Southern Nevada Agency Partnership (SNAP) Science and Research Strategy

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Executive Summary

The Southern Nevada Agency Partnership (SNAP) was established as a forum for four land management agencies (Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and U.S. Forest Service) to address common issues pertaining to Southern Nevada. Together they manage more than seven million acres of public lands encompassing eleven distinct and fragile ecosystems. These ecosystems support many species and their habitats including those of interest or of management concern to these agencies. Southern Nevada public lands are also rich in irreplaceable cultural and historic resources.

The rapid population growth in the region has increased recreation use and augmented needs for right-of-ways and other community demands of these lands. Adding to this complexity, these ecosystems face increasing stresses such as the rapid spread of invasive non-native plants, increasing fire frequency and climate change.

The SNAP interagency science and research team has been organized to develop and implement an interagency science program to inform management decision regarding natural resources, cultural resources and human use of public lands. This team has worked for several years with agency resource specialists and invited science partners to develop this SNAP Science and Research Strategy. The overall goal is to integrate and coordinate scientific research programs in Southern Nevada and improve the efficiency and effectiveness of these programs. It will inform and guide SNAP agencies in identifying and articulating highest priority science and research needs, sharing resources and funds from other sources, and eliminating redundancy between research programs within their focus areas.

The topics addressed in this strategy were selected after an extensive review of other regional science plans. This strategy has developed primary research questions that respond to interagency goals, established during the development of the Strategy, and are described in Chapter 4. The remaining sections of the Strategy, primarily discuss processes to achieve a fully successful Science and Research Strategy. A short synopsis of each of the chapters is presented below.

Chapter 1 *Introduction*

A description of the Southern Nevada Agency Partnership is provided, including its vision, mission and geographic scope. An overview of the eleven ecosystems of Southern Nevada is given, including a listing of species of management concern. The purpose and objectives of the Strategy are described.

Chapter 2 *Organization and Responsibilities*

The roles and responsibilities of the individuals and groups who share in administering and implementing the SNAP Science and Research Strategy are presented. These groups include the SNAP Board, the interagency science and research team, and the SNAP Science Panel.

Chapter 3 *Adaptive Management*

A conceptual model is presented that integrates science and research activities into the standard adaptive management framework. The role of science in adaptive management is

explained. The processes for the synthesis of science findings and incorporation of new knowledge in planning and decision-making are also described.

Chapter 4 *SNAP Science and Research Needs and Priorities*

A framework for science needs is presented based upon the following three interagency goals, developed within the context of agency missions:

Goal 1: Restore, sustain, and enhance Southern Nevada's ecosystems.

Goal 2: Provide for responsible use of Southern Nevada's lands in a manner that preserves heritage resources and promotes an understanding of human interaction with the landscape.

Goal 3: Promote scientifically-informed and integrated approaches to effective, efficient, and adaptive management.

Sub-goals and associated science questions or tasks are described for each of these goals.

Chapter 5 *Developing and Updating the SNAP Science and Research Needs Assessment*

The prioritization of SNAP science and research needs is an ongoing process. The Strategy recommends that an annual Needs Assessment document be prepared. The process to prepare this document would begin with the call for concept papers, annual work plans for SNAP agencies, and the identification of SNAP species of management concern. A final Needs Assessment would be prepared by the interagency science and research team with assistance from the SNAP Science Panel, and review by the SNAP Board. The annual Needs Assessment document communicates SNAP's science and research needs to the broader scientific research community and to potential research partners.

Chapter 6 *Synthesis*

An important component of the Strategy is the synthesis of science findings with a goal of identifying potential implications to resource management in Southern Nevada. The first synthesis report would be prepared during the first years of the implementation of the Strategy. This synthesis report will take the form of specific reviews addressing priority science questions for Strategy sub-goals for the topics of fire, invasive species, landscapes and watersheds, biodiversity, cultural resources, historic content, recreation, land uses, and education. A synthesis team would be selected to narrow priorities, create a database, collect information, undertake data synthesis activities and prepare the synthesis report. Future synthesis reports should be prepared every five years.

