifications to the river corridor and off the highway; attempt to remove invasive fish populations and tamarisk in an effort to restore the Virgin River to its natural state
- no changes to the riparian area
- completely restored and functioning natural riparian and aquatic ecosystems
- riparian habitat fully restored
- no livestock grazing should be taking place within the zone of influence
- restored riparian habitats by removing nonnative invasive species, reduction in deer browse pressure, and careful management of public access and uses
- clean riparian environment

Water Quality

- water quality would remain in a pristine state
- water would be clean
- water clear and clean

Free-flowing Condition

- hope the river flows like it does today
- a natural riverbed (no dams or any human-made features added)
- less development of riverbed

General

- improved and updated systems such as campsites, access, and educational programming about environmental issues
- preserved in its current state with little or no additional improvements or changes to the river corridor or its tributaries
- would like the canyon to be preserved in its current state
- minimal impacts and intrusions from modern amenities
- natural experience to be the same or better than it is today
- would like to see the river remain wild with a minimum of human interference
- avoiding human-made modifications to the riverbed is a must
- preventing overuse of the corridor and excessive erosion along banks
- river and its surroundings free of human-made features and invasive species
- as little impact from humans as possible
- would like to see a wild river (unregulated flows) with easy access (permits, access/egress points) to enjoy a level of solitude, but would be pleased to share the rivers with others at the same time
- would like it to remain as it is today
- don't want to see overdevelopment, overuse, or degradation of the resource

- less development near tributaries on Kolob Terrace and Chamberlain Ranch

Question 7. Additional comments or suggestions?

Recreation

- when boating The Narrows, a one-night stay should be required to ensure that parties making the trip are prepared for the remoteness and commitment level of taking on the canyon
- whitewater boaters who want to attempt The Narrows at a reasonable water flow should be first required to successfully run the section of rapids within the park from below the Temple of Sinawava to the visitor center
- The Narrows is better attempted as an overnight trip for boaters because of its remote location
- shelter, food, and additional supplies should be required equipment
- if there is a concern about the difficult rescue in The Narrows, kayakers should be required to sign extensive waivers and/or carry private SAR insurance
- maintain a list of local boaters to send out requests for help in the event of an emergency would be helpful
- educating park staff on whitewater kayaking through The Narrows so they can share conditions with would-be boaters and inspecting their gear (much like Westwater Canyon in eastern Utah) could further reduce the possibility of an emergency
- kayaking must be acknowledged and accepted as part of the very nature of the National Wild and Scenic River System in your plan
- please consider kayaking as a valuable resource for the Virgin River area
- please keep the river open to paddlers, it is one of the most incredible river trips in the United States
- there could be a gear check and questionnaire about paddling experience before entering the canyon to eliminate hazardous situations in the depths
- allow kayaking above 600 cfs due to the extreme diurnal flow even when the river goes over 1,200 cfs at night, it is at a safe flow for experienced boaters during the day
- revisit the kayaking permit situation and instead of setting determined maximum flows, focus on education of the spring environment and the need to be prepared.
- consider changing the permitting process to allow permits to be obtained a day or two before—allowing kayakers to put on earlier in the day, allowing more daylight to complete the run
- would like to see the flow limit raised on the Zion Narrows to maybe something like 800 cfs for 24 hours—optimal flow for that section is 600–800 cfs
- would like to see continued unrestricted access to the Virgin River and its tributaries for boaters

Natural Resources

- Virgin River provides habitat from many animals and plants that would not be able to exist without the valuable water source the river provides
- concerned about water pollution from summer homes near Chamberlain Ranch
- have seen horse manure pushed into the river near Court of the Patriarchs horse corrals—should be investigated

INTERNAL WORKSHOPS

The planning team initially conducted at an outstandingly remarkable values workshop in Springdale, Utah, outside Zion National Park in June 2010. The outstandingly remarkable values were developed for subsequent use in shaping management alternatives. The team gathered pertinent information about the designated wild and scenic rivers, drafted narrative descriptions of the outstandingly remarkable values, identified site-specific issues and opportunities, and identified stakeholders and their interests. The outstandingly remarkable values workshop provided the foundation for this comprehensive management plan. Participants in this workshop included staff from Zion National Park, Bureau of Land Management St. George Field Office, the State of Utah, the Five County Association of Governments, and the Town of Springdale.

A second planning team workshop was held February 15–17, 2011, at Zion National Park to develop a range of alternatives for the protection and enhancement of the designated wild and scenic river. During the workshop, team members focused on covering major components of the comprehensive river management plan, including:

- planning issues and opportunities
- goal statements
- best management practices
- alternative concept statements
- alternative management strategies
- section 7 evaluation guidelines
- instream flows
- monitoring framework
- guiding principles to address climate change
- boundary delineation

A visitor use management and alternatives refinement workshop was held May 24–26, 2011, at the Canyon Community Center in Springdale, Utah, and was attended by staff from the National Park Service and the Bureau of Land Management. The purpose of the workshop was to develop a long-term strategy for managing visitor use along the Virgin River corridor to be included in the comprehensive river management plan.

To achieve this purpose, the workshop sought to accomplish the following:

- review and understand the outstandingly remarkable values of the Virgin River and review related management goals and objectives
- understand the existing state of knowledge related to visitor influence on outstandingly remarkable values, free-flowing condition, and water quality (river values)
- identify the critical elements of the river-related visitor experience and resource conditions that may serve as indicators and that would inform the potential kinds and amounts of visitor use to be considered in the plan
- prioritize the list of potential visitor use management indicators and develop a range of standards for inclusion in the plan
- identify management strategies that could be applied for each priority indicator
- discuss kinds and amounts of use by river segment

Last, a choosing by advantages workshop was held November 15–16, 2011, at Zion National Park and attended by staff from the National Park Service and the Bureau Land Management. The purpose of this workshop was to further clarify and understand the advantages and costs of the alternatives developed during the March 23–24, 2011, alternatives workshop and to develop a preferred alternative approach for management of the wild and scenic river based on advantages and costs of each

alternative. The outcome of this workshop is a recommendation of a preferred alternative to the NPS Intermountain Regional director and the BLM St. George Field Office manager.

CONSULTATION AND COORDINATION WITH OTHER AGENCIES, OFFICES, AND ASSOCIATED TRIBES

Consultation with federal and state agencies and American Indian tribes for the comprehensive management plan was initiated during public scoping and then reaffirmed in February 2012. Scanned copies of letters received from other agencies, offices, and associated tribes are included in the appendixes.

CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE

Zion National Park and the St. George Field Office initiated an informal consultation with the U.S. Fish and Wildlife Service in a letter October 5, 2010, notifying the U.S. Fish and Wildlife Service that we were beginning the process of developing a comprehensive management plan for the recently designated wild and scenic segments of the Virgin River. The Endangered Species Act requires in section 7(a)(2) that each federal agency, in consultation with the Secretary of the Interior, ensures that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The information provided by the U.S. Fish and Wildlife Service was used to develop the list of special status species found in "Chapter 3: Affected Environment."

CONSULTATION WITH TRADITIONALLY ASSOCIATED TRIBES

In letters dated May 2010, the planning team notified the offices of the 12 traditionally associated tribes that it had begun preparation of the comprehensive management plan. The tribes were invited to consult and participate in the planning process on a government-to-government basis. No comments concerning the plan or the actions of the plan have been received from any of the tribes. Consultation with American Indian tribes is carried out in accordance with various federal laws, executive orders, regulations, and policies (e.g., Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments"; Executive Order 13007, "Indian Sacred Sites"; and section 106 of the National Historic Preservation Act).

Copies of the comprehensive management plan will be provided by request to any associated tribe for review and comment. Tribes would have opportunities to identify any subsequent issues or concerns, and the park would continue to consult during preparation/implementation of the plan and as part of its ongoing commitment to maintain open tribal- agency communications. Information and recommendations conveyed by associated tribes with regard to river management or other concerns would be considered and addressed as appropriate, and the agencies will undertake measures to protect and maintain traditional access to culturally important resources and places.

SECTION 106 CONSULTATION WITH THE UTAH STATE HISTORIC PRESERVATION OFFICE

The planning team notified the Utah State Historic Preservation Office and the Advisory Council on Historic Preservation of the commencement of the comprehensive management plan in a letter dated April 25, 2012, and invited the Utah state historic preservation officer and ACHP staff to participate in the consultation and planning process to assist with the preservation management of historic properties. The plan / environmental assessment will be available for

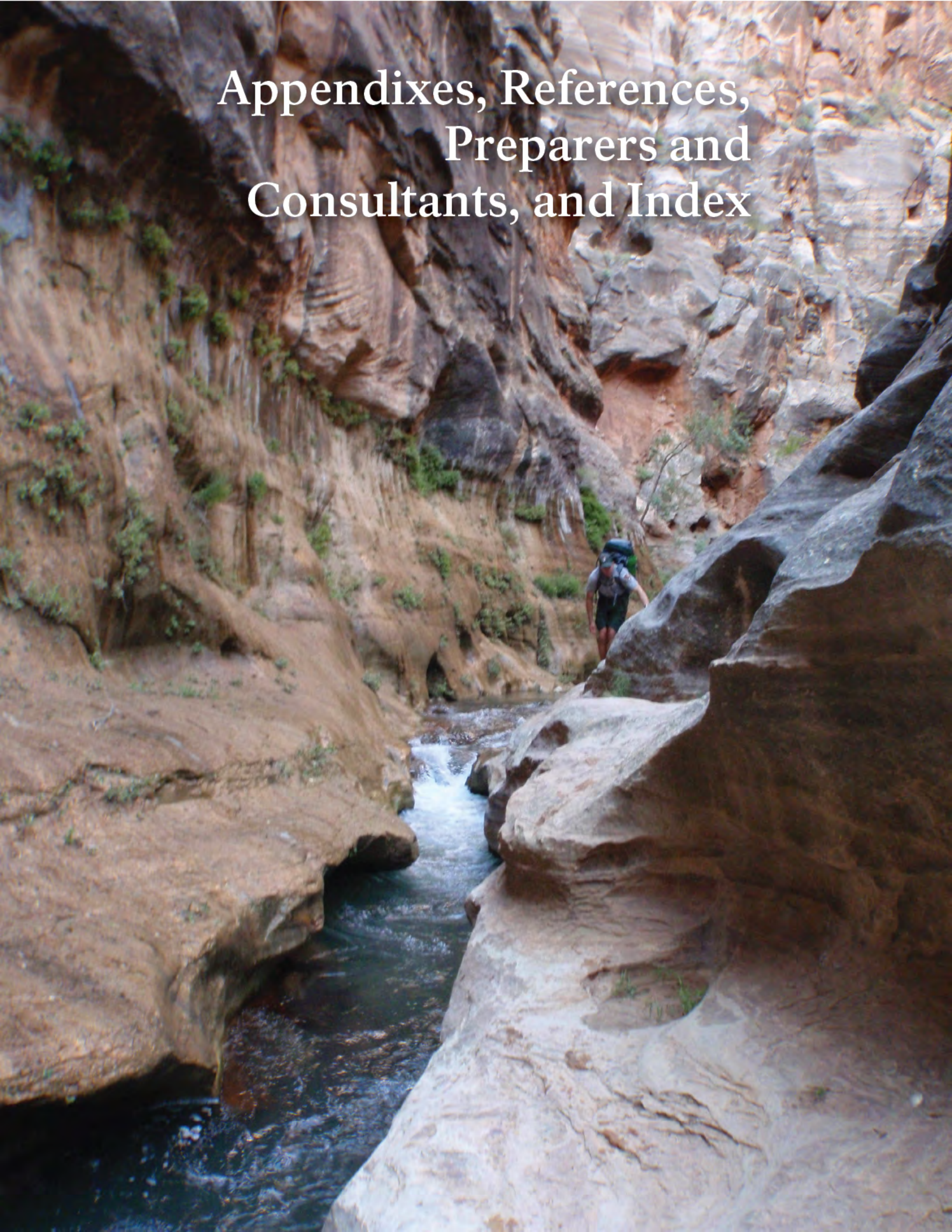
review and comment by the Utah State Historic Preservation Office and Advisory Council on Historic Preservation. The planning team will consult with the state historic preservation officer and ACHP staff in accordance with section 106 of the National Historic Preservation Act with regard to specific undertakings that may arise from the comprehensive management plan to assess potential effects on historic properties and to seek ways to avoid or limit adverse effects as necessary.

Environmental Assessment Review

This plan / environmental assessment will be released for a 30-day public review period. To inform the public of the availability of the plan / environmental assessment, the planning team will publish and distribute a letter to various agencies, tribes, and members of the public on the mailing list and issue a press release. Copies of the plan / environmental assessment will be provided to interested individuals, upon request. Copies of the plan / environmental assessment will also be available for review and comment on the Internet at http://park planning.nps.gov/zion.

During the public comment period, the public is encouraged to submit their comments to the address provided on the cover page at the beginning of this document or to provide comments on the park planning website. Following the close of the comment period, all comments will be reviewed and analyzed prior to the release of the decision document. The Bureau of Land Management and National Park Service will issue responses to substantive comments received during the comment period and will make appropriate changes to the plan / environmental assessment, as needed.

Appendixes, References, Preparers and Consultants, and Index



APPENDIX A: LEGISLATION

Wild & Scenic Rivers Act

An Act[1]
To provide for a National Wild and Scenic Rivers System, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that

SECTION 1.

(a) This Act may be cited as the "Wild and Scenic Rivers Act."

(b) It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

(c) The purpose of this Act is to implement this policy by instituting a national wild and scenic rivers system, by designating the initial components of that system, and by prescribing the methods by which and standards according to which additional components may be added to the system from time to time.

SECTION 2.

(a) The national wild and scenic rivers system shall comprise rivers
(i) that are authorized for inclusion therein by Act of Congress, or
(ii) that are designated as wild, scenic or recreational rivers by or pursuant to an act of the legislature of the State or States through which they flow, that are to be permanently administered as wild, scenic or recreational rivers by an agency or political subdivision of the State or States concerned, that are found by the Secretary of the Interior, upon

[1] The Wild and Scenic Rivers Act (16 U.S.C. 1271-1287) as set forth herein consists of Public Law 90-542 (October 2, 1968) and amendments thereto.

application of the Governor of the State or the Governors of the States concerned, or a person or persons thereunto duly appointed by him or them, to meet the criteria established in this Act and such criteria supplementary thereto as he may prescribe, and that are approved by him for inclusion in the system, including, upon application of the Governor of the State concerned, the Allagash Wilderness Waterway, Maine; that segment of the Wolf River, Wisconsin, which flows through Langlade County and that segment of the New River in North Carolina extending from its confluence with Dog Creek downstream approximately 26.5 miles to the Virginia State line.

Upon receipt of an application under clause (ii) of this subsection, the Secretary shall notify the Federal Energy Regulatory Commission and publish such application in the Federal Register. Each river designated under clause (ii) shall be administered by the State or political subdivision thereof without expense to the United States other than for administration and management of federally owned lands. For purposes of the preceding sentence, amounts made available to any State or political subdivision under the Land and Water Conservation [Fund] Act of 1965 or any other provision of law shall not be treated as an expense to the United States. Nothing in this subsection shall be construed to provide for the transfer to, or administration by, a State or local authority of any federally owned lands which are within the boundaries of any river included within the system under clause (ii).

(b) A wild, scenic or recreational river area eligible to be included in the system is a free-flowing stream and the related adjacent land area that possesses one or more of the values referred to in Section 1, subsection (b) of this Act. Every wild, scenic or recreational river in its free-flowing condition, or upon restoration to this condition, shall be considered eligible for inclusion in the national wild and scenic rivers system and, if included, shall be classified, designated, and administered as one of the following:

(1) Wild river areas -- Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) Scenic river areas -- Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) Recreational river areas -- Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

SECTION 3.

(a) The following rivers and the land adjacent thereto are hereby designated as components of the national wild and scenic rivers system:

[List of designated rivers omitted. Please see following list.]

(b) The agency charged with the administration of each component of the national wild and scenic rivers system designated by subsection (a) of this section shall, within one year from the date of designation of such component under subsection (a) (except where a different date is provided in subsection (a)), establish detailed boundaries therefore (which boundaries shall include an average of not more than 320 acres of land per mile measured from the ordinary high water mark on both sides of the river); and determine which of the classes outlined in section 2, subsection (b), of this Act best fit the river or its various segments. Notice of the availability of the boundaries and classification, and of subsequent boundary amendments shall be published in the Federal Register and shall not become effective until ninety days after they have been forwarded to the President of the Senate and the Speaker of the House of Representatives.

(c) Maps of all boundaries and descriptions of the classifications of designated river segments, and subsequent amendments to such boundaries, shall be available for public inspection in the offices of the administering agency in the District of Columbia and in locations convenient to the designated river.

(d) (1) For rivers designated on or after January 1, 1986, the Federal agency charged with the administration of each component of the National Wild and Scenic Rivers System shall prepare a comprehensive management plan for such river segment to provide for the protection of the river values. The plan shall address resource protection, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of this Act. The plan shall be coordinated with and may be incorporated into resource management planning for affected adjacent Federal lands. The plan shall be prepared, after consultation with State and local governments and the interested public within 3 full fiscal years after the date of designation. Notice of the completion and availability of such plans shall be published in the Federal Register.

(2) For rivers designated before January 1, 1986, all boundaries, classifications, and plans shall be reviewed for conformity within the requirements of this subsection within 10 years through regular agency planning processes.

SECTION 4.

(a) The Secretary of the Interior or, where national forest lands are involved, the Secretary of Agriculture or, in appropriate cases, the two Secretaries jointly shall study and submit to the President reports on the suitability or nonsuitability for addition to the national wild and scenic rivers system of rivers which are designated herein or hereafter by the Congress as

potential additions to such system. The President shall report to the Congress his recommendations and proposals with respect to the designation of each such river or section thereof under this Act. Such studies shall be completed and such reports shall be made to the Congress with respect to all rivers named in subparagraphs 5(a) (1) through (27) of this Act no later than October 2, 1978. In conducting these studies the Secretary of the Interior and the Secretary of Agriculture shall give priority to those rivers

(i) with respect to which there is the greatest likelihood of developments which, if undertaken, would render the rivers unsuitable for inclusion in the national wild and scenic rivers system, and

(ii) which possess the greatest proportion of private lands within their areas. Every such study and plan shall be coordinated with any water resources planning involving the same river which is being conducted pursuant to the Water Resources Planning Act (79 Stat. 244; 42 U.S.C. 1962 et seq.). Each report, including maps and illustrations, shall show among other things the area included within the report; the characteristics which do or do not make the area a worthy addition to the system; the current status of land ownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the national wild and scenic rivers system; the Federal agency (which in the case of a river which is wholly or substantially within a national forest, shall be the Department of Agriculture) by which it is proposed the area, should it be added to the system, be administered; the extent to which it is proposed that such administration, including the costs thereof, be shared by State and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system. Each such report shall be printed as a Senate or House document.

(b) Before submitting any such report to the President and the Congress, copies of the proposed report shall, unless it was prepared jointly by the Secretary of the Interior and the Secretary of Agriculture, be submitted by the Secretary of the Interior to the Secretary of Agriculture or by the Secretary of Agriculture to the Secretary of the Interior, as the case may be, and to the Secretary of the Army, the Chairman of the Federal Power Commission, the head of any other affected Federal department or agency and, unless the lands proposed to be included in the area are already owned by the United States or have already been authorized for acquisition by Act of Congress, the Governor of the State or States in which they are located or an officer designated by the Governor to receive the same. Any recommendations or comments on the proposal which the said officials furnish the Secretary or Secretaries who prepared the report within ninety days of the date on which the report is submitted to them, together with the Secretary's or Secretaries' comments thereon, shall be included with the transmittal to the President and the Congress.

(c) Before approving or disapproving for inclusion in the national wild and scenic rivers system any river designated as a wild, scenic or recreational river by or pursuant to an act of the State legislature, the Secretary of the Interior shall submit the proposal to the Secretary of Agriculture, the Secretary of the Army, the Chairman of the Federal Power Commission, and the head of any other affected Federal department or agency and shall evaluate and give due weight to any recommendations or comments which the said officials furnish him within ninety days of the date on which it is submitted to them. If he approves the proposed inclusion, he shall publish notice thereof in the Federal Register.

(d) The boundaries of any river proposed in section 5(a) of this Act for potential addition to the National Wild and Scenic Rivers System shall generally comprise that area measured within one-quarter mile from the ordinary high water mark on each side of the river. In the case of any designated river, prior to publication of boundaries pursuant to section 3(b) of this Act, the boundaries also shall comprise the same area. This subsection shall not be construed to limit the possible scope of the study report to address areas which may lie more than one-quarter mile from the ordinary high water mark on each side of the river.

SECTION 5.

(a) The following rivers are hereby designated for potential addition to the national wild and scenic rivers system:

[List of study rivers and study periods is omitted. If you need the list, please contact a Council member.]

(c) The study of any of said rivers shall be pursued in as close cooperation with appropriate agencies of the affected State and its political subdivisions as possible, shall be carried on jointly with such agencies if request for such joint study is made by the State, and shall include a determination of the degree to which the State or its political subdivisions might participate in the preservation and administration of the river should it be proposed for inclusion in the national wild and scenic rivers system.

(d) (1) In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potentials. The Secretary of the Interior and the Secretary of Agriculture shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas within the United States shall be evaluated in planning reports by all Federal agencies as potential alternative uses of the water and related land resources involved.

(2) The Congress finds that the Secretary of the Interior, in preparing the Nationwide Rivers Inventory as a specific study for possible additions to the National Wild and Scenic Rivers System, identified the Upper Klamath River from below the John Boyle Dam to the Oregon-California State line. The Secretary, acting through the Bureau of Land Management, is authorized under this subsection to complete a study of the eligibility and suitability of such segment for potential addition to the National Wild and Scenic Rivers System. Such study shall be completed, and a report containing the results of the study shall be submitted to Congress by April 1, 1990. Nothing in this paragraph shall affect the authority or responsibilities of any other Federal agency with respect to activities or action on this segment and its immediate environment.

SECTION 6.

(a) (1) The Secretary of the Interior and the Secretary of Agriculture are each authorized to acquire lands and interests in land within the authorized boundaries of any component of the national wild and scenic rivers system designated in section 3 of this Act, or hereafter designated for inclusion in the system by Act of Congress, which is administered by him, but he shall not acquire fee title to an average of more than 100 acres per mile on both sides of the river. Lands owned by a State may be acquired only by donation or by exchange in accordance with the subsection (d) of this section. Lands owned by an Indian tribe or a political subdivision of a State may not be acquired without the consent of the appropriate governing body thereof as long as the Indian tribe or political subdivision is following a plan for management and protection of the lands which the Secretary finds protects the land and assures its use for purposes consistent with this Act. Money appropriated for Federal purposes from the land and water conservation fund shall, without prejudice to the use of appropriations from other sources, be available to Federal departments and agencies for the acquisition of property for the purposes of this Act.