Chapter 7 *Outreach Strategy*

The purpose of outreach is to inform external research organizations about the science and research needs for Southern Nevada public lands and encourage them to participate in addressing these needs. Outreach materials will include a web presence, single page graphic summary sheets, Needs Assessment publications, electronic visual presentations and a welcome/introduction packet for researchers.

Chapter 8 *Quality Assurance*

This chapter details a recommended quality assurance program for science and research occurring on public lands managed by SNAP agencies. The SNAP quality assurance program plan includes a process for standardizing data collection protocols over time. A key quality assurance component of the SNAP Science and Research Strategy is its review process.

Chapter 9 *Science Coordination and Information Sharing*

An important goal of the Strategy is to ensure effective linkages for the dissemination of knowledge and sharing of data, results, data collection and management systems, staff and resources. Coordination activities need to include the SNAP Board, SNAP teams, the interagency science and research team, agency staff, and the broader scientific community. Included are mechanisms to increase the exchange of data and information, reduce the duplication of efforts, and encourage science and monitoring efforts both within SNAP agencies and with other entities in the Mojave Desert region.

Chapter 10 *Funding Needs and Sources*

The SNAP-participating agencies are committed to providing a consistent scientific approach across agency boundaries; and the SNAP Science and Research Strategy is a key mechanism for achieving that goal. Besides agency commitment, consistent funding is also necessary to successfully implement the SNAP Science and Research Strategy. This chapter discusses funding needs for components of the Strategy, and reviews potential sources of funding for SNAP science and research projects.

Chapter 11 *Strategy Evaluation*

A component often overlooked in the development of science strategies is a process to continually improve and increase the effectiveness of the Strategy over time. The key components of this process are three separate reports, which include (1) an annual report of the interagency science and research team, (2) an annual Needs Assessment document (see Chapter 5), and (3) a periodic synthesis report (see Chapter 6). Based upon the information contained in these reports, the current Science and Research Strategy may be updated or refined. The first update to the Strategy will be in 2011.

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Chapter 1
Introduction

Background

SOUTHERN NEVADA AGENCY PARTNERSHIP

The Southern Nevada Agency Partnership (SNAP) is a four federal agency partnership, which includes the Bureau of Land Management (BLM), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS). Through SNAP, these agencies work with each other, the local community, and other partners for the benefit of Southern Nevada's federally managed lands, which total more than seven million acres.

Since 1999, SNAP agencies have been developing interagency programs and projects to enhance services to the public, improve stewardship of the public lands, and increase the efficiency and effectiveness of their management activities. SNAP has defined four major strategic focus areas: (1) Restoration; (2) Protection; (3) Public Education, Recreation, and Use; and (4) Science and Research. Work is carried out within 15 specific topic areas that, for the most part, are associated with interagency teams (Figure 1-1).

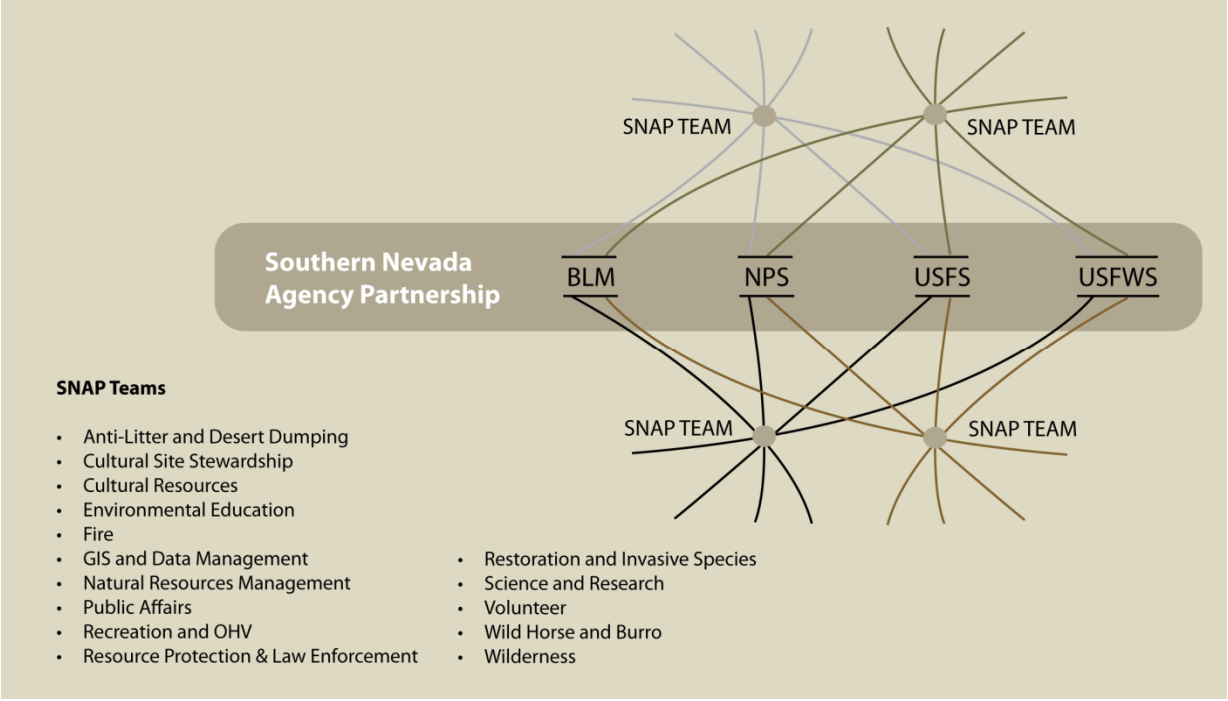


Figure 1-1. Diagram illustrating the formation of four of the fifteen SNAP teams. All 15 teams are listed in the figure. Each SNAP team (circles) is composed of members from each SNAP Agency. Individual agencies also have their own goals, activities, and cooperators related to a given topic (GIS = Geographical Information Systems; OHV = Off-highway Vehicle).

This document – the SNAP Science and Research Strategy – informs and guides teams in identifying and articulating highest priority SNAP science and research needs, sharing resources and funds from other sources, and eliminating redundancy between research programs within their focus areas.

SNAP PUBLIC LANDS IN SOUTHERN NEVADA

Federal lands managed by SNAP agencies in Southern Nevada include two national recreation areas, two national conservation areas, four national wildlife refuges, 18 congressionally designated wilderness areas, five wilderness study areas, 22 areas of critical environmental concern, and critical habitat for 17 listed species. The more than seven million acres of public lands, though seemingly dry and harsh, encompass eleven distinct and fragile ecosystems (Figure 1-2) that support many species and their habitats. These species include those of interest or of management concern to SNAP agencies (Figure 1-3). This list of species, along with other tools and processes described in subsequent chapters of this SNAP Science and Research Strategy will be used to provide a level of focus to SNAP science and research efforts.