(2) When a tract of land lies partially within and partially outside the boundaries of a component of the National Wild and Scenic Rivers System, the appropriate Secretary may, with the consent of the landowners for the portion outside the boundaries, acquire the entire tract. The land or interest therein so acquired outside the boundaries shall not be counted against the average one-hundred-acre-per-mile fee title limitation of subsection (a)(1). The lands or interests therein outside such boundaries, shall be disposed of, consistent with existing authorities of law, by sale, lease, or exchange.

(b) If 50 per centum or more of the entire acreage outside the ordinary high water mark on both sides of the river within a federally administered wild, scenic or recreational river area is owned in fee title by the United States, by the State or States within which it lies, or by political subdivisions of those States, neither Secretary shall acquire fee title to any lands by

condemnation under authority of this Act. Nothing contained in this section, however, shall preclude the use of condemnation when necessary to clear title or to acquire scenic easements or such other easements as are reasonably necessary to give the public access to the river and to permit its members to traverse the length of the area or of selected segments thereof.

(c) Neither the Secretary of the Interior nor the Secretary of Agriculture may acquire lands by condemnation, for the purpose of including such lands in any national wild, scenic or recreational river area, if such lands are located within any incorporated city, village or borough which has in force and applicable to such lands a duly adopted, valid zoning ordinance that conforms with the purposes of this Act. In order to carry out the provisions of this subsection the appropriate Secretary shall issue guidelines, specifying standards for local zoning ordinances, which are consistent with the purposes of this Act. The standards specified in such guidelines shall have the object of (A) prohibiting new commercial or industrial uses other than commercial or industrial uses which are consistent with the purposes of this Act, and (B) the protection of the bank lands by means of acreage, frontage, and setback requirements on development.

(d) The appropriate Secretary is authorized to accept title to non-Federal property within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress and, in exchange therefore, convey to the grantor any federally owned property which is under his jurisdiction within the State in which the component lies and which he classifies as suitable for exchange or other disposal. The values of the properties so exchanged either shall be approximately equal or, if they are not approximately equal, shall be equalized by the payment of cash to the grantor or to the Secretary as the circumstances require.

(e) The head of any Federal department or agency having administrative jurisdiction over any lands or interests in land within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress is authorized to transfer to the appropriate Secretary jurisdiction over such lands for administration in accordance with the provisions of this Act. Lands acquired by or transferred to the Secretary of Agriculture for the purposes of this Act within or adjacent to a national forest shall upon such acquisition or transfer become national forest lands.

(f) The appropriate Secretary is authorized to accept donations of lands and interests in land, funds, and other property for use in connection with his administration of the national wild and scenic rivers system.

(g) (1) Any owner or owners (hereinafter in this subsection referred to as "owner") of improved property on the date of its acquisition, may retain for themselves and their successors or assigns a right of use and occupancy of the improved property for noncommercial residential purposes for a definite term not to exceed twenty-five years, or in lieu thereof, for a term ending at the death of the owner, or the death of his spouse, or the death of either or both of them. The owner shall elect the term to be reserved. The appropriate Secretary shall pay to the owner the fair market value of the property on the date of such acquisition less the fair market value on such a date retained by the owner.
(2) A right of use and occupancy retained pursuant to this subsection shall be subject to termination whenever the appropriate Secretary is given reasonable cause to find that such use and occupancy is being exercised in a manner which conflicts with the purposes of this Act. In the event of such a finding, the Secretary shall tender to the holder of that right an amount equal to the fair market value of that portion of the right which remains unexpired on the date of termination. Such right of use or occupancy shall terminate by operation of law upon tender of the fair market price.
(3) The term "improved property," as used in this Act, means a detached, one-family dwelling (hereinafter referred to as "dwelling"), the construction of which was begun before January 1, 1967, (except where a different date is specifically provided by law with respect to any particular river), together with so much of the land on which the dwelling is situated, the said land being in the same ownership as the dwelling, as the appropriate Secretary shall designate to be reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use, together with any structures accessory to the dwelling which are situated on the land so designated.

SECTION 7.

(a) The Federal Power Commission shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act (41 Stat. 1063), as amended (16 U.S.C. 791a et seq.), on or directly affecting any river which is designated in section 3 of this Act as a component of the national wild and scenic rivers system or which is hereafter designated for inclusion in that system, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration. Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area on the date of designation of a river as a component of the National Wild and Scenic Rivers System. No department or agency of the United States shall recommend authorization

of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration, or request appropriations to begin construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior or the Secretary of Agriculture, as the case may be, in writing of its intention so to do at least sixty days in advance, and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would effect the component and the values to be protected by it under this Act. Any license heretofore or hereafter issued by the Federal Power Commission affecting the New River of North Carolina shall continue to be effective only for that portion of the river which is not included in the National Wild and Scenic Rivers System pursuant to section 2 of this Act and no project or undertaking so licensed shall be permitted to invade, inundate or otherwise adversely affect such river segment.

(b) The Federal Power Commission shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, as amended, on or directly affecting any river which is listed in section 5, subsection (a), of this Act, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river might be designated, as determined by the Secretary responsible for its study or approval --

(i) during the ten-year period following enactment of this Act or for a three complete fiscal year period following any Act of Congress designating any river for potential addition to the national wild and scenic rivers system, whichever is later, unless, prior to the expiration of the relevant period, the Secretary of the Interior and where national forest lands are involved, the Secretary of Agriculture, on the basis of study, determine that such river should not be included in the national wild and scenic rivers system and notify the Committees on Interior and Insular Affairs of the United States Congress, in writing, including a copy of the study upon which the determination was made, at least one hundred and eighty days while Congress is in session prior to publishing notice to that effect in the Federal Register: *Provided*, That if any Act designating any river or rivers for potential addition to the national wild and scenic rivers system provides a period for the study or studies which exceeds such three complete fiscal year period the period provided for in such Act shall be substituted for the three complete fiscal year period in the provisions of this clause (i); and

(ii) during such interim period from the date a report is due and the time a report is actually submitted to the Congress; and

(iii) during such additional period thereafter as, in the case of any river the report for which is submitted to the President and the Congress for inclusion in the national wild and scenic rivers system, is necessary for congressional consideration thereof or, in the case of any river recommended to the Secretary of the Interior under section 2(a)(ii) of

this Act, is necessary for the secretary's consideration thereof, which additional period, however, shall not exceed three years in the first case and one year in the second.

Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a potential wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or diminish the scenic, recreational, and fish and wildlife values present in the potential wild, scenic or recreational river area on the date of designation of a river for study as provided in section 5 of this Act. No department or agency of the United States shall, during the periods hereinbefore specified, recommend authorization of any water resources project on any such river or request appropriations to begin construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture in writing of its intention so to do at least sixty days in advance of doing so and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would affect the component and the values to be protected by it under this Act.

(c) The Federal Power Commission and all other Federal agencies shall, promptly upon enactment of this Act, inform the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture, of any proceedings, studies, or other activities within their jurisdiction which are now in progress and which affect or may affect any of the rivers specified in section 5, subsection (a), of this Act. They shall likewise inform him of any such proceedings, studies, or other activities which are hereafter commenced or resumed before they are commenced or resumed.

(d) Nothing in this section with respect to the making of a loan or grant shall apply to grants made under the Land and Water Conservation Fund Act of 1965 (78 Stat. 897; 16 U.S.C. 4601-5 et seq.).

SECTION 8.

(a) All public lands within the authorized boundaries of any component of the national wild and scenic rivers system which is designated in section 3 of this Act or which is hereafter designated for inclusion in that system are hereby withdrawn from entry, sale, or other disposition under the public land laws of the United States. This subsection shall not be construed to limit the authorities granted in section 6(d) or section 14A of this Act.

(b) All public lands which constitute the bed or bank, or are within one-quarter mile of the bank, of any river which is listed in section 5, subsection (a), of this Act are hereby

withdrawn from entry, sale, or other disposition under the public land laws of the United States for the periods specified in section 7, subsection (b), of this Act. Notwithstanding the foregoing provisions of this subsection or any other provision of this Act, subject only to valid existing rights, including valid Native selection rights under the Alaska Native Claims Settlement Act, all public lands which constitute the bed or bank, or are within an area extending two miles from the bank of the river channel on both sides of the river segments referred to in paragraphs (77) through (88) of section 5(a) are hereby withdrawn from entry, sale, State selection or other disposition under the public land laws of the Unites States for the periods specified in section 7(b) of this Act.

SECTION 9.

(a) Nothing in this Act shall affect the applicability of the United States mining and mineral leasing laws within components of the national wild and scenic rivers system except that --

(i) all prospecting, mining operations, and other activities on mining claims which, in the case of a component of the system designated in section 3 of this Act, have not heretofore been perfected or which, in the case of a component hereafter designated pursuant to this Act or any other Act of Congress, are not perfected before its inclusion in the system and all mining operations and other activities under a mineral lease, license, or permit issued or renewed after inclusion of a component in the system shall be subject to such regulations as the Secretary of the Interior or, in the case of national forest lands, the Secretary of Agriculture may prescribe to effectuate the purposes of this Act;

(ii) subject to valid existing rights, the perfection of, or issuance of a patent to, any mining claim affecting lands within the system shall confer or convey a right or title only to the mineral deposits and such rights only to the use of the surface and the surface resources as are reasonably required to carrying on prospecting or mining operations and are consistent with such regulations as may be prescribed by the Secretary of the Interior, or in the case of national forest lands, by the Secretary of Agriculture; and

(iii) subject to valid existing rights, the minerals in Federal lands which are part of the system and constitute the bed or bank or are situated within one-quarter mile of the bank of any river designated a wild river under this Act or any subsequent Act are hereby withdrawn from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto.

Regulations issued pursuant to paragraphs (i) and (ii) of this subsection shall, among other things, provide safeguards against pollution of the river involved and unnecessary impairment of the scenery within the components in question.

(b) The minerals in any Federal lands which constitute the bed or bank or are situated within one-quarter mile of the bank of any river which is listed in section 5, subsection (a) of this

Act are hereby withdrawn from all forms of appropriation under the mining laws during the periods specified in section 7, subsection (b) of this Act. Nothing contained in this subsection shall be construed to forbid prospecting or the issuance of leases, licenses, and permits under the mineral leasing laws subject to such conditions as the Secretary of the Interior and, in the case of national forest lands, the Secretary of Agriculture find appropriate to safeguard the area in the event it is subsequently included in the system. Notwithstanding the foregoing provisions of this subsection or any other provision of this Act, all public lands which constitute the bed or bank, or are within an area extending two miles from the bank of the river channel on both sides of the river segments referred to in paragraphs (77) through (88) of section 5(a), are hereby withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto, during the periods specified in section 7(b) of this Act.

SECTION 10.

(a) Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its esthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area.

(b) Any portion of a component of the national wild and scenic rivers system that is within the national wilderness preservation system, as established by or pursuant to the Act of September 3, 1964 (78 Stat. 890; 16 U.S.C., ch. 23), shall be subject to the provisions of both the Wilderness Act and this Act with respect to preservation of such river and its immediate environment, and in case of conflict between the provisions of these Acts the more restrictive provisions shall apply.

(c) Any component of the national wild and scenic rivers system that is administered by the Secretary of the Interior through the National Park Service shall become a part of the national park system, and any such component that is administered by the Secretary through the Fish and Wildlife Service shall become a part of the national wildlife refuge system. The lands involved shall be subject to the provisions of this Act and the Acts under which the national park system or national wildlife refuge system, as the case may be, is administered, and in case of conflict between the provisions of these Acts, the more restrictive provisions shall apply. The Secretary of the Interior, in his administration of any component of the national wild and scenic rivers system, may utilize such general statutory authorities relating to areas of the national park system and such general statutory authorities otherwise available to him

for recreation and preservation purposes and for the conservation and management of natural resources as he deems appropriate to carry out the purposes of this Act.

(d) The Secretary of Agriculture, in his administration of any component of the national wild and scenic rivers system area, may utilize the general statutory authorities relating to the national forests in such manner as he deems appropriate to carry out the purposes of this Act.

(e) The Federal agency charged with the administration of any component of the national wild and scenic rivers system may enter into written cooperative agreements with the Governor of a State, the head of any State agency, or the appropriate official of a political subdivision of a State for State or local governmental participation in the administration of the component. The States and their political subdivisions shall be encouraged to cooperate in the planning and administration of components of the system which include or adjoin State-or county-owned lands.

SECTION 11.

(a) The Secretary of the Interior shall encourage and assist the states to consider, in formulating and carrying out their comprehensive statewide outdoor recreation plans and proposals for financing assistance for State and local projects submitted pursuant to the Land and Water Conservation Fund Act of 1965 (78 Stat. 897), needs and opportunities for establishing State and local wild, scenic and recreational river areas.

(b) (1) The Secretary of the Interior, the Secretary of Agriculture, or the head of any other Federal agency, shall assist, advise, and cooperate with States or their political subdivisions, landowners, private organizations, or individuals to plan, protect, and manage river resources. Such assistance, advice and cooperation may be through written agreements or otherwise. This authority applies within or outside a federally administered area and applies to rivers which are components of the National Wild and Scenic Rivers System and to other rivers. Any agreement under this subsection may include provisions for limited financial or other assistance to encourage participation in the acquisition, protection, and management of river resources.

(2) Wherever appropriate in furtherance of this Act, the Secretary of Agriculture and the Secretary of the Interior are authorized and encouraged to utilize the following:

(A) For activities on federally owned land, the Volunteers in the Parks Act of 1969 (16 U.S.C. 18g-j) and the Volunteers in the Forest Act of 1972 (16 U.S.C. 558a-558d).

(B) For activities on all other lands, section 6 of the Land and Water Conservation Fund Act of 1965 (relating to the development of statewide comprehensive outdoor recreation plans).

(3) For purposes of this subsection, the appropriate Secretary or the head of any Federal agency may utilize and make available Federal facilities, equipment, tools and technical assistance to volunteers and volunteer organizations, subject to such limitations and restrictions as the appropriate Secretary or the head of any Federal agency deems necessary or desirable.

(4) No permit or other authorization provided for under provision of any other Federal law shall be conditioned on the existence of any agreement provided for in this section.

SECTION 12.

(a) The Secretary of the Interior, the Secretary of Agriculture, and the head of any other Federal department or agency having jurisdiction over any lands which include, border upon, or are adjacent to, any river included within the National Wild and Scenic Rivers System or under consideration for such inclusion, in accordance with section 2(a)(ii), 3(a), or 5(a), shall take such action respecting management policies, regulations, contracts, plans, affecting such lands, following the date of enactment of this sentence, as may be necessary to protect such rivers in accordance with the purposes of this Act. Such Secretary or other department or agency head shall, where appropriate, enter into written cooperative agreements with the appropriate State or local official for the planning, administration, and management of Federal lands which are within the boundaries of any rivers for which approval has been granted under section 2(a)(ii). Particular attention shall be given to scheduled timber harvesting, road construction, and similar activities which might be contrary to the purposes of this Act.

(b) Nothing in this section shall be construed to abrogate any existing rights, privileges, or contracts affecting Federal lands held by any private party without the consent of said party.

(c) The head of any agency administering a component of the national wild and scenic rivers system shall cooperate with the Administrator, Environmental Protection Agency and with the appropriate State water pollution control agencies for the purpose of eliminating or diminishing the pollution of waters of the river.

SECTION 13.

(a) Nothing in this Act shall affect the jurisdiction or responsibilities of the States with respect to fish and wildlife. Hunting and fishing shall be permitted on lands and waters administered as parts of the system under applicable State and Federal laws and regulations unless, in the case of hunting, those lands or waters are within a national park or monument. The administering Secretary may, however, designate zones where, and establish periods

when, no hunting is permitted for reasons of public safety, administration, or public use and enjoyment and shall issue appropriate regulations after consultation with the wildlife agency of the State or States affected.

(b) The jurisdiction of the States and the United States over waters of any stream included in the national wild, scenic or recreational river area shall be determined by established principles of law. Under the provisions of this Act, any taking by the United States of a water right which is vested under either State or Federal law at the time such river is included in the national wild and scenic rivers system shall entitle the owner thereof to just compensation. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.

(c) Designation of any stream or portion thereof as a national wild, scenic or recreational river area shall not be construed as a reservation of the waters of such streams for purposes other than those specified in this Act, or in quantities greater than necessary to accomplish these purposes.

(d) The jurisdiction of the States over waters of any stream included in a national wild, scenic or recreational river area shall be unaffected by this Act to the extent that such jurisdiction may be exercised without impairing the purposes of this Act or its administration.

(e) Nothing contained in this Act shall be construed to alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by any States which contain any portion of the national wild and scenic rivers system.

(f) Nothing in this Act shall affect existing rights of any State, including the right of access, with respect to the beds of navigable streams, tributaries, or rivers (or segments thereof) located in a national wild, scenic or recreational river area.

(g) The Secretary of the Interior or the Secretary of Agriculture, as the case may be, may grant easements and rights-of-way upon, over, under, across, or through any component of the national wild and scenic rivers system in accordance with the laws applicable to the national park system and the national forest system, respectively: *Provided*, That any conditions precedent to granting such easements and rights-of-way shall be related to the policy and purpose of this Act.

SECTION 14.

The claim and allowance of the value of an easement as a charitable contribution under section 170 of title 26, United States Code, or as a gift under section 2522 of said title shall constitute an agreement by the donor on behalf of himself, his heirs, and assigns that, if the terms of the instrument creating the easement are violated, the donee or the United States may acquire the servient estate at its fair market value as of the time the easement was donated minus the value of the easement claimed and allowed as a charitable contribution or gift.

SECTION 14A.

(a) Where appropriate in the discretion of the Secretary, he may lease federally owned land (or any interest therein) which is within the boundaries of any component of the National Wild and Scenic Rivers system and which has been acquired by the Secretary under this Act. Such lease shall be subject to such restrictive covenants as may be necessary to carry out the purposes of this Act.

(b) Any land to be leased by the Secretary under this section shall be offered first for such lease to the person who owned such land immediately before its acquisition by the United States.

SECTION 15.

Notwithstanding any other provision to the contrary in sections 3 and 9 of this Act, with respect to components of the National Wild and Scenic Rivers System in Alaska designated by paragraphs (38) through (50) of section 3(a) of this Act --

(1) the boundary of each such river shall include an average of not more than six hundred and forty acres per mile on both sides of the river. Such boundary shall not include any lands owned by the State or a political subdivision of the State nor shall such boundary extend around any private lands adjoining the river in such manner as to surround or effectively surround such private lands; and

(2) the withdrawal made by paragraph (iii) of section 9(a) shall apply to the minerals in Federal lands which constitute the bed or bank or are situated within one-half mile of the bank of any river designated a wild river by the Alaska National Interest Lands Conservation Act.

SECTION 16.

As used in this Act, the term --

(a) "River" means a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes.

(b) "Free-flowing," as applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modifi-cation of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: *Provided*, That this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the national wild and scenic rivers system.

(c) "Scenic easement" means the right to control the use of land (including the air space above such land) within the authorized boundaries of a component of the wild and scenic rivers system, for the purpose of protecting the natural qualities of a designated wild, scenic or recreational river area, but such control shall not affect, without the owner's consent, any regular use exercised prior to the acquisition of the easement. For any designated wild and scenic river, the appropriate Secretary shall treat the acquisition of fee title with the reservation of regular existing uses to the owner as a scenic easement for purposes of this Act. Such an acquisition shall not constitute fee title ownership for purposes of section 6(b).

SECTION 17.

There are hereby authorized to be appropriated, including such sums as have heretofore been appropriated, the following amounts for land acquisition for each of the rivers described in section 3(a) of this Act:

Clearwater, Middle Fork, Idaho, $2,909,800;
Eleven Point, Missouri, $10,407,000;
Feather, Middle Fork, California, $3,935,700;
Rio Grande, New Mexico, $253,000;
Rogue, Oregon, $15,147,000
St. Croix, Minnesota and Wisconsin, $21,769,000;
Salmon, Middle Fork Idaho, $1,837,000; and
Wolf Wisconsin, $142,150.

Omnibus Public Land Management Act of 2009

Public Law 111–11
111th Congress

An Act

To designate certain land as components of the National Wilderness Preservation System, to authorize certain programs and activities in the Department of the Interior and the Department of Agriculture, and for other purposes.

Mar. 30, 2009
[H.R. 146]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Omnibus Public Land Management Act of 2009.
16 USC 1 note.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Omnibus Public Land Management Act of 2009".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sec. 1. Short title; table of contents.

TITLE I—ADDITIONS TO THE NATIONAL WILDERNESS PRESERVATION SYSTEM

Subtitle A—Wild Monongahela Wilderness

Sec. 1001. Designation of wilderness, Monongahela National Forest, West Virginia.
Sec. 1002. Boundary adjustment, Laurel Fork South Wilderness, Monongahela National Forest.
Sec. 1003. Monongahela National Forest boundary confirmation.
Sec. 1004. Enhanced Trail Opportunities.

Subtitle B—Virginia Ridge and Valley Wilderness

Sec. 1101. Definitions.
Sec. 1102. Designation of additional National Forest System land in Jefferson National Forest as wilderness or a wilderness study area.
Sec. 1103. Designation of Kimberling Creek Potential Wilderness Area, Jefferson National Forest, Virginia.
Sec. 1104. Seng Mountain and Bear Creek Scenic Areas, Jefferson National Forest, Virginia.
Sec. 1105. Trail plan and development.
Sec. 1106. Maps and boundary descriptions.
Sec. 1107. Effective date.

Subtitle C—Mt. Hood Wilderness, Oregon

Sec. 1201. Definitions.
Sec. 1202. Designation of wilderness areas.
Sec. 1203. Designation of streams for wild and scenic river protection in the Mount Hood area.
Sec. 1204. Mount Hood National Recreation Area.
Sec. 1205. Protections for Crystal Springs, Upper Big Bottom, and Cultus Creek.
Sec. 1206. Land exchanges.
Sec. 1207. Tribal provisions; planning and studies.

Subtitle D—Copper Salmon Wilderness, Oregon

Sec. 1301. Designation of the Copper Salmon Wilderness.
Sec. 1302. Wild and Scenic River Designations, Elk River, Oregon.
Sec. 1303. Protection of tribal rights.

Subtitle E—Cascade-Siskiyou National Monument, Oregon

Sec. 1401. Definitions.