The Ecosystems of Southern Nevada

1. **Alpine** – herbaceous, high-altitude tundra vegetation, generally above timberline; characteristically sparse with low vegetation adapted to winter snowfalls and generally cold temperatures.
2. **Bristlecone pine** – in the Spring and Sheep Mountains, ranging in elevation from 9,000 to 11,500 feet (2,740 to 3,500 meters) on exposed, dry, rocky slopes and ridges; comprises evergreen conifer woodland dominated by bristlecone pine.
3. **Mixed conifer** – includes white fir, ponderosa pine, and ponderosa pine/mountain shrub community types; found in Spring and Sheep Mountains on generally north and east-facing slopes.
4. **Piñon-juniper** – mountain shrub, piñon, piñon-juniper, and juniper community types at elevations ranging from 4,900 to 8,200 feet (1,500 to 2,500 meters).
5. **Sagebrush** – sagebrush/perennial grass community types, found in the Spring, Sheep, and Virgin Mountains, typically ranging from 4,900 to 9,200 feet (1,500 to 2,800 meters).
6. **Blackbrush community** – typically considered part of the Mojave Desert scrub ecosystem, but managed at the ecosystem level; occurs on upper bajadas (alluvial fans), slopes, and valleys below 5,900 feet (1,800 meters).
7. **Salt desert scrub** – occurs between 3,250 and 5,800 feet (990 and 1,770 meters) in a mosaic pattern within stands of creosote-bursage and blackbrush communities.
8. **Mojave Desert** – smallest of the four North American deserts, although most widespread ecosystem in Clark County. Shrublands occur below 4,000 feet (1,220 meters) and include two major plant communities, Mojave mixed scrub and creosote-bursage.
9. **Mesquite and catclaw community** – nested within Mojave Desert scrub biogeographically, but managed at the ecosystem level.
10. **Desert riparian/aquatic** – associated with rivers and streams, generally below 4,000 feet; primarily includes Virgin and Muddy Rivers, Las Vegas Valley Wash, and Colorado River.
11. **Perennial springs** – more than 500 known springs are widely distributed from high mountains to low deserts; most are coldwater springs and vary from small, isolated pools with short spring-brooks to larger spring-fed rivers such as the Muddy River.

Figure 1-2. Southern Nevada's 11 ecosystem types and their key features are shown as described within the Multiple Species Habitat Conservation Plan and Environmental Impact Statement for Clark County, Nevada, September 2000.

SNAP Species of Management Concern

Amphibian

Relict leopard frog	*Rana onca*

Birds

Northern goshawk	*Accipiter gentilis*
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*
Southwestern willow flycatcher	*Empidonax trailii extimus*
American peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Blue grosbeak	*Passerina caerulea*
Phainopepla	*Phainopepla nitens*
Summer tanager	*Piranga rubra*
Vermillion flycatcher	*Pyrocephalus rubinus*
Yuma clapper rail	*Rallus longirostrus* yumanensis
Arizona bell's vireo	*Vireo bellii arizonae*

Fishes

Meadow Valley Wash desert sucker	*Catostomus clarki* ssp. 2
Devils Hole pupfish	*Cyprinodon diabolis*
Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*
Warm springs pupfish	*Cyprinodon nevadensis pectoralis*
Pahrump poolfish	*Empetrichthys latos latos*
Pahranagat roundtail chub	*Gila robusta jordani*
Virgin River chub	*Gila seminuda*
Virgin River chub (Muddy River population)	*Gila seminuda* pop. 2
Virgin River spinedace	*Lepidomeda mollispinis mollispinis*
Moapa dace	*Moapa coriacea*
Woundfin	*Plagopterus argentissimus*
Moapa speckled dace	*Rhinichthys osculus moapae*
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*
Pahranagat speckled dace	*Rhinichthys osculus velifer*
Meadow Valley speckled dace	*Rhinichthys osculus* ssp. 11
Razorback sucker	*Xyrauchen texanus*

Invertebrates

Ash Meadows naucorid	*Ambrysus amargosus*
Warm Springs naucorid	*Ambrysus relictus*
Acastus checkerspot	*Chlosyne acastus robusta*
Spring Mountains dark blue	*Euphilotes ancilla purpura*
Morand's checkerspot	*Euphydryas chalcedona morandi*
Spring Mountains comma skipper	*Hesperia colorado mojavensis*
Charleston ant	*Lasius nevadensis*
Nevada admiral	*Limenitis weidemeyerii nevadae*
Amargosa naucorid	*Pelocoris shoshone amargosus*
Spring Mountains icarioides blue	*Plebejus icarioides austinorum*
Mt. Charleston blue	*Plebejus shasta charlestonensis*
Giuliani's dune scarab beetle	*Pseudocotalpa giulianii*
Moapa pebblesnail	*Pyrgulopsis avernalis*
Blue Point pyrg	*Pyrgulopsis coloradensis*
Spring Mountains pyrg	*Pyrgulopsis deaconi*
Corn Creek pyrg	*Pyrgulopsis fausta*
Southeast Nevada pyrg	*Pyrgulopsis turbatrix*
Carole's fritillary	*Speyeria carolae*
Moapa Warm Spring riffle beetle	*Stenelmis moapa*

Mammals

Pale lump-nosed bat	*Corynorhinus townsendii pallescens*
Spotted bat	*Euderma maculatum*
Allen's big-eared bat	*Idionycteris phyllotis*
Silver-haired bat	*Lasionycteris noctivagans*
Pahranagat Valley montane vole	*Microtus montanus fucosus*
Fringed myotis	*Myotis thysanodes*
Palmer's chipmunk	*Neotamias palmeri*
Hidden Forest Uinta chipmunk	*Neotamias umbrinus nevadensis*
Big free-tailed bat	*Nyctinomops macrotis*
Bighorn sheep	*Ovis canadensis nelsoni*

Reptiles

Western redtail skink	*Eumeces gilberti rubricaudatus*
Desert tortoise	*Gopherus agassizii*
Banded Gila monster	*Heloderma suspectum cinctum*

Plants

Rough angelica	*Angelica scabrida*
Charleston pussytoes	*Antennaria soliceps*
Sticky ringstem	*Anulocaulis leiosolenus* var. *leiosolenus*
Las Vegas bearpoppy	*Arctomecon californica*
King's rosy sandwort	*Arenaria kingii* spp. *rosea*
Clokey milkvetch	*Astragalus aequalis*
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*
Clokey eggvetch	*Astragalus oophorus* var. *clokeyanus*
Spring Mountains milkvetch	*Astragalus remotus*
Ash Meadows milkvetch	*Astragalus phoenix*
Upswept moonwort	*Botrychium ascendens*
Dainty moonwort	*Botrychium crenulatum*
Slender moonwort	*Botrychium lineare*
Spring-loving centaury	*Centaurim namophilum*
Las Vegas cryptantha	*Cryptantha insolita*
Jaeger whitlowgrass	*Draba jaegeri*
Charleston draba	*Draba paucifructa*
Ash Meadows sunray	*Enceliopsis nudicaulis* var. *corrugate*
Nevada willowherb	*Epilobium nevadense*
Pahrump Valley buckwheat	*Eriogonum bifucatum*
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*
Sticky buckwheat	*Eriogonum viscidulum*
Clokey greasebush	*Glossopetalon clokeyi*
Ash Meadows gumplant	*Grindelia fraxinopratensis*
Charleston ivesia	*Ivesia cryptocaulis*
Jaeger ivesia	*Ivesia jaegeri*
Ash Meadows ivesia	*Ivesia kingii* var. *eremica*
Ash Meadows blazingstar	*Mentzelia leucophylla*
Amargosa niterwort	*Nitrophila mohavensis*
White-margined beardtongue	*Penstemon albomarginatus*
Bicolored beardtongue	*Penstemon bicolor* ssp. *bicolor*
Rosy two-colored beardtongue	*Penstemon bicolor* ssp. *roseus*
Jaeger beardtongue	*Penstemon thompsoniae* spp. *jaegeri*
Clokey's catchfly	*Silene clokeyi*
Charleston tansy	*Sphaeromeria compacta*
Charleston kittentails	*Synthyris ranunculina*
Charleston grounddaisy	*Townsendia jonesii* var. *tumulosa*
Charleston violet	*Viola charlestonensis*

Figure 1-3. List of species of interest or management concern to SNAP agencies. This list will be used as a tool to provide additional focus to SNAP science and research efforts. It is expected to adjust and change as needs change, research needs are met, and new priorities arise.

Southern Nevada public lands are also rich in irreplaceable cultural and historical resources that include archaeological remains, historic sites, cultural landscapes, traditional cultural properties, and other areas of significance to Native American and other cultural groups. Evidence demonstrates human presence in Southern Nevada as early as 10,000 years ago, with continual presence through prehistoric, ethnohistoric, and historic times. The now seemingly inhospitable desert has a long history of changes; at different times providing diverse eco-zones for use by native people and later historic immigrants. In particular, springs and their associated resources provided desirable stopping points along trails and pathways connecting surrounding regions. These resources also provided opportunities to settle into the area. Archaeological research studies human occupations and the use of the existing environment. This research is necessarily multidisciplinary, incorporating studies from social and environmental disciplines. Studies of human presence on the landscape provides information on the history of human adaptation and impacts on the environment. All archaeological research provides information for the development of up-to-date prehistoric and historic contexts for Southern Nevada to guide resource management and future studies.