(f) INCORPORATION OF ACQUIRED LAND AND INTERESTS.—Any land or interest in land that is located in the National Conservation Area that is acquired by the United States shall—

(1) become part of the National Conservation Area; and

(2) be managed in accordance with—

(A) the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.);

(B) this section; and

(C) any other applicable law (including regulations).

(g) WITHDRAWAL.—

(1) IN GENERAL.—Subject to valid existing rights, all Federal land located in the National Conservation Area is withdrawn from—

(A) all forms of entry, appropriation, and disposal under the public land laws;

(B) location, entry, and patenting under the mining laws; and

(C) operation of the mineral leasing, mineral materials, and geothermal leasing laws.

(2) ADDITIONAL LAND.—If the Secretary acquires additional land that is located in the National Conservation Area after the date of enactment of this Act, the land is withdrawn from operation of the laws referred to in paragraph (1) on the date of acquisition of the land.

SEC. 1976. ZION NATIONAL PARK WILD AND SCENIC RIVER DESIGNATION.

(a) DESIGNATION.—Section 3(a) of the Wild and Scenic Rivers Act (16 U.S.C. 1274(a)) (as amended by section 1852) is amended by adding at the end the following:

"(204) ZION NATIONAL PARK, UTAH.—The approximately 165.5 miles of segments of the Virgin River and tributaries of the Virgin River across Federal land within and adjacent to Zion National Park, as generally depicted on the map entitled 'Wild and Scenic River Segments Zion National Park and Bureau of Land Management' and dated April 2008, to be administered by the Secretary of the Interior in the following classifications:

"(A) TAYLOR CREEK.—The 4.5-mile segment from the junction of the north, middle, and south forks of Taylor Creek, west to the park boundary and adjacent land rim-to-rim, as a scenic river.

"(B) NORTH FORK OF TAYLOR CREEK.—The segment from the head of North Fork to the junction with Taylor Creek and adjacent land rim-to-rim, as a wild river.

"(C) MIDDLE FORK OF TAYLOR CREEK.—The segment from the head of Middle Fork on Bureau of Land Management land to the junction with Taylor Creek and adjacent land rim-to-rim, as a wild river.

"(D) SOUTH FORK OF TAYLOR CREEK.—The segment from the head of South Fork to the junction with Taylor Creek and adjacent land rim-to-rim, as a wild river.

"(E) TIMBER CREEK AND TRIBUTARIES.—The 3.1-mile segment from the head of Timber Creek and tributaries of Timber Creek to the junction with LaVerkin Creek and adjacent land rim-to-rim, as a wild river.

"(F) LAVERKIN CREEK.—The 16.1-mile segment beginning in T. 38 S., R. 11 W., sec. 21, on Bureau of Land Management land, southwest through Zion National Park, and ending at the south end of T. 40 S., R. 12 W., sec. 7, and adjacent land ½-mile wide, as a wild river.

"(G) WILLIS CREEK.—The 1.9-mile segment beginning on Bureau of Land Management land in the SWSW sec. 27, T. 38 S., R. 11 W., to the junction with LaVerkin Creek in Zion National Park and adjacent land rim-to-rim, as a wild river.

"(H) BEARTRAP CANYON.—The 2.3-mile segment beginning on Bureau of Management land in the SWNW sec. 3, T. 39 S., R. 11 W., to the junction with LaVerkin Creek and the segment from the headwaters north of Long Point to the junction with LaVerkin Creek and adjacent land rim-to-rim, as a wild river.

"(I) HOP VALLEY CREEK.—The 3.3-mile segment beginning at the southern boundary of T. 39 S., R. 11 W., sec. 20, to the junction with LaVerkin Creek and adjacent land ½-mile wide, as a wild river.

"(J) CURRENT CREEK.—The 1.4-mile segment from the head of Current Creek to the junction with LaVerkin Creek and adjacent land rim-to-rim, as a wild river.

"(K) CANE CREEK.—The 0.6-mile segment from the head of Smith Creek to the junction with LaVerkin Creek and adjacent land ½-mile wide, as a wild river.

"(L) SMITH CREEK.—The 1.3-mile segment from the head of Smith Creek to the junction with LaVerkin Creek and adjacent land ½-mile wide, as a wild river.

"(M) NORTH CREEK LEFT AND RIGHT FORKS.—The segment of the Left Fork from the junction with Wildcat Canyon to the junction with Right Fork, from the head of Right Fork to the junction with Left Fork, and from the junction of the Left and Right Forks southwest to Zion National Park boundary and adjacent land rim-to-rim, as a wild river.

"(N) WILDCAT CANYON (BLUE CREEK).—The segment of Blue Creek from the Zion National Park boundary to the junction with the Right Fork of North Creek and adjacent land rim-to-rim, as a wild river.

"(O) LITTLE CREEK.—The segment beginning at the head of Little Creek to the junction with the Left Fork of North Creek and adjacent land ½-mile wide, as a wild river.

"(P) RUSSELL GULCH.—The segment from the head of Russell Gulch to the junction with the Left Fork of North Creek and adjacent land rim-to-rim, as a wild river.

"(Q) GRAPEVINE WASH.—The 2.6-mile segment from the Lower Kolob Plateau to the junction with the Left Fork of North Creek and adjacent land rim-to-rim, as a scenic river.

"(R) PINE SPRING WASH.—The 4.6-mile segment to the junction with the left fork of North Creek and adjacent land ½-mile, as a scenic river.

"(S) WOLF SPRINGS WASH.—The 1.4-mile segment from the head of Wolf Springs Wash to the junction with Pine

Spring Wash and adjacent land ½-mile wide, as a scenic river.

"(T) KOLOB CREEK.—The 5.9-mile segment of Kolob Creek beginning in T. 39 S., R. 10 W., sec. 30, through Bureau of Land Management land and Zion National Park land to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(U) OAK CREEK.—The 1-mile stretch of Oak Creek beginning in T. 39 S., R. 10 W., sec. 19, to the junction with Kolob Creek and adjacent land rim-to-rim, as a wild river.

"(V) GOOSE CREEK.—The 4.6-mile segment of Goose Creek from the head of Goose Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(W) DEEP CREEK.—The 5.3-mile segment of Deep Creek beginning on Bureau of Land Management land at the northern boundary of T. 39 S., R. 10 W., sec. 23, south to the junction of the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(X) NORTH FORK OF THE VIRGIN RIVER.—The 10.8-mile segment of the North Fork of the Virgin River beginning on Bureau of Land Management land at the eastern border of T. 39 S., R. 10 W., sec. 35, to Temple of Sinawava and adjacent land rim-to-rim, as a wild river.

"(Y) NORTH FORK OF THE VIRGIN RIVER.—The 8-mile segment of the North Fork of the Virgin River from Temple of Sinawava south to the Zion National Park boundary and adjacent land ½-mile wide, as a recreational river.

"(Z) IMLAY CANYON.—The segment from the head of Imlay Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(AA) ORDERVILLE CANYON.—The segment from the eastern boundary of Zion National Park to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(BB) MYSTERY CANYON.—The segment from the head of Mystery Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(CC) ECHO CANYON.—The segment from the eastern boundary of Zion National Park to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(DD) BEHUNIN CANYON.—The segment from the head of Behunin Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(EE) HEAPS CANYON.—The segment from the head of Heaps Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a wild river.

"(FF) BIRCH CREEK.—The segment from the head of Birch Creek to the junction with the North Fork of the Virgin River and adjacent land ½-mile wide, as a wild river.

"(GG) OAK CREEK.—The segment of Oak Creek from the head of Oak Creek to where the forks join and adjacent land ½-mile wide, as a wild river.

"(HH) OAK CREEK.—The 1-mile segment of Oak Creek from the point at which the 2 forks of Oak Creek join to the junction with the North Fork of the Virgin River and adjacent land ½-mile wide, as a recreational river.

"(II) CLEAR CREEK.—The 6.4-mile segment of Clear Creek from the eastern boundary of Zion National Park to the junction with Pine Creek and adjacent land rim-to-rim, as a recreational river.

"(JJ) PINE CREEK .—The 2-mile segment of Pine Creek from the head of Pine Creek to the junction with Clear Creek and adjacent land rim-to-rim, as a wild river.

"(KK) PINE CREEK.—The 3-mile segment of Pine Creek from the junction with Clear Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim, as a recreational river.

"(LL) EAST FORK OF THE VIRGIN RIVER.—The 8-mile segment of the East Fork of the Virgin River from the eastern boundary of Zion National Park through Parunuweap Canyon to the western boundary of Zion National Park and adjacent land ½-mile wide, as a wild river.

"(MM) SHUNES CREEK.—The 3-mile segment of Shunes Creek from the dry waterfall on land administered by the Bureau of Land Management through Zion National Park to the western boundary of Zion National Park and adjacent land ½-mile wide as a wild river.".

16 USC 1274 note.

(b) INCORPORATION OF ACQUIRED NON-FEDERAL LAND.—If the United States acquires any non-Federal land within or adjacent to Zion National Park that includes a river segment that is contiguous to a river segment of the Virgin River designated as a wild, scenic, or recreational river by paragraph (204) of section 3(a) of the Wild and Scenic Rivers Act (16 U.S.C. 1274(a)) (as added by subsection (a)), the acquired river segment shall be incorporated in, and be administered as part of, the applicable wild, scenic, or recreational river.

16 USC 1274 note.

(c) SAVINGS CLAUSE.—The amendment made by subsection (a) does not affect the agreement among the United States, the State, the Washington County Water Conservancy District, and the Kane County Water Conservancy District entitled "Zion National Park Water Rights Settlement Agreement" and dated December 4, 1996.

SEC. 1977. WASHINGTON COUNTY COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT PLAN.

(a) DEFINITIONS.—In this section:

(1) SECRETARY.—The term "Secretary" means the Secretary of the Interior.

(2) SECRETARY CONCERNED.—The term "Secretary concerned" means—

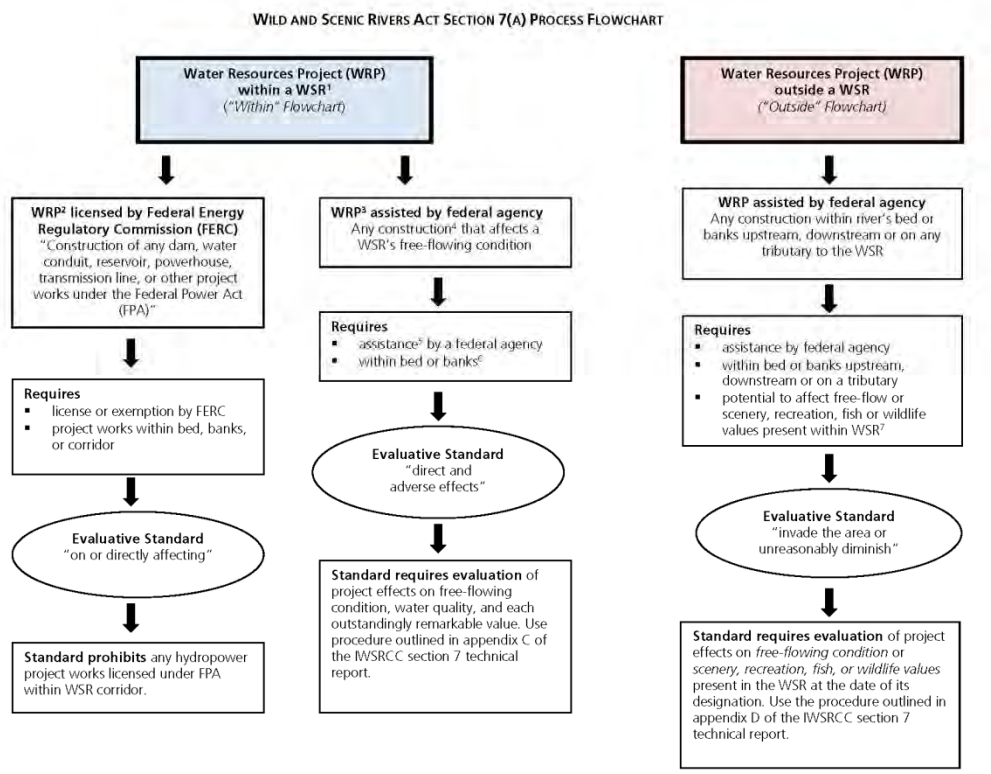
(A) with respect to land managed by the Bureau of Land Management, the Secretary; and

(B) with respect to land managed by the Forest Service, the Secretary of Agriculture.

(3) TRAIL.—The term "trail" means the High Desert Off-Highway Vehicle Trail designated under subsection (c)(1)(A).

APPENDIX B: WILD AND SCENIC RIVERS ACT

Section 7 Process Flowcharts



[1] **A wild and scenic river** includes the river channel and adjacent areas within the wild and scenic river boundaries pursuant to section 3(a) or 2(a) (ii) of the Wild and Scenic Rivers Act.

[2] **A water resources project** (i.e., a hydropower project licensed under the Federal Energy Regulatory Commission) refers to construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project work under the hydropower provisions (license and exemption) of the Federal Power Act (Part I), as amended (41 Stat. 1063; 16 USC 791a et seq.). Other facilities licensed by the Federal Energy Regulatory Commission under the Federal Power Act (e.g., interstate power transmission lines or natural gas pipelines) are not prohibited outright. They are subject to review under section 7(a) only if they include construction as described in footnote 6.

[3] **A water resources project** is federally assisted construction that would affect a designated river's free-flowing characteristics, as defined in section 16(b) of the Wild and Scenic Rivers Act (see footnote 6). Examples of water resources projects include, but are not limited to, fisheries habitat and watershed restoration/enhancement projects; water diversion projects; transmission lines and pipelines; bridge and other roadway construction/reconstruction projects; dams; water conduits; bank stabilization projects; channelization projects; powerhouses; levee construction; reservoirs; recreation facilities such as boat ramps or fishing piers; or dredge and fill projects that require a federal permit, such as from the U.S. Army Corps of Engineers as required by section 404 of the Clean Water Act (33 USC 1344).

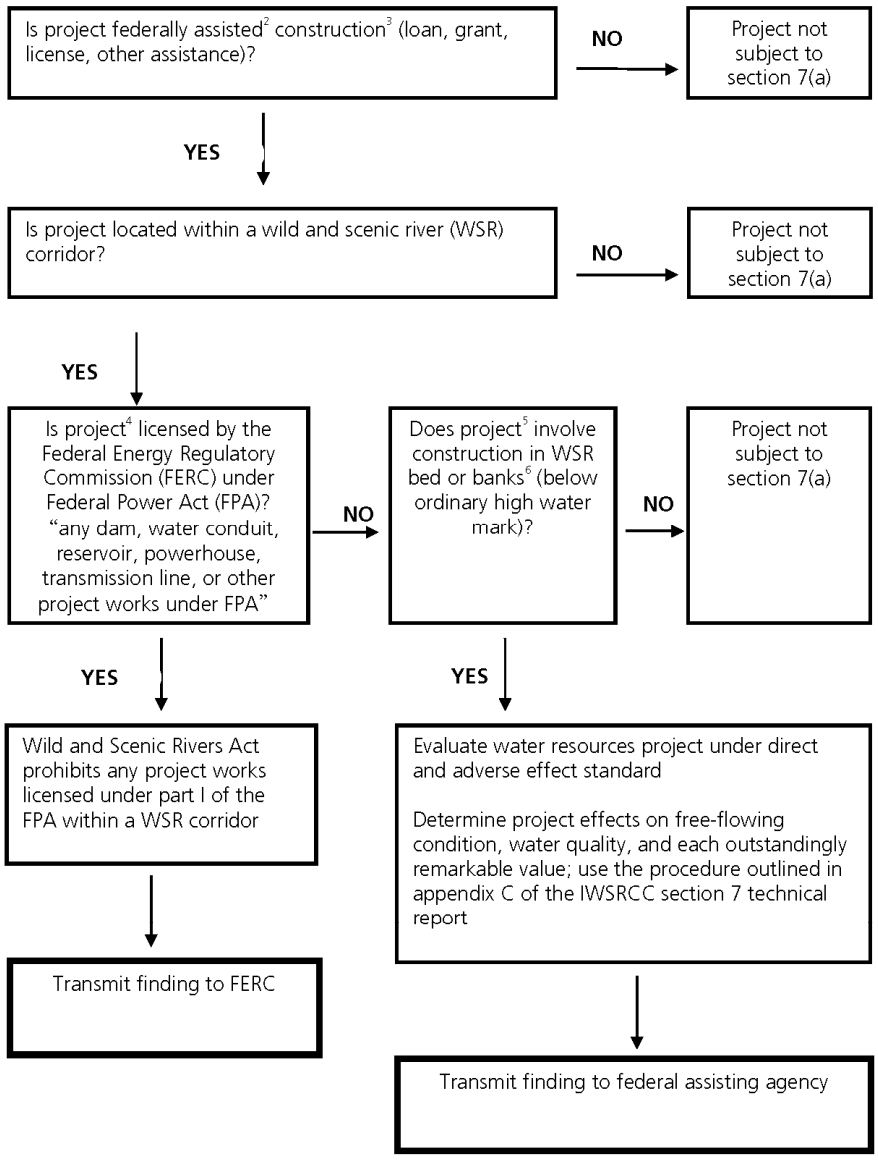
[4] **Construction** refers to any action carried out with federal assistance that would affect the free-flowing characteristics of a wild and scenic river.

[5] **Assistance** refers to any loan, grant, license, or other assistance in the construction of any water resources project.

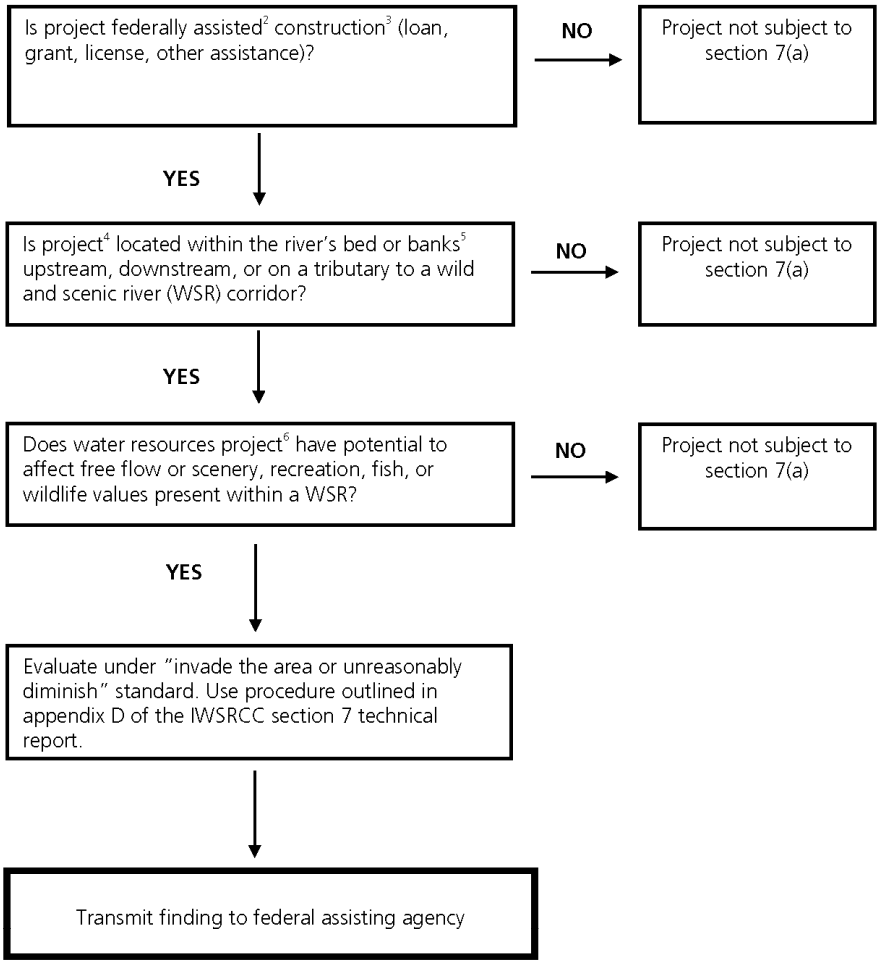
[6] '**Bed or banks** is an interpretation of section 16(b) of the Wild and Scenic Rivers Act, which defines free-flowing characteristics, in part, as "existing or flowing in natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway." Generally, the applicability of section 7(a) is limited to the area within the ordinary high water mark) of the river. The ordinary high water mark is defined in 33 CFR Part 328.3(e) as "…that line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

[7] Requires a **nexus** between the proposed upstream, downstream, or tributary project and the wild and scenic river or such project is not a water resources project for purposes of a section 7(a) determination. Projects that have the potential to affect the river's free flow or the scenery, recreation, fish, or wildlife values of a wild and scenic river are dams, upstream diversion structures, and projects that can be seen from the wild and scenic river, as they have the potential to affect these characteristics and values in the designated river.

SECTION 7(A) FLOWCHART FOR A WATER RESOURCES PROJECT WITHIN A WILD AND SCENIC RIVER CORRIDOR[1]



SECTION 7(A) FLOWCHART FOR A WATER RESOURCES PROJECT OUTSIDE OF A WILD AND SCENIC RIVER CORRIDOR[1]



APPENDIX C: OUTSTANDINGLY REMARKABLE VALUES EVALUATIONS

VIRGIN RIVER
OUTSTANDINGLY REMARKABLE VALUES
WORKSHOP REPORT

PROJECT BACKGROUND

The Omnibus Public Land Management Act of 2009, signed by President Obama (Public Law 111-11), designated approximately 165.5 miles of the Virgin River and tributaries of the Virgin River across Federal land within and adjacent to Zion National Park to be administered by the Secretary of the Interior under various classifications under the Wild and Scenic Rivers (WSR) Act. Federal Agencies administering wild and scenic rivers are required to prepare a comprehensive management plan for the protection of the river values, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of the act. Developing an outstandingly remarkable values (ORV) statement is the first step in developing a comprehensive river management plan. Outstandingly remarkable values are river-related, contribute to the function of the eco-system and/or owe their location or existence to the river, they are the reason the river rises to the level of national significance and protection. This project will build on the supporting work in the Wild and Scenic River Evaluation - Eligibility, Classification and Suitability Report which was completed as part of the 2001 Zion General Management Plan. This project will develop the ORV statement and prepare a Comprehensive River Management Plan (CRMP).

OVERVIEW

This report summarizes results from the (ORV) workshop held June 22-24, 2010, in Springdale, Utah outside Zion National Park. The purpose of the workshop was to clearly define the Virgin River's ORVs; evaluate and describe each ORV by river segment; identify site-specific issues and opportunities; and identify stakeholders. These ORV statements will provide the foundation for developing the Comprehensive River Management Plan.

This workshop is the second of three pilot projects designed to develop ORV statements for designated wild and scenic rivers within the National Park system. The intent of this new approach is to bring subject matter experts, park managers, and wild and scenic river program leaders together in a workshop setting to define and evaluate ORVs. The ultimate benefit of this effort is the long-term protection and enhancement of ORVs—attained through a better articulation of the river's national significance and importance to the public. The ORVs form the basis on which decisions in the management plan are made. Thus the ORV workshop is a first step in establishing a strong foundation for the preparation of the Virgin River CRMP.

The focus of the workshop was on designated portions of the Virgin River located within, or along the boundary of, Zion National Park and adjacent Bureau of Land Management (BLM) Wilderness. In the Omnibus Public Land Management Act of 2009, 39 river segments and/or tributaries totaling 165.5 miles were identified on these National Park Service(NPS) and BLM lands, including the major segments: North Fork Virgin River above the Temple of Sinawava (wild segments), North Fork Virgin River below Temple of Sinawava (recreational segments, wild segments), East Fork of the Virgin River (wild segments), North Creek (wild segments, scenic segments), La Verkin Creek (wild segments), and Taylor

Creek (wild segments, scenic segments). The results of this workshop will provide a foundation for developing a Comprehensive River Management Plan (CRMP) for these river segments and tributaries.

In a spirit of collaboration, and per guidance in Section 10 (e) of the Wild and Scenic Rivers Act, staffs from the Utah Governor's Office, Five County Association of Governments and the Town of Springdale were invited to participate in the workshop, and they provided valuable input throughout the week. Representatives from the traditionally associated tribes, U.S. Forest Service, US Fish and Wildlife Service, Utah Division on Wildlife Resources, Utah Division of Water Quality and the Virgin River Recovery Program were also invited, but were unable to attend the workshop.

FACILITATORS

Bill Hansen, Wild and Scenic River Program Co-lead, Water Resources Division
Gary Weiner, Intermountain Region Wild and Scenic River Coordinator, RTCA
Bernice Sterin, Utah WSR Coordinator, Utah National Landscape Conservation System Coordinator, BLM
Kristina Rylands, User Capacity Specialist and WSR Inter-Agency Council Member, Yosemite National Park and Denver Service Center
Tracy Atkins, Project Manager, Denver Service Center

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Kezia Nielsen, Environmental Planning & Compliance
Ray O'Neil, Ranger, Wilderness Coordinator
Dave Sharrow, Hydrologist, Geologist
Cheryl Decker, Vegetation Management Lead
Claire Crow, Wildlife Lead
Sarah Horton, Cultural Resource Lead
Adrienne Fitzgerald, Interpretive Ranger
Matt Betenson, GIS Specialist
Annette Werderich, Plateau District Permits Supervisor
Jack Burns, Chief Concessions Management
Mike Walsh, Acoustic Technician
Greg Comer, Biologist/GIS technician
Katie Johnson, Fire Ecologist

Bureau of Land Management
Kyle Volyes, Recreation/Wilderness Planner, St. George Office
Steve Prather, Park Ranger, St. George Office
Ben Cramer, Park Ranger, St. George Office
Tim Croissant, Biologist, St. George Office

State of Utah
Judy Edwards, Senior Policy Analyst, Utah Governor's Public Lands Policy Coordination Office

Five County Association of Governments
Gary Zabriskie, Director of Community and Economic Development

Town of Springdale
Tom Dansie, Director of Community Development

WORKSHOP PREPARATION

Development of the ORV statement for the Virgin River began well before the workshop started. Prior to the workshop, participants were asked to complete a series of technical specialist report forms in order to gather, review, and summarize as much background information as possible about the river's outstandingly remarkable values. These reports included detailed information about resources in the river corridor, whether they were rare, unique or exemplary, a regional comparison to similar resources, and how they related to the river. Completing these reports ahead of time gave specialists an opportunity to review existing documentation and articulate their own understanding of the river's ORVs. This allowed for much more in-depth and productive discussions during the workshop. In the end, these reports provided the basis for the river's ORV statement. Due to the length of these compiled reports, copies are available upon request.

THE PROCESS

The workshop began with a series of presentations about (1) the National Park Service and Bureau of Land Management efforts to advance wild and scenic river planning and management; (2) the role of the Interagency Wild and Scenic River Coordinating Council; (3) requirements of the Wild and Scenic Rivers Act; (4) the Omnibus Public Land Management Act of 2009 relating to the Virgin River and its tributaries designation; and (5) different approaches to defining ORVs from other planning efforts.

After the presentations, the team discussed the best approach for defining ORVs for the Virgin River and our process for moving forward. It was agreed that Yosemite's approach to organizing ORVs for the Merced River would work best for this effort. This involved developing a set of broad ORV statements that best articulates each ORV for the Virgin River and its tributaries. Afterwards, ORV sub-statements were developed for river segments that provide evidence and support for the broader ORV statements. An evaluation process based on a clearly defined set of criteria for each ORV was used to determine which river segments contain the different ORVs.



Participants during morning overview

Participants were divided into three groups, and each group was assigned a set of ORVs based on their subject matter expertise. Throughout the workshop, each group developed broad ORV statements, evaluated each ORV by river segment, and developed ORV sub-statements by river segment. At key points in the process, each group presented their results to the larger group in order to discuss and refine their statements and findings. Free-flowing condition and water quality were also addressed during this effort. Along with ORVs, these form the three pillars of protection under the Wild and Scenic River Act. Although the primary focus of the workshop was to define the river's ORVs, it was also necessary to describe the Virgin River's free-flowing condition and water quality. These support the integrity of the ORVs and are key components of the comprehensive river management plan. Small groups were organized as follows:

Group 1: Free-flowing Condition, Water Quality, Geology and Fisheries
Group 2: Scenery, Recreation, Cultural and Historic
Group 3: Ecological, Vegetation, Wildlife



Group 1: Geology, Fish, Water Quality and Free-Flowing Condition

The initial set of ORVs listed above was based on those identified in the "Wild and Scenic River Evaluation – Eligibility, Classification and Suitability" study for the Virgin River completed in 2001 as part of the Zion National Park General Management Plan. This study was the basis for the Omnibus Public Land Management Act of 2009 relating to the Virgin River designation. "Ecological" and "vegetation"

were combined into one "Ecological Processes" ORV due the amount of overlap between them. The "historic" and "cultural" ORVs were renamed "cultural" in order to broaden this category to focus on the rivers' outstandingly remarkable prehistoric values.



Group 2: Cultural, Scenery and Recreation

After the broad ORV statements and sub-statements were developed, workshop participants then identified issues and opportunities related to the CRMP. Those issues and opportunities that were site-specific were located on maps using a dot-on-map exercise. Dots were color-coded and numbered and then placed on the map. Each dot was cross-referenced to a matrix that described the site-specific issue or opportunity. This exercise was completed as a large group. The attached map and index of site-specific issues and opportunities provides a summary of this exercise.

The last session of the workshop was to identify stakeholders that should be contacted during public scoping for the comprehensive river management plan. After the workshop, stakeholders' likely interests will be identified as well as available outreach tools. This will be the basis for a future public involvement strategy that is implemented throughout the planning process.

At end of each day, participants were asked to complete a plus/delta exercise to evaluate the workshop. The "plus" side of the exercise was to identify aspects of the workshop they think are working well and should continue. The "delta" side was to identify aspects they think should change and suggest ways to improve it. This was an effective way to quickly get input from participants throughout the workshop in order make adjustments as needed and for future workshops.



Group 3: Ecological Processes and Wildlife

Based on the workshop evaluation, participants suggested providing more context for how the Wild and Scenic River process would be integrated in the overall planning process; provide additional information on how the CRMP will be used to guide park decisions and protect WSR segments and having a slide show showing geology and scenery of different river segments early in the workshop; the facilities were very nice, but break-out rooms would be helpful for the small groups.

Positive feedback from the participants included having a well-organized process in place for the workshop; completion of all technical specialist report forms prior to the workshop; the preparation of workshop materials ahead of time (e.g., folders, posters, maps, etc.); good presentation overview and visual aids; facilitation of the workshop to keep things on track and provide good guidance; great teamwork with other agency; breakout sessions worked very well, especially in helping clarify and develop the ORVs and the right mix of subject matter experts and wild and scenic river leadership—and

of course, all the great snacks. In the end, the workshop was successful due to the hard work and on-going engagement of the participants and their dedication to the Virgin River.

Facilitators and participants from outside the park also took the opportunity to visit and explore several segments of the Virgin River.



Gary Weiner, Judy Edwards and Bill Hansen discussing the hanging gardens.



Judy Edwards and Tracy Atkins explore the Narrows, Gary Weiner in the background.

OVERVIEW OF WORK ACCOMPLISHED

The four primary outcomes of the workshop are attached to this report. They include: (1) the draft set of broad ORV statements and sub-statements by river segment, (2) the evaluation of ORVs by river segment, (3) the mapping of site-specific issues and opportunities, and (4) a list of stakeholders and their potential interests.

Zion National Park and Bureau of Land Management reviewed the draft ORV report and the ORV evaluations. The workshop facilitators and subject matter experts were encouraged to submit their comments on the draft report. Once all comments are incorporated, it will be sent to the Intermountain Region and WASO for their comments. Once all comments have been reconciled, the ORV statement will be ready for public review as part of scoping on the Comprehensive River Management Plan.

NEXT STEPS

A consolidated set of ORV statements will be presented to the public in the fall during scoping of the Comprehensive River Management Plan. Public comments on these draft statements will be used to further refine them. They will not be finalized until the Comprehensive River Management Plan is complete. The following action items are high priority and must be completed as soon as possible to be ready for public scoping this fall.

VIRGIN RIVER AND TRIBUTARIES
DRAFT ORV STATEMENTS

Free-flowing condition, water quality, and outstandingly remarkable values (ORVs) form the three pillars of protection under the Wild and Scenic River Act. Free-flowing condition and water quality support the integrity of the ORVs and are key components of the Comprehensive River Management Plan. Because of their importance to the overall protection and enhancement of a designated wild and scenic river, free-flow condition and water quality are included as part of this ORV statement. These fundamental characteristics of the Virgin River and its tributaries are described below.

Water Quality



Water quality conditions of the North and East Forks of the Virgin River and its tributaries are generally considered natural and high quality. They are reflective of the largely unaltered geohydrologic setting and are generally within state water quality standards. This is due to the relatively light level of development on the watershed, and to the fact that most, and for some of the tributary streams all, of the flow is from groundwater discharge from the Navajo Sandstone. The Navajo Sandstone is made up of over 99% pure quartz sand and provides a near perfect sandstone filter. Major cations in the water are calcium, magnesium and sodium, while anions are dominated by bicarbonate, sulfate and chloride. The dissolved minerals are present at levels that would be expected in an arid watershed of sedimentary rock and increase in a downstream direction as the river contacts geologic layers with a greater amount of soluble minerals. Water temperatures would be marginal for cold water fish, but are well suited for the native fish species.

Two water quality characteristics that could be considered problematic are suspended sediment and fecal bacteria. The sediment loading in these streams is spectacular during floods, and while it might be influenced to some degree by upstream land use practices, it is generally considered to be a reflection of the extreme rate on natural erosion of this watershed. This level of sediment loading and turbidity during floods would be considered a major deficiency elsewhere, but in these rivers it is an attribute of natural conditions rather than a concern and sediment levels appear to be a major factor preventing the invasion of exotic fish species. The level of fecal bacteria has proven to be a chronic problem on the North Fork of the Virgin River upstream of the Temple of Sinawava. The state has included this reach on the list of rivers not meeting water quality standards and the park advises extra caution for visitors hiking the Zion Narrows. The source of the contamination is under investigation. Occasional spikes of bacteria concentrations also occur on other rivers usually during flood events when such occurrences would be expected.

Protection from water quality degradation is provided under the Clean Water Act by state-designated protected uses. All segments are protected as a source of irrigation water. The North and East Forks of the Virgin River and North Creek are protected as sources of domestic drinking water. All of the segments except the North Fork of the Virgin are protected for secondary contact recreation, while the North Fork of the Virgin River is designated for primary contact recreation in recognition of the large number of people engaging in water play and swimming. To protect fish and aquatic life, the North Fork of the Virgin River, Kolob Creek and Taylor Creek carry a designation for cold-water fisheries; La Verkin Creek has a designation for warm-water fisheries, and the East Fork of the Virgin River and North Creek are designated for nongame fish. In addition, the North and East Forks and Kolob Creek have a High Quality Category 1 designation that precludes new point-source discharges. A stream-specific standard for total dissolved solids is established for North Creek at 2,035 mg/l, though this has little bearing on park waters in a different geologic setting.

Free Flowing Condition

The Virgin River and its tributaries in Zion National Park have carved spectacular vertical-walled canyons through the Navajo Sandstone and surrounding sedimentary strata, and continue to carve them today. The erosive force is provided by frequent flood events that occur most numerously from sudden summer monsoon storms, but also from spring snowmelt, and rarely but significantly, from very large winter rain-on-snow flood events. Annual flow is highly variable and large runoff years are more likely during El Niño climate events (Andrews, 2000).

Sediment transport from this rapidly eroding landscape is exceptional; for example annual sediment loads in the North Fork of the Virgin River estimated at 800,000–1,000,000 tons per year and yield from other tributaries is of similar magnitude.

Streamflow in the large rivers and almost all tributaries is essentially natural and free-flowing. There are no large reservoirs on the watershed that would reduce flood flows, augment base flows, cause daily hydropower fluctuations, or modify stream temperatures. Therefore, discharge patterns show the full range of natural conditions. Water flow in this reach is protected by federal reserved and appropriative water rights held by the NPS and recognized in the Zion National Park Water Rights Settlement Agreement (NPS, 1996). Additionally, the State Engineer manages the Virgin River Basin as if it is fully appropriated, so no new diversions of water are permitted. Consumptive use of water upstream of the park amounts to about 6% - 10% of the average annual discharge. Kolob Reservoir located on Kolob Creek 2 miles upstream of the park has the capacity to substantially alter flows on Kolob Creek capturing much of the spring runoff and augmenting summer and fall flows, typically by releasing 5-10 cfs in the summer or fall. Releases will probably increase with the Crystal Creek Project coming on-line in 2010, so spring runoff and summer base flows will be altered in Kolob Creek, while the changes in the North Fork of the Virgin River will be insignificant. The Crystal Creek project provides for the diversion of an average of 4,000 acre-feet per year from the upper reaches of Crystal Creek, piping that water to Kolob Reservoir, and then releasing it down Kolob Creek to meet the Washington County Water Conservancy District's water needs downstream near St. George. Controlled Reservoir releases are limited to 35 cfs under the Zion National Park Water Rights Settlement Agreement.

ORV Statements

The foundation for preparing a comprehensive wild and scenic river management plan is to clearly and succinctly articulate a designated river's outstandingly remarkable values. During the June 2010 workshop, criteria were used to draft a set of outstandingly remarkable value statements for the Virgin River. This criterion is based on the Interagency Wild and Scenic Rivers Coordinating Council guidance for determining ORVs (IWSRCC 1999), which states:

- An ORV must be river related or dependent. This means that a value must:
  - Be located in the river or on its immediate shorelands (generally within ¼ mile on either side of the river);
  - Contribute substantially to the functioning of the river ecosystem; and/or
  - Owe its location or existence to the presence of the river.
- An ORV must be rare, unique, or exemplary at a comparative regional or national scale. Such a value would be one that is a conspicuous example from among a number of similar values that are themselves uncommon or extraordinary.

So that their protection and enhancement can be assured, the National Park Service also determined that ORVs for the Virgin River and its tributaries must be specifically evaluated and defined for individually designated river segments. Those segments found to have ORVs are described following the general ORV statement for that value.

The results of the workshop concluded that the Virgin River contains the following set of outstandingly remarkable values: cultural, geologic, recreational, scenic, ecological processes, wildlife, and, fish. A set of broad statements has been developed that articulates each ORV for the entire Virgin River and its tributaries. An evaluation process based on a clearly defined set of criteria for each ORV was used to determine which river segments and tributaries contain the different ORVs. The results from this evaluation were used to develop ORV sub-statements for those river segments, which provide evidence and support for the broader ORV statements. The following matrix summarizes the evaluation results and provides an organization to the ORV statements and sub-statements described below.

Table 1: ORV Matrix

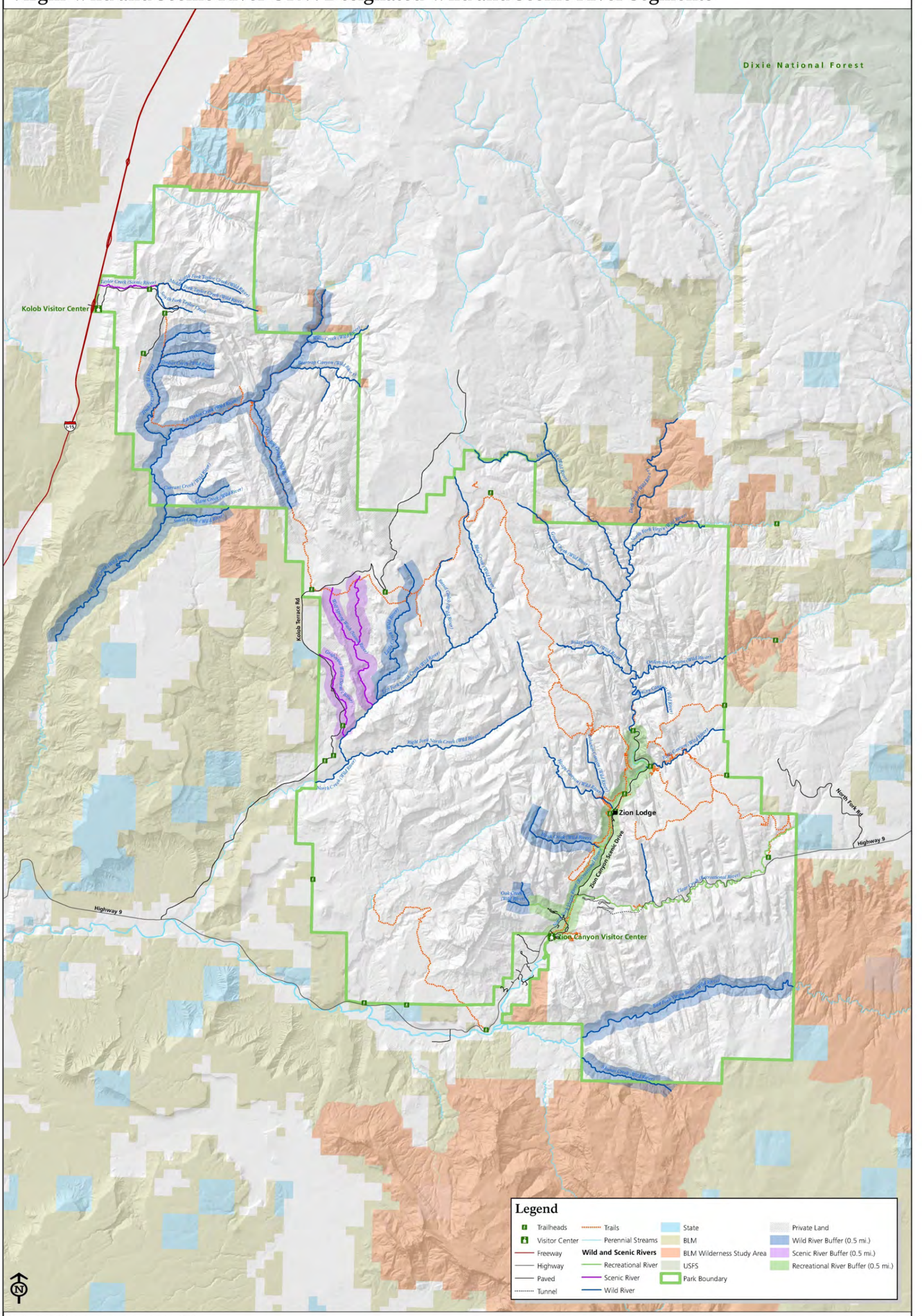
River Segment **Main Segment** or Tributary Segment	**ORV Category**						
	Cultural	**Geologic**	**Recreational**	**Scenic**	**Ecological Processes**	**Wildlife**	**Fish**
North Fork Virgin River above Temple (wild)		●	●	●	●	●	●
Kolob /Oak Creek (BLM) (wild)		●					
Goose Creek (wild)		●				●	
Imlay Canyon (wild)		●	●			●	
Orderville Canyon (wild)		●	●	●	●	●	
Deep Creek (wild)		●	●	●			●

River Segment **Main Segment** or Tributary Segment	**ORV Category**						
	Cultural	**Geologic**	**Recreational**	**Scenic**	**Ecological Processes**	**Wildlife**	**Fish**
Mystery Canyon (wild)		●	●	●			
North Fork Virgin River below Temple (recreational)	●	●	●	●			●
Birch Creek (wild)		●		●			
Pine Creek (wild and recreational)		●	●	●		●	
Oak Creek (wild and recreational)				●		●	
Heaps Canyon (wild)		●				●	
Behunin Canyon (wild)		●				●	
Echo Canyon (wild)		●				●	
Clear Creek (recreational)		●					
East Fork Virgin River (wild)	●	●			●	●	●
Shunes Creek (wild)					●		●
North Creek (wild)		●	●	●	●		●
Wildcat Canyon / Blue Creek (wild)						●	
Right Fork North Creek (wild)		●		●		●	
Left Fork North Creek (wild)		●	●	●		●	
Grapevine Wash (scenic)							
Wolf Springs Wash (scenic)							
Pine Springs Wash (scenic)							
Little Creek (wild)		●					
Russell Gulch (wild)		●		●		●	
La Verkin Creek (wild)		●	●			●	
Willis Creek (wild)		●				●	
Beartrap Canyon (wild)		●				●	
Timber Creek (wild)		●					
Current Creek (wild)		●				●	
Cane Creek (wild)		●					
Hop Valley Creek (wild)		●					
Smith Creek - BLM (wild)		●					
Taylor Creek (scenic)		●		●			
North Fork Taylor Creek (wild)		●		●			
Middle Fork Taylor Creek (wild)		●		●			
South Fork Taylor Creek (wild)		●		●		●	

Zion National Park
Utah

National Park Service
U.S. Department of the Interior

Virgin Wild and Scenic River ORV: Designated Wild and Scenic River Segments



Produced by: NPS Denver Service Center Planning Division
June 2010

0 2.5 5 10 Miles

Cultural ORV



The continuum of human occupation along the Virgin River and its tributaries encompasses thousands of years and diverse people, cultures and uses. In the arid southwest landscape, the occurrence of plentiful water, accompanying vegetation, animal diversity, arable land, and other resources found along the Virgin River and its tributaries provided ideal conditions for cultural communities to flourish. Not surprisingly, the Virgin River system contains some of the best examples in the region of prehistoric American Indian sites that provide a tangible connection to ancestors for the culturally associated tribes. Furthermore, the Virgin River corridor contains places and resources important to the cultural traditions of contemporary American Indian tribes.

North Fork of the Virgin River below of Temple of Sinawava

Zion National Park and the Virgin River lie within the traditional homeland of the Southern Paiute. The Virgin River corridor has a deep history in Southern Paiute life. The primary life element for the Paiute is water and this area serves as a place that was constantly lived in because of the availability of water. The abundant water supported farming, brought in animals, promoted plant growth and was utilized for day to day living. In the Ethnographic Overview and Assessment for Zion National Park, completed in 1997, researchers documented numerous accounts of the special importance of the Virgin River to Paiute people. Place names from the Paiute language abound for prominent features or locations, such as the Temple of Sinawava – the beginning of the Narrows on the Virgin River. Zion Canyon was a meeting place with abundant food, both vegetal and animal. Other resources were plentiful as well, such as specific minerals for color pigments and willow for basketry.

Although most physical evidence of Southern Paiute use and occupation was obliterated by non-native occupations, the canyon, river and the overall river ecoscape retains its cultural significance to Paiute people and therefore its integrity as a place of special meaning. In support of the culturally significant resources that can be found along the river, Zion maintains an Memorandum of Understanding with most of the surrounding bands of Southern Paiute for the gathering of plant resources for traditional cultural-religious purposes. Given the long-standing and on-going relationship of the Southern Paiute people to this area, an outstandingly remarkable cultural value was found for the North Fork of the Virgin River below of Temple of Sinawava.

East Fork of the Virgin River

The importance of cultural resource sites in the East Fork of the Virgin River is tied to the uniqueness of Parunuweap Canyon itself. It is one of the few remaining locations in area occupied by the Virgin Branch Ancestral Puebloan culture where a geographically discrete body of sites representative of a long-term community has remained mostly undisturbed. This river canyon exists in a nearly unaltered state, as compared to other areas of the region that have experienced significant historic era developments.

Prehistoric sites along the East Fork of the Virgin River are among the "type" sites through which the Virgin Branch (also known as Anasazi) was initially recognized as a distinctive regional manifestation of Formative Period Ancestral Puebloan cultures. In addition, Southern Paiute and Mormon Pioneer historic sites also occur within this canyon. Most of these sites are contributing features to the Parunuweap Canyon Archeological District, listed in the National Register of Historic Places in 1996 with significance at the national level. Parunuweap Canyon was legislatively included in Zion National Park in 1918 in specific recognition of the nationally significant archaeological resources present.

Because of the relatively undisturbed condition of this river canyon, the setting is ideal for future research where the interrelationships of geographically, culturally, and temporally related sites can be studied without ambiguity. In other words, the river canyon contains a series of distinct communities across multiple time periods and all of the sites represent activities of those communities utilizing riverine resources over a long period of time. The East Fork of the Virgin River perfectly embodies a natural classroom and is an exemplary site for research on the Ancestral Puebloan culture, therefore an outstandingly remarkable cultural value was found on this segment of the Virgin River.

NOTE: Based on existing information and best professional judgment, only the segments above contain prehistoric, historic, or traditional cultural properties that meet the criteria for a Cultural ORV. This may be refined as information is gained through additional data gathering and/or as part of ongoing consultation with American Indian tribes.

Geologic ORV



The Virgin River and its tributaries are uniquely situated along the western margin of the Colorado Plateau where the recent history of tectonic activity and erosional downcutting has resulted in a labyrinth of deep walled sandstone canyons, volcanic phenomena, and widespread exposures of brilliantly colored sedimentary deposits. Unique geologic features include Navajo sandstone exposures, a remnant of the world's largest sand dune desert, river-carved canyons forming the world's tallest sandstone cliffs, narrow slot canyons, hanging waterfalls, springs and seeps, and accelerated erosion processes. This dynamic geologic system creates a diverse landscape of channels, canyons and springs that support a variety of ecological communities, including hanging gardens, desert fish and other aquatic species. The geology of Virgin River and its tributaries offer world-class opportunities for canyoneering, rock climbing, hiking and wilderness experiences.

The specialists considered a number of factors in determining if a segment included an outstandingly remarkable geologic value. These factors included the high cliffs of Navajo sandstone, known to be the world's highest sandstone cliffs and slot canyons, are deep and exceptionally narrow vertical walled canyons. Other factors were that springs discharging from the Navajo sandstone aquifer, which are notably extensive in these canyons, are unusual in this arid setting, and are known to support a large

number of rare and endemic species. Also the landforms which indicate an exceptional rate of erosion including deep canyons, cliffs, expanses of bedrock exposure and extensive landslide deposits. Further, high waterfalls and hanging valleys resulting from the exceptionally high runoff from slickrock and differential rates of erosion leaving channels with large vertical drops. Finally, river channels that have been dammed by landslides or lava dams in the recent geologic past and inverted valleys resulting from lava flows down canyon bottoms followed by rapid erosion of the surrounding rock layers that leaves the lava flow as an elevated sinuous ridgeline. Each of these factors contributes to the unique and exemplary geologic values of the Virgin River and its tributaries.

North Fork of the Virgin River and tributaries above the Temple of Sinawava, including: Kolob Creek/Oak Creek (BLM), Goose Creek, Imlay Canyon, Orderville Canyon, Deep Creek, and Mystery Canyon

The North Fork of the Virgin River and its tributaries in this segment form a labyrinth of deep slot canyons as they all slice through the massive beds of Navajo sandstone 2,000 feet thick. Each of the streams begins in strata above the Navajo then becomes a slot canyon of progressively greater depth as the channel descends through the sandstone. These are world-class examples of exceptionally rapid erosion through the aggressive downcutting of stream channels into a massive layer of easily-eroded sandstone. At their narrowest points the vertical-walled slots are from 20 feet wide for the North Fork of the Virgin River and Deep Creek, to as little as 5 to 10 feet for the smaller tributary streams. As the channels cut through the lower one-third of the Navajo sandstone groundwater discharges from the Navajo aquifer in a myriad of springs, seeps and hanging gardens. Some of the discharges trickle or gush from discrete fractures, while in many areas the discharge is directly from the pores of the sandstone forming extensive wet weeping walls and lushly vegetated hanging gardens. The tributary streams are very steep and include many waterfalls and plunge pools. There are also a myriad of ephemeral waterfalls that cascade over the cliffs following intense rainfall or generous snow-melt. These segments have an outstandingly remarkable geologic value.

North Fork of the Virgin River and tributaries below the Temple of Sinawava, including: Birch Creek, Pine Creek, Behunin Canyon, Echo Canyon and Heaps Canyon

This reach of the North Fork of the Virgin River and its tributaries flows through the majestic Zion Canyon where the colorful 2,000-foot high cliffs of Navajo sandstone dominate the scene. Each of the tributaries cuts deep slot canyons into the upper portion of the Navajo sandstone, and then pours into Zion Canyon over a high waterfall. There are also a myriad of ephemeral waterfalls that cascade over the cliffs following intense rainfall or generous snow-melt. As the North Fork of the Virgin River cuts into the softer rock layers below the Navajo sandstone the canyon widens and the river is no longer confined as a slot canyon. Many springs exist at the base of the Navajo sandstone and provide the perennial flow of each of these tributaries and most of the flow of the river. Some of the spring discharge trickles from discrete fractures, while in many areas the discharge is directly from the pores of the sandstone as wet weeping walls and lushly vegetated hanging gardens. In the very recent geologic past landslides have dammed the canyon, with the mile-long Sentinel Landslide being the most prominent. The lakebed sediments upstream of the landslide, and the steep channel where the river is still cutting through the landslide dam have a great influence on the geomorphology of the North Fork of the Virgin River. A rate of erosion of the North Fork of the Virgin River, its tributaries and the surrounding landscape of about 1,300 feet per million years (Biek and others, 2000) is exceptional, even for the Colorado Plateau, and is illustrated by the presence of massive vertical cliffs, deep slot canyons, numerous hanging valleys with waterfalls, the daily occurrence of rockfalls, frequent landslides, and the exceptional sediment transport by the river, estimated at 800,000-1,000,000 tons per year (Andrews, 2000). These segments have an

outstandingly remarkable geologic value due to the exemplary character of the Navajo sandstone cliffs, slot canyons and groundwater discharges.

Clear Creek
Clear Creek contains vast exposures of Navajo sandstone cliffs and exposed slickrock, providing an exemplary indication of rapid rates of erosion. The canyon itself forms several short slot canyons, and many tributaries form slot canyons in the WSR corridor. Several tributaries form hanging valleys and waterfalls during runoff events, though this is not as pronounced as along the main North Fork of the Virgin River in Zion Canyon. Clear Creek lacks the presence of springs from the lower Navajo Sandstone, because the segment ends with the confluence with Pine Creek at a point above the level of the Navajo aquifer. As a result, this segment contains only 4 of the 7 geologic ORV criteria. However, the very prominent carving of straight, parallel, joint-controlled canyons rises to the level of regional and national significance and gives this segment an outstandingly remarkable geologic value.

East Fork of the Virgin River
This segment contains an abundance of high Navajo sandstone cliffs up to 1,200 vertical feet in height. The East Fork of the Virgin River forms a narrow slot canyon at the upstream 1 mile of this segment within the park. Numerous waterfalls exist where differential rates of erosion have left all of the ephemeral tributary drainages as hanging valleys well above the canyon floor. Stream flow arises from discharge from numerous springs originating in the bottom third of the Navajo sandstone. The exceptional rate of erosion is indicated by the presence of high cliffs, colluvial and landslide deposits, expansive exposures of slickrock in the upper half of the Navajo Sandstone, and the exceptionally large level of sediment transport in the river. This segment has an ORV for geology.

North Creek and tributaries, including: Right Fork, Left Fork, Little Creek and Russell Gulch
This segment and tributaries contains an abundance of high Navajo sandstone cliffs up to 1,800 vertical feet in height. Several narrow, exemplary slot canyons exhibit waterfalls, pour-offs, and plunge pools. Stream flow arises from discharge from several springs originating in the bottom third of the Navajo sandstone. Recent volcanism is apparent along North Creek and its Left Fork. Geologically recent lava flows have poured down North Creek on multiple occasions, first 1 million years ago then again 260,000 years ago (Willis and Hylland, 2002). The remains of the flows are visible along the canyon walls and where they have filled Lee and Cave Valleys and the canyon of Little Creek. There is also a classic "inverted valley" along the north side of North Creek and west of the Left Fork where erosion-resistant lavas that once flowed down the canyon bottoms, now form ridgelines due to rapid erosion of the adjacent soft sedimentary rocks. Lakebed deposits, which are very rare in erosional environments of this high degree, exist in the Right Fork of North Creek as a result of lakes created first by a Pleistocene lava dam and later by a landslide (Willis and Hylland, 2002). While fossils in the Navajo sandstone are rare, there is a unique block of sandstone in the Left Fork of North Creek with several dozen dinosaur tracks. These segments have an outstandingly remarkable geologic value.

La Verkin Creek and tributaries, including: Willis Creek, Bear Trap Canyon, Timber Creek, Hop Valley, Current Creek, Cane Creek and Smith Creek
This segment and tributaries contains an abundance of high Navajo sandstone cliffs up to 2,000 vertical feet in height. Several narrow, exemplary slot canyons exhibit waterfalls, pour-offs, and plunge pools. Stream flow arises from several springs originating in the bottom third of the Navajo sandstone. Hop Valley, Bear Trap Canyon and Willis Creek are superb examples of joint and fault controlled canyons, and while structural control of drainages is not unusual, it is compelling here because the canyons are boldly cut into the thick sandstone. Lakebed deposits, which are very rare in erosional environments of this

high degree, are found in Hop Valley, and Current and Cane Creeks. A landslide dam at the downstream end of Hop Valley filled the canyon 200-300 feet deep, and subsequent filling of the canyon behind the dam results in today's 4-mile long, straight, vertical walled, flat bottom valley with a perennial stream meandering for much of its length (Biek, 2007). A rate of erosion in this area of about 1,300 feet per million years is exceptional, even for the Colorado Plateau (Biek and others, 2000), and is illustrated by the presence of massive vertical cliffs, deep slot canyons, numerous hanging valleys with waterfalls, the daily occurrence of rockfalls, frequent landslides, and the exceptional rate of sediment transport. These segments have an outstandingly remarkable geologic value.

Taylor Creek and tributaries including: North Fork of Taylor Creek, Middle Fork of Taylor Creek and South Fork of Taylor Creek

Taylor Creek and its tributaries flow from a collection of parallel canyons in the Navajo sandstone then below their confluence westward across the Hurricane Fault. The canyons are formed along a series of east-west trending joints that are bound by large monoliths of massive Navajo Sandstone. The eolian sandstone here is fully 2,000 feet thick and forms the highest sandstone cliffs known on earth. Each of the forks flows in a vertical walled canyon that is an oversized version of a slot canyon with a floor 100-300 feet wide, then narrows to a true slot canyon in the upper reaches. Recent landslide dams and lake deposits are found in the Middle and South Forks of Taylor Creek, the former with a landslide dam that occurred in 1990 and failed catastrophically in 1993, and the latter with two landslide dams roughly 4,000 and 2,000 years old (Biek, 2007). Hanging valleys are present in these canyons and, while they are less numerous than in other parts of Zion National Park, they are elevated over 1,000 feet above the valley floor, and produce short-lived waterfalls after rainfall events. Evidence of exceptionally active erosion abounds in the recent rockfalls and landslides, talus and colluvium covered slopes and high rates of sediment transport. Spring discharges from the Navajo aquifer, while small, are sufficient to produce several hanging gardens and small perennial flows where the channel cuts through the base of the Navajo Sandstone. Near the west end of this segment, Taylor Creek cuts across the Hurricane fault which is recognized as the topographic boundary between the Colorado Plateau and the Basin and Range provinces. Given the highest sandstone cliffs know on earth, the extreme height of the hanging valleys and other characteristics noted these segments have an outstandingly remarkable geologic value.

Recreational ORV



Exceptional recreational opportunities exist along the Virgin River and its tributaries, providing visitors from around the world with a chance to develop personal and lasting connections with the river within some of the most unique water-carved desert canyons in the region. The dramatic setting dominated by scenic grandeur contribute to a spectrum of river-related experiences - from the self-reliant adventure of canyoneering or hiking and backpacking through narrow river and creek channels, to enjoying photography and other artistic pursuits, viewing scenery, or camping along the river. For generations, the striking contrast of heat and water, stone and gardens have drawn people to this unique desert river and its tributaries. The regional of comparison for the Recreation ORV is the portion of the Colorado Plateau which lies in southwestern Utah west of the Green and Colorado Rivers. See Recreation al ORV table in Appendix for detailed evaluation by segment.

Recreational experts considered that to qualify as having an outstandingly remarkable recreational value, a segment must have river related or river dependent recreational activities. Activity occurs within river or immediate shore lands within corridor and/or owes its existence to the river and its various characteristics. Also the recreational experience must be rare, unique or exemplary. For more details, see the outstandingly remarkable recreation value table at the end of the report.

North Fork of the Virgin River above the Temple of Sinawava

The section of the North Fork of the Virgin River, known as the Narrows, offers a memorable and rare experience due to its dramatic scenery and setting – in particular, the play of light and shadow on the walls, and lush gardens clinging to the rock faces, features enhanced by the echoing sounds of cascading water in the narrow gorge. Recreation in this world-class segment of the river is extremely popular, attracting people from around the world to this relatively easily accessible narrow slot canyon. Visitors are drawn to the shaded canyon where wading in the water is central to the experience and provides a refreshing respite from the desert heat. From a half-hour walk along the cool canyon path to experiencing a multi-day backpacking adventure wading in sometimes waist-deep water, this segment of the river allows visitors of varying ages and abilities a chance to get into the river and experience the canyon. The dramatic scenic grandeur and towering walls of stone also draw photographers, writers, and painters. One cannot leave this segment of the river without garnering a sense of intimacy with nature and awe at the river's enduring beauty and power. This segment has an ORV for recreation.

Imlay Canyon

The unique geologic features, such as large potholes, combined with interesting scenery create a difficult and challenging canyoneering experience. This segment has an outstandingly remarkable recreational value.

Orderville Canyon
The Orderville segment offers an outstanding canyoneering experience that allows visitors to be enveloped in a deep and confined canyon. While not as technically challenging as other slot canyons in the river corridor, this section offers a high degree of adventure for visitors with a wider range of physical abilities. The steep and narrow rock walls create a quiet sensation of being enveloped and embraced by the earth for long stretches of the segment. Visitors to this tributary also enjoy views of hanging gardens and "pour-offs" of water into the river. It is this unique setting combined with the opportunities for solitude that provide a rare and unusual recreational opportunity. This segment has an outstandingly remarkable recreational value.

Deep Creek
From its origin near the trailhead to the confluence with the North Fork of the Virgin River at the Narrows, Deep Creek offers a unique slot canyon experience characterized by clear water, numerous plunge pools, pristine natural beauty, and exceptional opportunities for solitude. This segment has an outstandingly remarkable recreational value.

Mystery Canyon
From springs and hanging gardens to the sounds of water and experience of solitude, the Mystery Canyon segment offers visitors outstanding recreational opportunities and adventure challenge. As one slot canyon joins another at the confluence with the North Fork of the Virgin River, canyoneers must rappel down a waterfall into the Narrows. This segment has an outstandingly remarkable recreational value.

North Fork of the Virgin River below the Temple of Sinawava
This segment of the river offers a recreational setting that is intimate and sublime, defined by the river and the extreme geology. Here, the setting is transformed as the narrow river bottom widens, exposing open grassy areas framed by vertical sandstone walls. Visitors of all ages and abilities come here from around the world to engage in a full spectrum of river-related activities, such as bicycling or walking along the paths that parallel the river, camping, as well as simply splashing and wading in the water. No matter what the activity, nearly all visitors come to this segment to experience the scenery, which is unarguably moving and memorable. A diversity of towering iconic features dominate this segment, including the Great White Throne (the world's largest sandstone monolith), Angel's Landing, the Watchman, the Beehives, Weeping Rock, Streaked Wall, West Temple, Alter of Sacrifice, and the Court of the Patriarchs. Artists, writers, and photographers have long been drawn to this area of the river to capture the canyon's ever-changing beauty. This segment has an outstandingly remarkable recreational value.

Pine Creek
Adventure-seekers who experience the Pine Creek tributary enjoy the technical canyoneering challenge in a quintessential slot canyon with fluted and sculpted, cave-like walls. This segment also contains several outstanding swimming holes surrounded by the undulating colors of rock. This segment has an outstandingly remarkable recreational value.

Left Fork North Creek
Perhaps one of the most popular technical canyoneering routes in the region, if not the country, is a geologic feature known as the Subway along the Left Fork of North Creek. This route offers a unique combination of adventure and exceptional scenery and is appropriate for the average physically fit person. The Subway gets its name from the unusual tube-like shape within the slot canyon of rock. Here,

adventure seekers enjoy route finding, swimming, and short rappels. The exemplary geology and red rock waterfalls also attract photographers from around the country and the world. This segment has an outstandingly remarkable recreational value.

La Verkin Creek (within BLM segment of river)
The lower portion of LaVerkin Creek offers outstanding opportunities for solitude and unconfined recreation in a desert landscape dominated by pinion juniper forest. Here, the creek itself varies from braided channels to narrow canyons containing sections of deep pools and large boulders. Within this unique setting, visitors enjoy excellent opportunities to engage in a wide range or river-related recreational activities, such as hiking and backpacking, swimming or wading in exemplary plunge pools, horseback riding along the creek, and enjoying the scenery and solitude of this unique landscape. This segment has an outstandingly remarkable recreational value.

Scenic ORV

The Virgin River and its tributaries create diverse opportunities for views of the river's unparalleled scenery, which can be both dramatic and subtle. The river creates a landscape of cross-bedded sandstone cliffs, towering thousands of feet above the visitor. The geologic tapestry of contrasting colors and textures—red, white and pink cliffs; slivers of blue sky and lush green ribbons of riparian vegetation and hanging gardens—encompass the sculpted and undulating canyons. Seasonal waterfalls flow over slickrock from hanging canyons over 100 feet above the river floor.



River and tributary canyons offers a pleasing contrast in soil, rock, vegetation, and water, views that greatly enhance the visual quality, with still or cascading water dominating the landscape. Light changes in the canyon depending on the time of day and the season. Rocks can appear fiery red, golden, bright white, grey and black. Even the absence of water in some "phantom channels" creates drama and visual interest.

These elements combine to offer a landscape character that is unique and unforgettable on a scale that draws visitors from all over the world. To qualify as having an outstandingly remarkable scenic value, a segment must contain river related or river dependent scenery, be one of the most areas significant in the region for diversity of views, and have an occurrence of special features.

See outstandingly remarkable scenic value table in Appendix for detailed evaluation by segment.

North Fork of the Virgin River above Temple of Sinawava, Orderville Canyon, Deep Creek and Mystery Canyon

The Narrows, Orderville Canyon and Deep Creek, above the Temple of Sinawava are world class examples of narrow river canyons framed by soaring cliffs, where lush hanging gardens and the combination of water and light define the landscape. The section of the North Fork of the Virgin River known as the Narrows is memorable and rare for its visual qualities – in particular, the play of light and shadow on the walls, a feature enhanced by the echoing sounds of cascading water in the narrow gorge. Here, probably more than in any other river segment, water dominates the physical characteristics and shapes the visual experience. Special features include canyon walls which are over 1,500 feet high, with a width of less than 25 inches in some areas. Rich red sandstone walls and dark desert varnish contribute to color and texture variety. Big Spring and Mystery Spring are some of the finest examples in the region of spectacular hanging gardens, providing a striking visual combination and contrast of lush greenery and abundant wildflowers in a narrow sandstone canyon. This segment has an outstandingly remarkable scenic value.

North Fork of Virgin River below Temple of Sinawava

In this segment, the landscape is transformed as the narrow river bottom widens, exposing open expanses framed by vertical sandstone walls. Foreground views include a variety of textures and colors including grasses, cottonwoods and riparian vegetation that change color with the seasons, and give way to soaring red rock walls. A diversity of towering iconic features dominate this segment, including the Great White Throne (the world's largest sandstone monolith), Angel's Landing, the Watchman, the Beehives, Weeping Rock, Streaked Wall, West Temple, Altar of Sacrifice, and the Court of the Patriarchs. This segment has an outstandingly remarkable scenic value.

Birch Creek

The Birch Creek tributary of the North Fork of the Virgin River contains dramatic views of rock cliffs towering above the river, and includes an alternative and spectacular view of the Court of the Patriarchs. This segment has an outstandingly remarkable scenic value.

Oak Creek

The Oak Creek tributary of the North Fork of the Virgin River provides views of the Towers of the Virgin and West Temple from within a remote, natural setting. This segment has an outstandingly remarkable scenic value.

Pine Creek

The Pine Creek tributary includes colorful, sculpted, deep, cave like slot canyon. Further down the canyon, an outstanding view of the Great Arch of Zion becomes evident. This segment has an outstandingly remarkable scenic value.

North Creek

The Left Fork is particularly diverse in scenic views, beginning at the initial descent across spectacular crossbedding (variation in color and texture), down Russell Gulch into the Left Fork of North Creek. Clear, deep potholes, the characteristic 'subway' curvation of the canyon walls and the slot 'subway tracks' are very unusual in the region. Hanging gardens in the Right Fork are richly diverse and complex. The slot canyons, coupled with the wide canyon vistas in the first and last sections of the canyon, make this area extremely diverse. The upper section is particularly worthy of above average regional significance. High relief and surface variations meld well with the contrast in soils, rock, vegetation, and cascading water. This segment has an ORV for scenery.

Taylor Creek
The Taylor Creek segment contains some of the most striking and contrasting colors and textures in the river corridor—from dark green alpine vegetation, and colorful sprays of wildflowers to vivid red sheer rock walls and alcoves. Unique geological features include views of Zion Fingers and the Double Arch Alcove, as well as historic cabins along the creek that contribute to the scenic value in this unique segment of the river corridor. The Zion Fingers include a series of slot canyons which come out of a large red rock escarpment. This segment has an outstandingly remarkable scenic value.

Ecological Processes ORV



Ecological Processes supporting vegetation is an outstandingly remarkable value in some of the Virgin River designated segments due to the presence of exemplary riparian corridors and rare plant communities. The region of comparison for ecological processes is the Colorado Plateau physiographic region

The cottonwood gallery forests along the East Fork of the Virgin River and Shunes Creek provide rare examples of relatively intact, properly functioning riparian systems. Natural river processes proceed unimpeded, allowing for seasonal flooding and meander migration, vegetative recruitment and plant succession. Riparian vegetation is abundant and diverse. The Virgin River and its tributaries have created unique habitats for rare plant communities in a desert southwest ecosystem. Steep-walled canyons, carved over time by the rivers, create cool, moist microclimates that support hanging gardens that are rare and exemplary in the region. These gardens, occurring at seeps in the vertical sandstone walls, support a complex biotic community including several plant and animal species found only in the Virgin River system. The hanging gardens in Zion are more numerous and larger than gardens found elsewhere, and are sought out by researchers due to their rareness in the region.

Experts included rare species and communities, riparian habitat quality and scientific importance in the outstandingly remarkable ecological processes value.

North Fork of the Virgin River above Temple of Sinawava:
The North Fork of the Virgin River above the Temple of Sinawava, along with Orderville Canyon, support the most exceptional examples of hanging gardens in the region. The gardens are home to seven species of plants that grow nowhere else in the world. The moist microclimate provided by the river adds to the diversity of plant species in these gardens; which in some cases includes up to 26 species. These gardens also provide habitat for the endemic Zion snail (or wet-rock physa, *Physella zionis*).

East Fork of the Virgin River and Shunes Creek

The East Fork of the Virgin River has regionally outstanding examples of hanging gardens, with riverside microclimates supporting endemic plants like maidenhair fern, Zion shooting star, and yellow columbine. Further, the cottonwood gallery forests along the East Fork of the Virgin River and Shunes Creek provide rare examples of relatively intact, properly functioning riparian corridors. Natural river processes proceed unimpeded, allowing for seasonal flooding and meander migration, vegetative recruitment and plant succession. Riparian vegetation is abundant and diverse. Thick grasses and sedges along the banks form stable undercuts for fish habitat, woody species provide habitat for numerous species of wildlife, and invasive riparian woody species are very limited. These communities provide a regionally significant reference reach for restoration of degraded systems throughout the region.



In all other designated segments, hanging gardens either are not regionally significant, not river-related, or non-existent.

Wildlife ORV

Wildlife is an outstandingly remarkable value in the Virgin River and its tributaries due to the habitat for, and populations of desert bighorn sheep, Mexican spotted owl and the endemic Zion snail. The region of comparison for this ORV was generally southwestern Utah, northwestern Arizona and southeastern Nevada. The criteria for the wildlife ORV included: the wildlife was river related and river dependent, the wildlife population, habitat and scientific importance

East Fork Virgin River and Shunes Creek:
Desert bighorn sheep are listed as a sensitive species across the multi-state region. In the East Fork of the Virgin River and Shunes Creek, the convergence of river-carved cliffs, near-stream vegetation for forage, and proximity of year-round water provides one of the few known locations for bighorn sheep lambing in the region. Lambing grounds are concentrated along this river segment (Hart 2001, Deshler and Hart 1996), and are exceptionally productive. The productivity of these lambing grounds are critical for the long-term reproductive success of the species, since dispersing Virgin River sheep are the source for bighorn populations in much of the region. Research opportunities due to this population's success are regionally significant. Due to the critical lambing grounds, sustainable population and long-term research opportunities for desert bighorn sheep, an ORV for wildlife was found in the East Fork of the Virgin River and Shunes Creek.



Desert bighorn sheep
Photo credit: Michael Just

North Fork of the Virgin River above the Temple, North Fork of the Virgin River below the Temple, East Fork of the Virgin River, North Creek, Taylor Creek, and La Verkin Creek
The federally threatened Mexican spotted owl breeds in all of the designated river corridors at the highest density in the region and state. Breeding occurs in the cool microclimates provided by the narrow canyons along the designated stream courses. As primary nesting habitat, the river corridors provide the core of the designated critical habitat identified in the recovery plan for this species. After more than 20 years of monitoring, a storehouse of data on Zion's owl population provides the best opportunity for owl research regionwide. Occupied habitat with successful breeding occurs in each of the designated river segments and tributaries including: North Fork of the Virgin River above the Temple, North Fork of the Virgin River below the Temple, East Fork of the Virgin River, North Creek, Taylor Creek, and La Verkin Creek. Due to the critical habitat, sustainable population and long-term research studies for Mexican Spotted owl, an ORV for wildlife was found for all major segments of the Virgin River.



Mexican spotted owls
Photo credit: Ken Kingsley

North Fork of the Virgin River above Temple of Sinawava

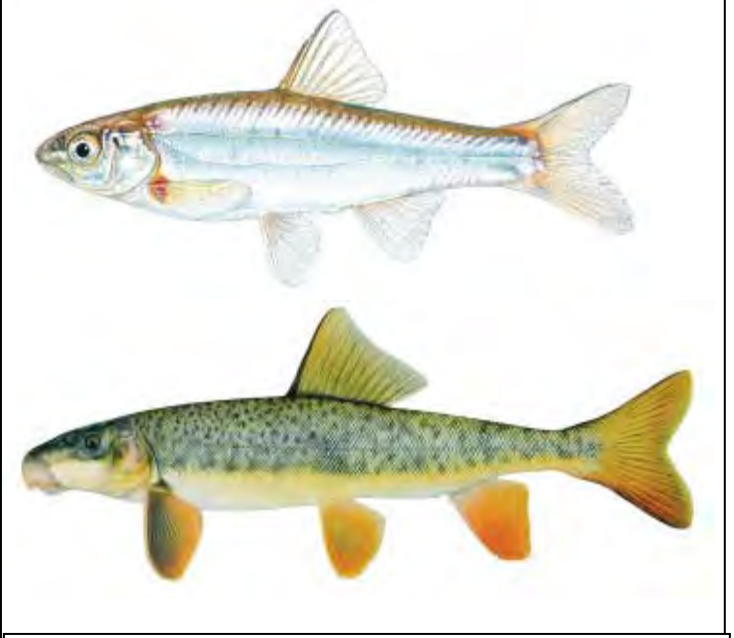
The North Fork of the Virgin River above the Temple of Sinawava and Orderville Canyon are home to the endemic Zion snail (*Physella zionis*). This snail, also known as wet rock physa, is found in some of the most exceptional hanging gardens in the region. This rare snail, identified in 1926, is of national significance as it is only found in Zion National Park along the Virgin River and its tributaries, therefore an ORV for wildlife was found.

Justification for changes in Wildlife ORVs from 2001 Eligibility, Suitability Study

Peregrine falcons, a species delisted from federal endangered status in 1999, are found nesting in the cliffs along designated river segments. These birds nest in solution holes, crevices and platforms high on the vertical cliffs. It is the cliffs that this species depends on, rather than the river itself. Peregrine falcons will nest on cliffs that are not river-carved, and they are well-known for successfully nesting on tall buildings in cities. The peregrine falcons at Zion may prey upon birds in the riparian corridor below their nest sites, but they often consume swifts up near the rim. Therefore, we did not identify peregrine falcons as a contributor to the wildlife ORV.

Bald eagles, a species delisted from federal endangered status in 2009, are an uncommon winter resident at Zion, and are occasional at other times in the year. Bald eagles have been recorded at all elevations in the park, winter surveys have shown that they most often use open slopes from the East entrance to Mt. Carmel Junction, and open valleys west of the park (Wauer 1997). Because this species is not dependent on the river segments, and the population at Zion is not exceptional for the region, we did not identify bald eagles as a contributor to the wildlife ORV.

Fish ORV



Virgin spinedace and flannelmouth sucker
Credit: Utah Division of Wildlife Resources

The Virgin River and its tributaries provide a unique and intact habitat for four native species including the Virgin Spinedace, flannelmouth sucker, desert sucker and speckled dace. The Virgin spinedace is nationally significant and only exists in the Virgin River System. Both the Virgin River spinedace and the flannelmouth sucker are managed under conservation agreements. The Virgin River and several of its tributaries support regionally significant levels of natural and sustainable reproduction for all four native fish species. The North and East Forks of the Virgin River provide the most productive habitat for these fish in the Virgin River basin. The geologic setting and flow regime provide high flows and large sediment loads, unique water quality, and frequent disturbance which are effective deterrents to exotic species. Other factors contributing to the productivity for native fish are connectivity to tributary systems and habitat diversity for spawning, rearing and adult fish. Additionally, the "Zion" stonefly *(Isogenoides zionensis)*, an important component of the food web, is found along the Virgin River and its tributaries. The type specimen for this species was identified in Zion in 1949.

Fisheries criteria included the presence of native species and species of concern (natives (4) Speckled Dace, Desert Sucker, Virgin Spinedace*, Flannelmouth Sucker* Species of Concern), natural and sustaining population, habitat quality and diversity such as: connectivity, water quality, including sediment, food – including Zion Stonefly, cover, diverse (pools, riffles, runs) spring inflows/nursery And natural hydrology

An evaluation table for the Fish ORV is found at the end of this report. The area of comparison for this ORV included the remainder of the Virgin River watershed, the Colorado River Basin and the nation. The remainder of the Virgin River watershed was included because native fish abundance is greatest in the Zion portion of the watershed. The Colorado River Basin was included as some of the fish are more widely distributed within its streams. Since the native fish in the Virgin River system are unique to this system, they reach the level of national significance.

North Fork of the Virgin River above the Temple of Sinawava

This segment contains all four of the native fish species, including the Virgin spinedace and flannelmouth sucker, both species of concern. Fish numbers and the diversity of spawning, rearing and adult fish habitats are high in the lower one mile of this segment, but drop off to near absence in the tightest part of the narrows due to frequent and energetic flood events. The number of Virgin spinedace and flannelmouth sucker are low but natural and sustainable reproduction is occurring. Exotic brown trout exist in small numbers, apparently kept in check by the flood and sediment regime to numbers that do

not impact the abundance of native fish. The Zion stonefly is a recently discovered species found in this segment of the North Fork of the Virgin River and is indicative of a disturbance-adapted aquatic fauna. Based upon the presence of the four native fish species and the Zion stonefly, fish are an ORV for this segment.

Deep Creek - BLM
Deep Creek contains two native fish species, flannelmouth sucker and desert sucker, although much of the use may be transitional. Reproduction may be occurring, but additional monitoring is needed. Habitat is marginal for native fish species and the presence of native fish is impacted by exotics such as brown trout and cutthroat trout. Based upon the presence of native fish species, fish is an ORV for this segment.

North Fork of the Virgin River below the Temple of Sinawava
This segment contains all four of the native fish species, including the Virgin spinedace and flannelmouth sucker, both species of concern. The Zion stonefly is a recently discovered and nationally significant species and is found in this segment of North Fork of the Virgin River. The North Fork of the Virgin River below the Temple has some of the highest levels of native fish reproduction in the Virgin River basin and typically contains an excellent distribution among age classes for all four species. The geologic setting and flow regime provide high flows and large sediment loads, good water quality, and frequent disturbance which are effective deterrents to exotic species. Other factors contributing to the productivity for native fish are connectivity to tributary systems and habitat diversity for spawning, rearing and adult fish. Based upon the presence of the four native fish species and the Zion stonefly, high levels of natural reproduction, an excellent age class of all four species and excellent spawning, rearing and adult habitat, fish are an ORV for this segment.

East Fork of the Virgin River
This segment contains all four of the native fish species, including the Virgin spinedace and flannelmouth sucker, both species of concern. The East Fork of the Virgin River has the highest levels of native fish reproduction in the Virgin River basin and typically contains an excellent distribution among age classes for all four species. This segment contains some of the finest native fish habitat in the Virgin River basin, characterized by largely natural flows, large sediment loads, unique water quality, and frequent disturbance which are an effective deterrent to exotic species. Habitats include connectivity to tributary systems, and diversity for spawning, rearing and adult fish. Based upon the presence of the four native fish species, high levels of natural reproduction, an excellent age class of all four species and excellent spawning, rearing and adult habitat, fish are an ORV for this segment.

Shunes Creek
This segment contains two native fish species; the Virgin spinedace, a species of concern, and the speckled dace. Shunes Creek has native fish reproduction, but additional monitoring is required to confirm the extent of the reproduction and sustainability of age classes. Shunes Creek is characterized by low flows during the dry season, but continues to carry a natural flow regime including floods that create habitat diversity. Due to low flows stream temperatures can be a concern. Shunes Creek is disconnected from the East Fork of the Virgin River seasonally. Based upon the presence of two native fish species, including the Virgin River spinedace, a species of concern, fish are an ORV for Shunes Creek.

North Creek, Right and Left Forks of North Creek
This segment contains the speckled dace and desert sucker, both are native fish but neither are species of concern. Virgin spinedace use North Creek downstream of the WSR reach, but their occupancy and

reproduction are intermittent due to recent flooding and periods when the stream is dry due to agricultural diversions. North Creek is a drop-pool system with limited runs and riffle habitat. North Creek is also periodically disconnected from the Virgin River. Based upon the presence of the two native fish species, and the potential for transitional use by the Virgin River spinedace, a species of concern, fish are an ORV for this segment.

VIRGIN RIVER
SITE-SPECIFIC ISSUES AND OPPORTUNITIES

During the May 2010 workshop, participants identified site-specific issues and opportunities along designated river segments. The following table and attached map provide a summary of this exercise. Please note that some issues and opportunities identified by the workshop participants are not site-specific and therefore do not appear on the map.

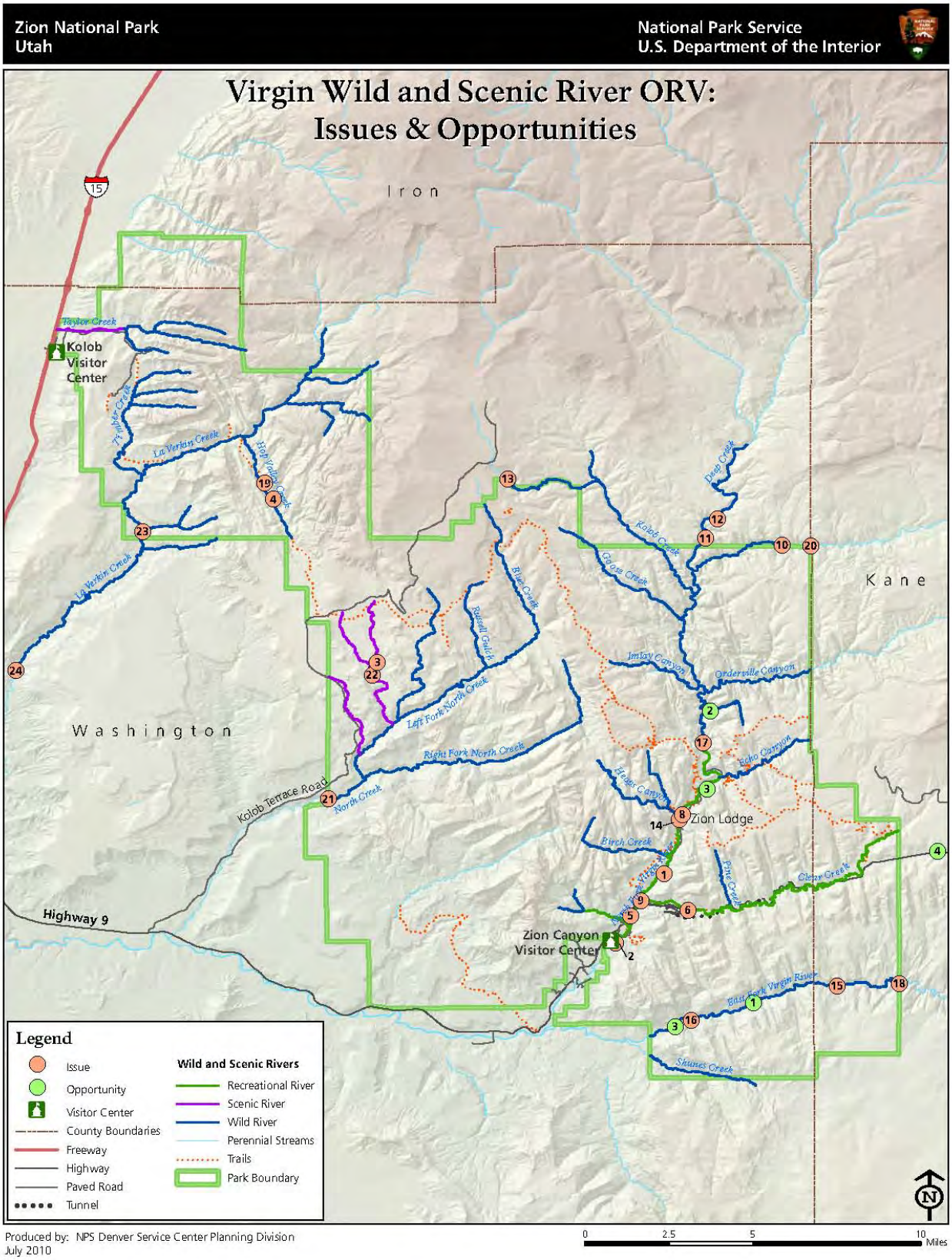
These results are not considered to be a comprehensive list of all issues and opportunities, but rather a starting point for developing planning issues to be addresses in the Comprehensive River Management Plan.

ORV Legend: *C=Cultural, F=Fish, G=Geology, S=Scenery, R=Recreation, W=Wildlife, E= Ecological Processes, WQ=Water Quality, FF=Free-Flowing*

Dot Color/ Number	Category	Potentially Affected ORVs, Water Quality and Free-flowing Condition
Orange	**Issues**	
	Land Use Conflicts:	
1	Sentinel landslide – planning for emergency contingencies	WQ, FF
2	Temporary parking lot (for road construction)	WQ
3, 4	Private in holdings	WQ, S, FF
	Horse concessions	WQ, S, R
	Runoff from developed landscapes	WQ
	Intrusions:	
	Need to inventory existing intrusions and assess impacts	FF, E, S
5	Bridges (historic/non-historic)	FF, E, S, C
6	**Roadwork:** • Storm water runoff • Road management within park	 WQ WQ, FF
7	Number not used	
8	**Rip-rap/Armoring of North Fork of Virgin River:** • Enhance river vs. risk infrastructure • Long-term road protection • Levees	 FF, E, R F, FF, R G, F, FF, WQ
	Hazards:	
	Flash floods	WQ, R
	Geologic events: • Landslides (Geology, Fish, Free-flowing condition) • Rockfall (Geology, Free-flowing condition)	 G, F, FF G, FF

Dot Color/ Number	Category	Potentially Affected ORVs, Water Quality and Free-flowing Condition
9	**Diversion dams:** • Water rights • Flow levels • Fish passage • Replacement of existing dams (review if any are historic)	G FF, F FF F FF,C
10	**Water Quality:** • E. Coli – Upper North Fork Virgin River • Chronic bacteria issue – recreational contact concerns	WQ, R
14	Impacts of trail maintenance – for example, Emerald pool trail	WQ, FF
	Recreation Impacts	WQ, W, E, S, R
	Boating vs. fish and riparian protection	WQ, F, E
	Use vs. habitat protection	WQ, F, W, E, R
	Capacity	WQ
	Human waste	WQ
11, 12	Monitoring needs at La Verkin Creek and Deep Creek for fish populations	F
12	Potential exotic fish removal (Deep Creek)	F
	Fish recovery plan – 2 species of concern in MOU	F
13	**Kolob Reservoir/ Kolob Creek :** • Release flow/ timing in regards to fish and recreation • Confusing approval system for permitting • No instream gauge • Vague flow reporting from Washington County Water Conservation District • Kolob reservoir MOU – visitors contact Washington County Water Conservation District	F, R, WQ R R, FF R, WQ WQ
	Climate change impacts (flooding, fire regime, vegetation impacts for traditional use, impacts to wildlife)	C, W, E, FF
15	Threat of contact with domestic sheep – disease	W
	Mexican Spotted Owl - potential impact with humans, management actions	W
	Unknown carrying capacity for Desert Big Horn Sheep	W
16	East Fork Virgin River: Maintenance removal of tamarisk and Russian olive	E
	Exotic grasses and Russian Thistle increase fire risk	E, W
17	Social trails and visitor impacts on endemic plant and animal species in hanging gardens and soils adjacent to trails	E, R, WQ, W, S
	Need for research on hanging gardens – new endemic plant and animal species?	E, W
	Boundary encroachment to park ORVs (invasive weeds, migration, water quality, trespass cows)	E, WQ, R, S
18	Tires and other trash in East Fork	F, E, FF, WQ

Dot Color/ Number	Category	Potentially Affected ORVs, Water Quality and Free-flowing Condition
19, 20, 21, 22, 23	**Scenic ORV Threats:** • Air Quality • Night Skies and Soundscapes • Wildland and Prescribed Fires • Bolts in slot canyons and anchors, rope scars	S, WQ S, R S, WQ, FF, E, C S, R, G
	Vandalism	C, S
	Erosion and flooding have impact on site integrity	C
	Visitor & employee safety (flash floods, falling, jumping rather than using rope, getting lost, lack of rope skills)	R
	OHV's illegally intruding – specific to Lower La Verkin Creek on BLM segment	R
	Out-of-bounds camping	R, E
	Private property & ability for folks to access Wilderness & WSR will require focused collaboration, formal agreements in future	R
	User capacity	R
	<u>Potential Management Issues:</u>	
	NPS administrative/management actions	All
	WSR Implementation: • Staff awareness • Park contact/lead • ESF Process	All
	Section 7 Implementation: Meet with US Army Corps, state on how permitting process is affected by WSR	All
	Planning Conflicts: General Management Plan vs. Comprehensive River Management Plan vs. Backcountry Management Plan vs. Fire Management Plan	All
Green	**Opportunities**	
1	Opportunities for research on species – Mexican Spotted Owl and Desert Big Horn Sheep, fish,	W, F
2	Opportunity to research migration patterns and genetic differentiation of disjunct hanging garden populations within desert ecosystems	W, V, F
3	Use East Fork Virgin River cottonwood gallery forest as reference for lower North Fork Virgin River riparian restoration and research	E
4	Collaborative work on weed management with upstream landowners	E
	Partnerships with Tribes on facilitating existing appropriate cultural practices and improve process to provide good information to tribes regarding access, material cultural resources	E, S, C
	Signage/Messaging Ideas : Signs (including WSR insignia on Riverwalk and Pa'rus Trail) Web Interpretation staff Special products	ALL


Zion National Park
Utah
National Park Service
U.S. Department of the Interior
Virgin Wild and Scenic River ORV:
Issues & Opportunities
Iron
Kane
Washington
Taylor Creek
Kolob Visitor Center
Timber Creek
La Verkin Creek
Hop Valley Creek
Deep Creek
Kolob Creek
Goose Creek
Russell Gulch
Imlay Canyon
Orderville Canyon
Left Fork North Creek
Right Fork North Creek
Echo Canyon
Kolob Terrace Road
North Creek
Zion Lodge
Birch Creek
Clear Creek
Fine Creek
Highway 9
Zion Canyon Visitor Center
East Fork Virgin River
Shunes Creek
Legend
Issue
Opportunity
Visitor Center
County Boundaries
Freeway
Highway
Paved Road
Tunnel
Wild and Scenic Rivers
Recreational River
Scenic River
Wild River
Perennial Streams
Trails
Park Boundary
Produced by: NPS Denver Service Center Planning Division
July 2010
0 2.5 5 10 Miles

VIRGIN RIVER
STAKEHOLDER INVOLVEMENT

During the last session of the workshop, participants identified stakeholders that should be contacted during public scoping for the Comprehensive River Management Plan. During this exercise, stakeholders were identified. Post-workshop, some of their likely interests were described. Available outreach tools were also identified, which will be the basis for a future public involvement strategy that is implemented throughout the planning process. This list of stakeholders will continue to be updated and cross-referenced with the parks' mailing lists to ensure they are being engaged during major steps of the planning effort.

Stakeholder	Potential Interest(s)
Organization/Agency	
Federal:	
US Forest Service	
US Fish and Wildlife	Wildlife, Species of concern
US Army Corps, St. George office	
DOT/Federal Highways	Roads and transportation
BLM – East side and St. George	
Culturally associated tribes (Need list)	Traditional uses and access/protection of important sites
Congressional representatives and staff (Need list)	
State:	
Utah Division of Wildlife Resources	Species of concern
Utah Department of Environmental Quality	
Utah Division of Water Resources	
Utah Division of Water Rights, Water Planning	
Utah Dept of Natural Resources	
Utah SHPO	Cultural resources/ORVs
Utah Governor's Public Lands Policy Coordination Office	
Local Government/Agencies	
Five County Association of Governments	
Washington County Water Conservancy District	
Kane County Water Conservancy District	
Kane County	
Washington County	
Iron County	
Springdale	
Rockville	

Stakeholder	Potential Interest(s)
Virgin	
La Verkin	
Hurricane	
Canyon Country Conservation District	
Organizations and Associations:	
Virgin River Resource Management and Recovery Program	River issues
Grand Canyon Trust	Conservation
Zion Natural History Association	
National Park Conservation Association	
The Nature Conservancy	Conservation
Trust for the Public Land	Conservation
Southern Utah Wilderness Alliance	Conservation
Citizens for Dixie's Future	
Backcountry Horsemen	Access and use limits, Regulations and management actions
Access Fund	Access and use limits, Regulations and management actions
American Canyoneering Association	Access and use limits, Regulations and management actions
Zion Canyoneering Coalition	Access and use limits, Regulations and management actions
Utah Historical Society	
Utah Rivers Council	
American Whitewater	Access and use limits, Regulations and management actions
American Rivers	Access and use limits, Regulations and management actions
Utah Geological Society	
Outback Hiking Club	Access and use limits, Regulations and management actions
Private or Commercial Interests:	
Inholders and nearby property owners (Need list)	
NCA Allotment Holders (Have BLM list)	
Chambers of Commerce (Need list)	
Tourism Bureaus/Boards (Need list)	
Xanterra and other Concessionaires	
Tourism Business Permitees (Need list)	
Canyoneers (Need list)	Access and use limits, Regulations and management actions
The Desert Rat	
Zion Canyoneering	

Available Public Outreach and Involvement Tools:

- Website
- Open houses
- Newsletters or postcards (like Tuolumne River Plan)
- Workbooks
- Press releases
- Visitor Center and other info nodes
- Organizations' Weekly/Monthly/Quarterly/Annual meetings
- NPS Planning, Environment and Public Comment website
- Twitter and Facebook
- Workshops
- Fact sheets and talking points sheets
- Park partner meetings
- Internal meetings
- Shuttle bus message
- Interpretation – signage, bus displays, junior ranger program
- Zion Natural History Association
- Reinforce WSR message

Appendix A:
ORV Evaluations

Cultural Evaluation

Evaluation Criteria

Prehistoric –The river or area within the river corridor contains a site where there is evidence of occupation or use by Native Americans. Sites must have unusual characteristics or exceptional human interest value. Sites may have national or regional importance for interpreting prehistory: may be rare and represent where a culture or cultural period was first identified and described; or may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes. Of particular significance are sites or features listed in, or eligible for inclusion in, the National Register of Historic Places as regionally or nationally significant.

Examples: Travel routes; camping sites; fishing sites; settlements; ceremonial sites

Historic – The river or area within the river corridor contains a site or feature associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual or one-of-a-kind in the region. A historic site and/or feature in most cases is 50 years old or older. Some cultural values may be displayed as place names. Of particular importance are sites or features listed in, or are eligible for inclusion in the National Register of Historic Places as regionally or nationally significant.

Examples: pioneer sites; travel routes; camping sites; river crossings; iconic landscapes

Traditional Use – The river or areas within the river corridor contains regionally unique location(s) of importance to Indian tribes (religious activities, fishing, hunting, and gathering). Locations may have unusual characteristics or exceptional cultural value being integral to continued pursuit of such activities. Locations may have been associated with treaty rights on ceded lands or activities unprotected by treaty on ceded lands or in traditional territories outside ceded lands.

River Segment	CULTURAL CRITERIA			
	ORV Evidence	Prehistoric	Historic	Traditional Use
North Fork of the Virgin River above the Temple of Sinawava	Documentation of prehistoric and historic use, place names and ongoing Memorandum of Understanding with Southern Paiute for traditional use	Yes	Yes	Yes
East Fork of the Virgin River	Prehistoric Ancestral Puebloan Sites, historic era Mormon sites	Yes	Yes	Yes

All other segments were not found to have prehistoric, historic or traditional cultural properties meeting criteria for the Cultural ORV.

Geologic Evaluation

Geology was evaluated on these criteria:

1. High cliffs of Navajo sandstone, known to be the world's highest sandstone cliffs
2. Slot canyons which are deep and exceptionally narrow vertical walled canyons
3. Springs discharging from the Navajo sandstone aquifer, which are notably extensive in these canyons, are unusual in this arid setting, and are known to support a large number of rare and endemic species
4. Landforms indicating an exceptional rate of erosion including deep canyons, cliffs, expanses of bedrock exposure and extensive landslide deposits.
5. High waterfalls and hanging valleys resulting from the exceptionally high runoff from slickrock and differential rates of erosion leaving channels with large vertical drops
6. River channels that have been dammed by landslides or lava dams in the recent geologic past
7. Inverted valleys resulting from lava flows down canyon bottoms followed by rapid erosion of the surrounding rock layers that leaves the lava flow as an elevated sinuous ridgeline.

Generally an outstandingly remarkable geologic value was found if 5 or more criteria are met per segment, unless there were exceptional examples. Most of these features exist to varying degrees across the Colorado Plateau. These features are exceptionally well represented in the canyons of the Virgin River, due to the Navajo sandstone reaching its greatest thickness and the rapid rate of erosion on the Plateau margin. The wide exposures of sedimentary bedrock and vertical cliffs on the Colorado Plateau are unique in North America.

River Segment **Main Segment** or Tributary Segment	**Navajo Sandstone Cliffs**	**Slot Canyons**	**Navajo Aquifer spring discharge**	**Exceptional Rate of erosion**	**Waterfalls**	**Landslide and Lava Dams**	**Inverted Valleys**	**Score**	**ORV**	**Comments**
North Fork Virgin River above Temple (Main)	Y	Y	Y	Y	Y	N	N	5	Yes	
Kolob/Oak Creek	Y	Y	Y	Y	Y	N	N	5	Yes	Includes BLM reach.
Goose Creek	Y	Y	Y	Y	Y	N	N	5	Yes	
Imlay Canyon	Y	Y	Y	Y	Y	N	N	%	Yes	Springs at Confluence with NFVR
Orderville Canyon	Y	Y	Y	Y	Y	N	N	5	Yes	
Deep Creek	Y	Y	Y	Y	Y	N	N	5	Yes	
Mystery Canyon	Y	Y	Y	Y	Y	N	N	5	Yes	
North Fork Virgin River below Temple (Main)	Y	N	Y	Y	Y	Y	N	5	Yes	
Birch Creek	Y	Y	Y	Y	Y	N	N	5	Yes	
Pine Creek	Y	Y	Y	Y	Y	N	N	5	Yes	
Oak Creek	Y	N	Y	Y	Y	N	N	4	No	
Behunin Canyon	Y	Y	Y	Y	Y	N	N	5	Yes	
Echo Creek	Y	Y	Y	Y	Y	N	N	5	Yes	
Clear Creek	Y	Y	N	Y	Y	N	N	4	Yes	Exceptional joint controlled canyons.

River Segment **Main Segment** or Tributary Segment	Navajo Sandstone Cliffs	Slot Canyons	Navajo Aquifer spring discharge	Exceptional Rate of erosion	Waterfalls	Landslide and Lava Dams	Inverted Valleys	Score	ORV	Comments
East Fork Virgin River (Main)	Y	Y	Y	Y	Y	N	N	5	Yes	
Shunes Creek	Y	N	Y	Y	Y	N	N	4	No	Consistent with original finding. Includes BLM
North Creek (Main)	Y	Y	Y	Y	Y	Y	Y	7	Yes	
Wildcat Canyon/ Blue Creek	Y	Y	N	Y	Y	N	N	4	No	Not consistent with original finding.
Right Fork	Y	Y	Y	Y	Y	Y	N	6	Yes	
Left Fork	Y	Y	Y	Y	Y	Y	Y	7	Yes	
Grapevine Wash	Y	N N	N	Y	Y	Y	N	4	No	Possible geologic in lower reach, this could be captured in LFNC corridor.
Pine Spring Wash	Y	N	N	Y	Y	Y	N	4	No	Possible geologic in lower reach, this could be captured in LFNC corridor.
Little Creek	Y	Y	N	Y	Y	Y	N	5	Yes	
Wolf Springs Wash	Y	N	N	Y	N	Y	N	3	No	No is consistent with original finding.
Russell Gulch	Y	Y	N	Y	Y	Y	N	5	Yes	
La Verkin Creek (Main)	Y	Y	Y	Y	Y	Y	N	6	Yes	
Willis Creek	Y	Y	Y	Y	Y	Y	N	6	Yes	
Beartrap Canyon	Y	Y	Y	Y	Y	N	N	5	Yes	
Timber Creek	Y	Y	N	Y	Y	N	N	5	Yes	Slot canyons on upper section
Current Creek	Y	N	Y	Y	Y	Y	N	5	Yes	
Cane Creek	Y	N	Y	Y	Y	Y	N	5	Yes	.
Hop Valley	Y	N	Y	Y	Y	Y	N	5	Yes	
Smith Creek - BLM	Y	N	Y	Y	Y	Y	N	5	Yes	
La Verkin (BLM, upstream)	Y	Y	?	Y	?	N	N	?		Need more information unless considered with NPS reach.
Taylor Creek (Main)	Y	Y	Y	Y	Y	Y	N	6	Yes	
North Fork	Y	Y	Y	Y	Y	Y	N	6	Yes	
Middle Fork	Y	Y	Y	Y	Y	N	N	5	Yes	
South Fork	Y	Y	Y	Y	Y	Y	N	6	Yes	
BLM upstream	N	N	N	Y	N	N	N	1	No?	Check on linkage with downstream reach
La Verkin (BLM, downstream)	Y		Y			Y		3 of 3	Yes	

Wildcat Canyon
Wildcat Canyon and its tributary of Blue Creek did not meet the criteria of having 5 of the seven geologic ORV criteria. This segment does contain exemplary examples of high Navajo sandstone cliffs, slot canyons, landforms indicating an exceptional rate of erosion, and waterfalls. While basalt flows and pyroclastic deposits cap the plateau at the headwaters of these segments, they do not form the exemplary landscape features like inverted valleys. This segment ends at the confluence with Russell Gulch above the level where the Navajo aquifer produces abundant springs. No outstandingly remarkable geologic value was found for this segment.

Oak Creek
The canyon of Oak Creek contains some of the highest cliffs of Navajo sandstone, reaching 2,000 feet of uninterrupted vertical cliff face. There are several high waterfalls from hanging valleys. An exceptional rate of erosion is demonstrated by the high cliffs, abundant talus and colluvial slopes, the remains of many large rockfalls and slope failures, and large sediment deposits from historic and prehistoric flood events. While slot canyons exist in the top of the Navajo sandstone in the Oak Creek watershed, they do not occur in the designated segment. Similarly, there are numerous seeps and springs at the base of the Navajo sandstone but this area also outside of the designated segment. Therefore, the Oak Creek segment when considered independently meets only 3 of the 7 geologic ORV criteria.

Shunes Creek:
This segment has 4 of 7 criteria for geology ORV: Navajo sandstone cliffs and aquifer spring discharge, exceptional rate of erosion and waterfalls. The geology is not rare or unique for the region, so no outstandingly remarkable geologic value was found for Shunes Creek.

Grapevine Wash, Wolf Springs Wash, Pine Springs Wash
These washes do not have 5 or more criteria for geology, therefore no outstandingly remarkable geologic value was found for this segment.

Recreational Evaluation

Evaluation Criteria

River Related or River Dependent*:* Activity occurs within river or immediate shore lands within corridor and/or owes its existence to the river and its various characteristics.

Rare, Unique, or Exemplary in a Regional or National Context:
Regional or National Context – Visitors are drawn from throughout the region, the nation or internationally specifically to participate in specified recreational opportunities.
Rare - The recreational activity or experience represents an example of this type of opportunity that is uncommon within the regional or national context.
Unique – The recreational activity or experience represents a singular example of the opportunity within the regional or national context.
Exemplary – The recreational activity or experience represents a conspicuous example among other similar opportunities within the regional or national context.

Main Segment or Tributary Segment	**RECREATIONAL CRITERIA**				
	ORV Evidence	River Related / Dependent	Rare	Unique	Exemplary
North Fork above the Temple of Sinawava	The Narrows offers a memorable and rare experience due to its dramatic scenery and setting. This segment attracts people from around the world.	**X**	**X**		**X**
Imlay Canyon	The unique geologic features, such as large potholes, combined with interesting scenery create a difficult and challenging canyoneering experience. This segment has an ORV for recreation.	**X**		**X**	
Orderville Canyon	Provides a canyoneering experience that envelops visitors in a deep and confined canyon. This section offers a high degree of adventure for visitors with a wider range of physical abilities. Visitors enjoy views of hanging gardens and "pour-offs" of water into the river. This unique setting combined with the opportunities for solitude provides a rare and unusual recreational opportunity.	**X**		**X**	
Deep Creek	Deep Creek offers a unique canyon experience characterized by clear water, numerous plunge pools, pristine natural beauty, and exceptional opportunities for solitude.	**X**		**X**	
Mystery Canyon	From springs and hanging gardens to the sounds of water and experience of solitude, the Mystery Canyon segment offers visitors outstanding recreational opportunities and adventure challenge.	**X**	**X**		

Main Segment or Tributary Segment	**RECREATIONAL CRITERIA**				
	ORV Evidence	River Related / Dependent	Rare	Unique	Exemplary
North Fork below the Temple of Sinawava	This segment offers a recreational setting that is both intimate and sublime, defined by the river and the extreme geology. Visitors of all ages come here from around the world to engage in a full spectrum of river-related activities. Nearly all visitors come to this segment to experience the scenery, which is unarguably moving and memorable. A diversity of towering iconic features dominates this segment, including the Great White Throne, Angel's Landing, Weeping Rock, and the Court of the Patriarchs. Artists, writers, and photographers have long been drawn to this area of the river to capture the canyon's ever-changing beauty.	**X**	**X**		
Pine Creek	Adventure-seekers who experience the Pine Creek tributary enjoy the technical canyoneering challenge in a quintessential slot canyon with fluted and sculpted, cave-like walls. This segment also contains several outstanding swimming holes surrounded by the undulating colors of rock.	**X**	**X**		
Left Fork North Creek	Perhaps one of the most popular technical canyoneering routes in the region, if not the country, is a geologic feature known as the Subway which gets its name from the unusual tube-like shape within the slot canyon of rock. Here, adventure seekers enjoy route finding, swimming, and short rappels. The exemplary geology and red rock waterfalls also attract photographers from around the country and the world.	**X**			**X**
La Verkin Creek (within BLM segment of river)	The lower portion of LaVerkin Creek offers outstanding opportunities for solitude and unconfined recreation in a desert landscape dominated by pinyon juniper forest. Within this unique setting, visitors enjoy excellent opportunities to engage in a wide range or river-related recreational activities, such as hiking and backpacking, swimming or wading in exemplary plunge pools, horseback riding along the creek, and enjoying the scenery and solitude of this unique landscape.	**X**		**X**	
East Fork of the Virgin River	This area is a Research Natural Area set aside for preservation and scientific study, it is closed to use. Since access is prohibited, it does not qualify as part of the Recreation ORV. Furthermore, the scenery is not outstandingly remarkable when compared to other similar areas in the region.	**X**			

Main Segment or Tributary Segment	**RECREATIONAL CRITERIA**				
	ORV Evidence	River Related / Dependent	Rare	Unique	Exemplary
Birch Creek, Oak Creek, Behunin Canyon, Echo Canyon, Clear Creek and Shunes Creek	These segments do not contain river-related recreational values that are outstandingly remarkable in a regional or national context. These segments do not have an ORV for recreation.				

East Fork of the Virgin River, including Shunes Creek
Because the East Fork of the Virgin River is a Research Natural Area set aside for preservation and scientific study, it is closed to recreational use. Since recreational access is prohibited, it does not qualify as having no outstandingly remarkable recreational value. Furthermore, the scenery is not outstandingly remarkable when compared to other similar areas in the region. Also, the mouth of canyon is private land and does not allow access which is a limiting factor to recreation. No recreation opportunities exist that are rare, unique or exemplary. The experience is not unique and does not draw people from around the region.

Kolob/Oak Creek, Goose Creek, Birch Creek, Oak Creek, Behunin Canyon and Echo Canyon, Clear Creek Shunes Creek, Wildcat Canyon/Blue Creek, Right Fork North Creek, Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, Little Creek, Russell Gulch, Willis Creek, Beartrap Canyon, Timber Creek, Current Creek, Cane Creek, Hop Valley Creek, Smith Creek and Taylor Creek (Main Creek and North, Middle and South Forks)
These segments do not contain river-related recreational values that are outstandingly remarkable in a regional or national context. These segments do not have an outstandingly remarkable recreational value.

Justification of Changes from 2001 WSR Report:
The East Fork of the Virgin River, also known as Parunuweap, and Shunes Creek, a main branch of the East Fork of the Virgin River, were zoned as Research Natural Areas in Zion's 2001 General Management Plan. This action added these areas to a national network of "research natural areas". Research Natural Areas are deemed to be ecological significant by maintaining biological diversity while allowing for research and educational opportunities to learn from this diversity. These areas which had little to no human disturbances are closed to the public in order to allow each to be an ecological/environmental benchmark in perpetuity. These river segments will not be open to recreational use based on this designation.

Recreational and Scenic ORV's are tied to the ability of the public being able to experience these ORV's. Due to Parunuweap and Shunes Creek Research Natural Areas being closed to recreational uses as described in the 2001 GMP, recreational and scenic ORVs were dropped from these river segments.

Scenic Evaluation

The Virgin River and its tributaries create diverse opportunities for views of the river's unparalleled scenery which can be both dramatic and subtle. The river creates a landscape of cross-bedded sandstone cliffs, towering thousands of feet above the visitor. The geologic tapestry of contrasting colors and textures—red, white and pink cliffs; slivers of blue sky and lush green ribbons of riparian vegetation and hanging gardens—encompass the sculpted and undulating canyons. Seasonal waterfalls flow over slickrock from hanging canyons over 100 feet above the river floor.

These elements combine to offer a landscape character that is unique and unforgettable on a scale that draws visitors from all over the world.

Scenic Criteria: To qualify as an outstandingly remarkable scenic value, a segment must contain all of the following:
It must be:

1. River related or river dependent
2. One of the most significant in the region for diversity of views, AND
3. Occurrence of special features.

Main Segment or Tributary Segment	**SCENIC CRITERIA**			
	ORV Evidence	River Related / Dependent	High Diversity of Views	Special Features
North Fork above the Temple of Sinawava, Orderville Canyon, Deep Creek and Mystery Canyon	World class examples of narrow river canyons, soaring cliffs in a variety of colors, lush hanging gardens and the combination of water and light. The Narrows is memorable and rare for its visual qualities – in particular, the play of light and shadow on the walls, a feature enhanced by the echoing sounds of cascading water in the narrow gorge. Water dominates the physical characteristics and shapes the visual experience. Special features include canyon walls which are over 1,500 feet high, with a width of less than 25 inches in some areas.	**X**	**X**	**X**
North Fork below the Temple of Sinawava	The landscape is transformed as the narrow river bottom widens, exposing open expanses framed by vertical sandstone walls. Foreground views include a variety of textures and colors including grasses, cottonwoods and riparian vegetation that change color with the seasons, and give way to soaring red rock walls. A diversity of towering iconic features dominate this segment, including the Great White Throne (the world's largest sandstone monolith), Angel's Landing, the Watchman, the Beehives, the Weeping Rock, Streaked Wall, West Temple, Alter of Sacrifice, and the Court of the Patriarchs.	**X**	**X**	**X**
Birch Creek	The Birch Creek contains dramatic views of rock cliffs towering above the river, and includes an alternative and spectacular view of the Court of the Patriarchs.	**X**	**X**	**X**
Pine Creek	Pine Creek includes colorful, sculpted, deep, cave like slot canyon. Further down the canyon, an outstanding view	**X**	**X**	**X**

Main Segment or Tributary Segment	**SCENIC CRITERIA**			
	ORV Evidence	River Related / Dependent	High Diversity of Views	Special Features
	of the Great Arch of Zion becomes evident.			
Oak Creek	The Oak Creek tributary of the North Fork provides views of the Towers of the Virgin and West Temple from within a remote, natural setting.	**X**	**X**	**X**
North Creek, Left and Right Forks of North Creek, and Russell Gulch	The Left Fork is particularly diverse in scenic views, beginning at the initial descent across spectacular crossbedding (variation in color and texture), down Russell Gulch into the Left Fork of North Creek. Clear, deep potholes, the characteristic 'subway' curvation of the canyon walls and the slot 'subway tracks' are very unusual in the region. Hanging gardens in the Right Fork are richly diverse and complex. The slot canyons, coupled with the wide canyon vistas in the first and last sections of the canyon, make this area extremely diverse. The upper section is particularly worthy of above average regional significance. High relief and surface variations meld well with the contrast in soils, rock, vegetation, and cascading water.	**X**	**X**	**X**
Echo Canyon	This canyon contains slickrock bowls, but overall, scenery in this segment is typical in the region. Therefore no scenery ORV was found for this segment.	**X**		
East Fork Virgin River and Shunes Creek	Zion Canyon has better diversity of views. Does not compare to other similar canyons in this region, or within the wild and scenic river corridor, and does not contain the diversity of views or special features that make it rare, exemplary, or unique. A small section by the water fall and Dennet Canyon have some scenic interest and the section above the waterfall is almost as good as the Narrows. But scenery in the overall segment is not regionally or nationally significant.	**X**		
Taylor Creek, and North, Middle and South Forks	The Taylor Creek segment contains some of the most striking and contrasting colors and textures in the river corridor—from dark green alpine vegetation, and colorful sprays of wildflowers to vivid red sheer rock walls and alcoves. Unique geological features include views of Zion Fingers and the Double Arch Alcove, as well as historic cabins along the creek that contribute to the scenic value in this unique segment of the river corridor. The Zion Fingers include a series of slot canyons which come out of a large red rock escarpment.	**X**	**X**	**X**

East Fork of the Virgin River

Scenery in this segment does not meet the criteria as a scenic ORV.

Zion Canyon has better diversity of views. The scenery does not compare to other similar canyons in this region, or within the wild and scenic river corridor, does not contain the diversity of views or special features that make it rare, exemplary, or unique. A small section by the water fall and Dennet Canyon

have some scenic interest and the section above the waterfall is almost as good as the Narrows. But scenery in the overall segment is not regionally or nationally significant.

Kolob/Oak Creek, Goose Creek, Imlay Canyon, Heaps Canyon, Behunin Canyon, Echo Canyon, Clear Creek, Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, Little Creek, Willis Creek, Beartrap Canyon, Timber Creek, Current Creek, Cane Creek, Hop Valley Creek, Smith Creek and La Verkin Creek in the BLM Segment:
Scenery in these segments is typical in the region, and no outstandingly remarkable scenic value was found.

Ecological Processes Evaluation

Ecological processes composed of unique communities of vegetation and associated wildlife is an outstandingly remarkable value in some of the Virgin River designated segments due to the presence of exemplary riparian corridors and rare plant communities.

Ecological Processes Criteria:

1. River related or river dependent
2. Rare species and communities
3. Riparian habitat quality
4. Scientific importance

Main Segment or Tributary Segment	**VEGETATION ORV CRITERIA**				
	ORV Evidence	River Related	Rare species and communities	Riparian habitat quality	Scientific importance
North Fork above the Temple of Sinawava	Support the most exceptional examples of hanging gardens in the region. Gardens are home to seven species of plants that grow nowhere else in the world and the diversity of plant species in these gardens includes up to 26 species. These gardens also provide habitat for the endemic Zion snail (*Physella zionis*).	**X**	**X**	**X**	**X**
East Fork Virgin River and Shunes Creek	Has regionally outstanding examples of hanging gardens, with riverside microclimates supporting endemic plants. The cottonwood gallery forests provide rare examples of relatively intact, properly functioning riparian corridors. Riparian vegetation is native, abundant and diverse. These communities provide a regionally significant reference reach for restoration of degraded systems elsewere.	**X**	**X**	**X**	**X**

In all other designated segments, hanging gardens and riparian habitat quality either are not regionally significant, not river-related, or non-existent.

Wildlife Evaluation

Wildlife is an outstandingly remarkable value in the Virgin River and its tributaries due to the habitat for, and populations of, two species of concern: Desert bighorn sheep and Mexican spotted owl and the endemic Zion snail.

Wildlife Criteria:

1. River related or river dependent
2. Wildlife populations
3. Habitat
4. Scientific importance

Main Segment or Tributary Segment	**WILDLIFE CRITERIA**				
	ORV Evidence	River Related	Wildlife populations	Habitat	Scientific importance
North Fork Virgin above Temple of Sinawava, Orderville Canyon	These segments are home to the endemic Zion snail (*Physella zionis*), also known as wet rock physa, is found in some of the most exceptional hanging gardens. This rare snail is of national significance as it is only found in Zion National Park along the Virgin River and its tributaries.	**X**	**X**	**X**	**X**
East Fork Virgin River and Shunes Creek	Desert bighorn sheep are listed as a sensitive species across the multi-state region. Lambing grounds are concentrated along this river segment and are exceptionally productive. Research opportunities due to this population's success are regionally significant.	**X**	**X**	**X**	**X**
North Fork Virgin above the Temple, North Fork Virgin below the Temple, East Fork Virgin, North Creek, Taylor Creek, and La Verkin Creek	The federally threatened Mexican spotted owl breeds in all of the designated river corridors at the highest density in the region and state. As primary nesting habitat, the river corridors provide the core of the designated critical habitat identified in the recovery plan for this species. After more than 20 years of monitoring, a storehouse of data on Zion's owl population provides the best opportunity for owl research regionwide.	**X**	**X**	**X**	**X**

Fish Evaluation

Segments of the Virgin River were evaluated for the outstandingly remarkable value of fish due to the unique fish found in this area.

Fish Criteria

1) Natives (4) Speckled Dace, Desert Sucker, Virgin Spinedace*, Flannel Mouth Sucker*. The latter two species are Species of Concern.
2) Natural and sustaining population
   a) Natural reproduction , year on year
   b) Abundance of reproduction
3) Habitat quality and diversity
   a) Connectivity
   b) Water quality, including sediment
   c) Food – including Zion Stonefly
   d) Cover
   e) Diverse (pools, riffles, runs)
   f) Spring inflows/nursery
   g) Natural hydrology

(*Managed under conservation agreement)

River Segment	FISH CRITERIA				
	Species of Concern	Diversity of Native Species	Natural Reproduction	Habitat Quality	Determination
North Fork of the Virgin River above the Temple of Sinawava	2	2	Yes	Good	ORV
Deep Creek	1	2	Yes	Good	ORV
North Fork of the Virgin River below the Temple of Sinawava	2	4	Yes	High	ORV
East Fork of the Virgin River	2	4	Yes	High	ORV
Shunes Creek	1	2	Yes	Good	ORV
North Creek	0	2	Yes	Good	ORV

Kolob/Oak Creek, Goose Creek, Imlay Canyon, Orderville Canyon, Mystery Canyon, Birch Creek, Pine Creek, Oak Creek, Heaps Canyon, Behunin Canyon, Echo Canyon, Clear Creek, Wildcat Canyon/Blue Creek, Grapevine Wash, Wolf Springs Wash, Pine Springs Wash, Little Creek, Russell Gulch, La Verkin Creek, Willis Creek, Beartrap Canyon, Timber Creek, Current Creek, Cane Creek, Hop Valley Creek, and Taylor Creek (all forks)

Fish is not an ORV for these segments because they do not contain fish.

References and Credits

Photo Credits:
All photographs by NPS unless otherwise noted.

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APPENDIX D: CONSULTATION LETTERS

United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

In reply refer to:
D18 Virgin W&SR

October 5, 2010

MEMORANDUM

TO	Larry Crist, Field Supervisor, USFWS, Utah Field Office
FROM	Tracy Atkins, Planning Project Manager
RE	Virgin Wild and Scenic River Comprehensive Management Plan

The National Park Service is working with the St. George Field Office of the Bureau of Land Management to develop a comprehensive river management plan (CRMP) for the Virgin Wild and Scenic River in Washington County, Utah. The wild and scenic river designation includes segments of the Virgin River, La Verkin Creek, Taylor Creek, and North Creek (including some tributaries) in Zion National Park and adjacent BLM wilderness (see map attached). The completed plan will provide a framework to guide future resource management and visitor use.

We are currently entering the scoping phase of the planning process. Involvement from agencies, organizations, and the public is being sought to identify issues and opportunities that the plan should address.

In accordance with consultation requirement of Section 7 of the Endangered Species, we wish to notify you of the CRMP/EA process and invite your participation. We are requesting a current list of federally endangered or threatened species that might be present in or around the rivers and any designated critical habitat to ensure adequate evaluation of the potential impacts that the plan could have on federally-listed species.

The river management plan will be developed concurrent with preparation of an environmental assessment (EA) in compliance with the National Environmental Policy Act. The CRMP/EA will identify significant management issues confronting the rivers, and present management alternatives for addressing these issues consistent with legal and policy mandates, including protecting and enhancing the rivers' outstandingly remarkable values, water quality, and free-flowing condition. The environmental impacts associated with implementing each of the management alternatives will be fully analyzed.

When it becomes available, you will receive a copy of the CRMP/EA that will include the findings of the NPS in regards to potential effects on listed species from implementing the alternatives.

We look forward to working closely with you throughout plan development and welcome your comments and advice regarding protection and preservation of area's diverse natural resources. Should you have any questions or wish to discuss this project in more detail, please contact Matthew Safford, Natural Resource Specialist in our Planning Division at 303-969-2898 or at matthew_safford@nps.gov.

Attachment:
Map of Virgin Wild and Scenic River

CC:
Kezia Nielson, Zion National Park

Sent to:
USFWS - Utah Field Office
Larry Crist, Field Supervisor
2369 Orton Circle, Ste. 50
West Valley City, UT 84119

United States Department of the Interior

NATIONAL PARK SERVICE
Zion National Park
Springdale, Utah 84767

IN REPLY REFER TO: L5815 (ZION, RM&R)

May __, 2010

[name and address]

Dear

The Omnibus Public Land Management Act of 2009 designated over 143 miles of rivers within Zion National Park as wild and scenic rivers. They are now part of the National Wild and Scenic River System (NWSRS) which was established by the Wild and Scenic Rivers Act of 1968, as amended. The NWSRS is directed to identify and protect:

> *...certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.*

As part of the designation Zion National Park is required to complete a Comprehensive River Management Plan within 3 years of designation. The management plan will address resource protection, development of adjacent lands and facilities, user capacities, and other management practices necessary to protect the free-flowing condition, water quality, and the identified outstandingly remarkable values of each river segment.

The first step in the planning process is to review the existing information the park has on these river segments. Much of this information comes from the General Management Plan completed in 2001. As part of the general management planning process, all waterways in the park were studied to determine if they would be eligible for inclusion in the NWSRS. This evaluation found five river systems, and their associated tributaries, to have the "outstandingly remarkable values" that would make them suitable as wild and scenic rivers (refer to the enclosed map). The five rivers include: North Fork Virgin River, East Fork Virgin River, North Creek, LaVerkin Creek, and Taylor Creek. The "outstandingly remarkable values" are described in the Wild and Scenic River Act (1968) and include: scenic, recreational, geologic, fish and wildlife, historic, cultural or similar values.

We invite you to participate in the process to identify outstandingly remarkable values for the designated rivers. You can provide input in a number of ways. First you are invited to a workshop to be held on Tuesday June 22, 2010 through June 24, 2010 in Springdale, Utah. If you chose to attend, please contact Sarah Horton, 435-772-0214 or sarah_horton@nps.gov by Friday June 11, 2010 to reserve a space in the workshop. Additional information on the workshop will be available in the coming weeks. Second, if you cannot attend the workshop you may provide information or comments to Sarah Horton by email or to Zion National Park, attn: Sarah Horton, Springdale, UT 84767.

If you have questions on wild and scenic river management or the identification of outstandingly remarkable values feel free to contact Sarah Horton. We look forward to your participation in this process.

Sincerely,

Jock F. Whitworth

enclosure

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United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

D18 Virgin W&SR

May 30, 2012

John M. Fowler, Executive Director
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue, NW, #803
Washington, D.C. 20004

Subject: Virgin Wild and Scenic River, Comprehensive River Management Plan and Environmental Assessment

Dear Mr. Fowler:

The National Park Service (NPS) is working with the St. George Field Office of the Bureau of Land Management to develop a comprehensive river management plan (CRMP) with environmental assessment (EA) for the Virgin Wild and Scenic River in Washington County, Utah. The wild and scenic river designation includes segments of the Virgin River, La Verkin Creek, Taylor Creek, and North Creek (including some tributaries) in Zion National Park and adjacent BLM wilderness. The completed plan will provide a framework to guide future resource management and visitor use. In accordance with section 800.8(c) of the Advisory Council on Historic Preservation's regulations (36 CFR Part 800), *Use of the NEPA Process for Section 106 Purposes*, we are notifying your office in advance of the National Park Service's intention to use the EA to meet its obligations under §106.

The river management plan will be developed concurrent with preparation of an EA in compliance with the National Environmental Policy Act. The CRMP/EA will identify significant management issues confronting the rivers, and present management alternatives for addressing these issues consistent with legal and policy mandates, including protecting and enhancing the rivers' outstandingly remarkable values, water quality, and free-flowing condition. The environmental impacts associated with implementing each of the management alternatives will be fully analyzed.

When it becomes available, you will receive a copy of the CRMP/EA that will include the findings of the NPS in regards to potential effects on cultural resources eligible for or listed on the National Register of Historic Places. At that time we will seek concurrence on our findings. Currently we are conducting public scoping. Documents related to the scoping process are available at the NPS planning website at http://parkplanning.nps.gov/zion. Please feel free to make comments or provide input that will be considered as we move forward with the development of alternatives next year. Comments can be made using the planning website, or they can be addressed to the NPS at the above address.

We look forward to working closely with you throughout plan development and welcome your comments. Should you have any questions or wish to discuss this project in more detail, please contact me at 303-969-2325 or at tracy_atkins@nps.gov.

Sincerely,

Tracy Atkins
Project Manager

cc:
Reid Nelson, Director
Office of Federal Agency Programs
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue, NW, #803
Washington, D.C. 20004

Kezia Nielson, Zion National Park

United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

D18 Virgin W&SR

May 30, 2012

Wilson G. Martin
State Historic Preservation Officer
Utah State History Office
300 S. Rio Grande Street
Salt Lake City, Utah 84101

Subject: Virgin Wild and Scenic River, Comprehensive River Management Plan and Environmental Assessment

Dear Mr. Martin:

The National Park Service (NPS) is working with the St. George Field Office of the Bureau of Land Management to develop a comprehensive river management plan (CRMP) with environmental assessment (EA) for the Virgin Wild and Scenic River in Washington County, Utah. The wild and scenic river designation includes segments of the Virgin River, La Verkin Creek, Taylor Creek, and North Creek (including some tributaries) in Zion National Park and adjacent BLM wilderness. The completed plan will provide a framework to guide future resource management and visitor use. In accordance with section 800.8(c) of the Advisory Council on Historic Preservation's regulations (36 CFR Part 800), *Use of the NEPA Process for Section 106 Purposes*, we are notifying your office in advance of the intention to use the EA to meet obligations under §106.

The river management plan will be developed concurrent with preparation of an EA in compliance with the National Environmental Policy Act. The CRMP/EA will identify significant management issues confronting the rivers, and present management alternatives for addressing these issues consistent with legal and policy mandates, including protecting and enhancing the rivers' outstandingly remarkable values, water quality, and free-flowing condition. The environmental impacts associated with implementing each of the management alternatives will be fully analyzed.

When it becomes available, you will receive a copy of the CRMP/EA that will include the findings of the NPS in regards to potential effects on cultural resources eligible for or listed on the National Register of Historic Places. At that time we will seek concurrence on our findings. Currently we are conducting public scoping. Documents related to the scoping process are available at the NPS planning website at http://parkplanning.nps.gov/zion. Please feel free to make comments or provide input that will be considered as we move forward with the development of alternatives next year. Comments can be made using the planning website, or they can be addressed to the NPS at the above address.

We look forward to working closely with you throughout plan development and welcome your comments. Should you have any questions or wish to discuss this project in more detail, please contact me at 303-969-2325 or at tracy_atkins@nps.gov.

Sincerely,

Tracy Atkins
Project Manager

cc:
Kezia Nielson, Zion National Park

United States Department of the Interior

NATIONAL PARK SERVICE
Zion National Park
Springdale, Utah 84767

IN REPLY REFER TO: L5815 (ZION RM&R)

October 12, 2010

Leigh Kuwanwisiwna
Hopi Tribal Headquarters
P.O. Box 123
Kykotsmovi, AZ 86039

Dear Leigh Kuwanwisiwna:

Zion National Park is working with the St. George Field Office of the Bureau of Land Management (BLM) to develop a comprehensive river management plan (CRMP) for the Virgin Wild and Scenic River in Washington County, Utah. The wild and scenic river designation includes segments of the Virgin River, La Verkin Creek, Taylor Creek, and North Creek (including some tributaries) in Zion National Park and adjacent BLM wilderness (see map attached). The completed plan will provide a framework to guide future resource management and visitor use.

We are currently entering the scoping phase of the planning process. We are asking for your assistance to identify issues and opportunities that the plan should address.

The river management plan will be developed concurrent with preparation of an environmental assessment (EA) in compliance with the National Environmental Policy Act. The CRMP/EA will identify significant management issues confronting the rivers, and present management alternatives for addressing these issues consistent with legal and policy mandates, including protecting and enhancing the rivers' outstandingly remarkable values, water quality, and free-flowing condition. The environmental impacts associated with implementing each of the management alternatives will be fully analyzed.

We look forward to working with you throughout plan development and welcome your comments and advice regarding protection and preservation of area's diverse natural resources. Should you have any questions or wish to discuss this project in more detail, please contact Sarah Horton, Cultural Resource Specialist at 435-772-0213 or at sarah_horton@nps.gov.

Sincerely,

Jock F. Whitworth
Superintendent, Zion National Park

Attachment: Map of Virgin Wild and Scenic River

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APPENDIX E: OVERVIEW OF THE UPCOMING TRANSPORTATION AND CAPACITY STUDY

Since its inception, the Zion Canyon shuttle system has been a success, carrying increasing numbers of passengers since service began. Zion's shuttle system is considered by federal land management officials and transportation experts throughout the country to be an excellent model for alternative transportation in national parks and related public lands. However, there are potential unintended consequences with respect to park resources and river-related visitor experience quality associated with the park's shuttle service. Before the shuttle service was implemented in 2000, turnouts, road shoulders, and parking lot areas regulated the amount of visitation to destinations within Zion Canyon. Currently, the shuttle service effectively eliminates this constraint on visitor use levels. This issue is exacerbated by the fact that, to date, the park's shuttle service has been operated according to visitor demand. That is, as the number of people waiting at the visitor center and other locations to ride the shuttle bus increases, the number of buses operating within the system is increased; in 2009, Zion Canyon shuttle ridership was just under 3.5 million. This approach is designed to reduce waiting times at shuttle bus stops and onboard crowding and potentially increases the convenience of using the shuttle service. However, the effects of "demand driven" shuttle service on resource conditions and the quality of river-related visitor experience at destinations serviced by the park's shuttle system are not known. The transportation and capacity study will help park staff evaluate and refine the operation of the shuttle system according to the amount of visitor use that can be accommodated at destinations within Zion Canyon, without unacceptable impacts to river and recreational values including the quality of visitor experience.

More specifically, the purpose of the upcoming study is to evaluate the effects of existing and alternative operating configurations of the shuttle service on park resources and visitor experience at destinations serviced by the shuttle system. This project complements the transportation study conducted in Zion during 2009, which focused on evaluating the operational and financial efficiency of the park's shuttle system. Together, results from the upcoming study and the 2009 study will assist the National Park Service in refining the operation of Zion's shuttle bus system in a manner that optimizes the operational efficiency and economic feasibility of the transportation system and protects park resources and the quality of visitor experience (NPS 2009b).

The upcoming study includes five integrated components: (1) modeling of transit vehicle traffic in Zion Canyon, (2) modeling visitor use at selected recreation sites serviced by the Zion shuttle bus, (3) modeling and mapping transportation noise and impacts to visitor soundscape experience, (4) assessing resource impacts at selected recreation sites serviced by the Zion shuttle bus, and (5) conducting visitor survey research at selected recreation sites serviced by the Zion shuttle bus. Integration of the five components of this study will assist the park in evaluating the extent to which their current and alternative configurations of the shuttle system maintain desired conditions of park resources and visitor experience. Study findings and management recommendations will be formulated and incorporated into a final report. Thus, the study will enhance the park staff's ability to use alternative transportation as an essential element of user capacity management and resource protection. This program of research will contribute to the protection and enhancement of river values in the heart of Zion Canyon, the section of the river corridor where the Zion shuttle service operates. Any visitor use policy changes would be implemented through the adaptive management process outlined in this plan. Any proposed visitor use policy changes would be available for public review and comment.

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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