Federal land managers within Southern Nevada are challenged with maintaining a complex variety of ecosystems and resources in the face of rapidly increasing urbanization within Clark County, Nevada. The rapid population growth has increased the recreational use of public lands, and increased the needs for rights-of-way and other community demands fulfilled by public lands. Adding to this complexity, the Mojave Desert faces increasing ecosystem stresses from changing conditions related to rapid spread of invasive non-native plants, and increasing fire frequency and intensity. Emerging issues resulting from climate change compound the causal factors listed above.

The interagency resource specialists and invited science partners who participated in the various workshops that outlined the goals and research questions within this SNAP Science and Research Strategy have contributed information within the context of these associated resources, community demands, ecosystem stressors, and changing conditions. The SNAP Science and Research Strategy is intended to assist in the management of SNAP resources by developing mutual goals and objectives. Those objectives will be accomplished by clearly articulating science and research needs, which will be met by providing mechanisms for enhancing agency and outside partnerships.

Vision, Mission, Purpose, and Objectives

SNAP has set the following vision and mission for the interagency science and research team. The purpose and objectives for the SNAP Science and Research Strategy are also presented in this section.

SCIENCE AND RESEARCH TEAM VISION

The cooperating federal agencies work towards the holistic management of Southern Nevada's public lands through a comprehensive science and research strategy. Successful management of natural and cultural resources on public lands meets the needs of present generations without compromising the ability of future generations to meet their needs.

MISSION

The mission of the interagency science and research team is to develop and implement an interagency science program that creates a consistent scientific approach across agency boundaries. The program is

intended to complement individual agency science and research activities, and is not intended to replace individual agency efforts. The programmatic mission for the SNAP Science and Research Strategy is to provide clear information on the health and trends of the Southern Nevada ecosystem for uniform, informed management decisions regarding natural resources, cultural resources, and human use of public lands.

STRATEGY PURPOSE AND OBJECTIVES

The core purpose of the SNAP Science and Research Strategy is to integrate and coordinate scientific research programs in Southern Nevada, and to improve the efficiency and effectiveness of these programs. Science and research needs are addressed more efficiently and effectively by (1) conducting research on an ecosystem basis, rather than taking localized administrative-unit approaches, (2) leveraging limited funding sources to address common issues, (3) exchanging and sharing study results, (4) minimizing redundant research efforts and focusing effort on prioritized land-management needs, and (5) establishing uniform study protocols. Specifically, the SNAP Science and Research Strategy will meet the following overarching objectives:

- Identify priority science needs related to agency goals
- Enhance public lands management through applied science
- Inform other regional conservation plans
- Integrate activities, projects, and results
- Leverage outside resources
- Transfer knowledge gained to other Mojave Desert land management agencies

Information resulting from the Strategy implementation will be disseminated to local, regional, and national groups, and to the public, as appropriate.

Strategy Overview

STRATEGY CONTENT OVERVIEW

To arrive at a general framework for the SNAP Science and Research Strategy, seven regional interagency plans were surveyed. These are listed below in alphabetical order.

(1) Chesapeake Bay Program
(2) Glen Canyon Dam Adaptive Management Program
(3) Lower Colorado Multi-Species Conservation Program
(4) Northeastern States Research Cooperative
(5) Northwest Forest Plan
(6) South Florida Ecosystem Restoration Task Force
(7) Tahoe Science Consortium

Key objectives were identified in each of these documents and organized along with the number of plans in which each objective appeared (Table 1-1). In a similar way, key topics were also identified, and are shown in Table 1-2. Based upon this review, the interagency science and research team opted to include all of the identified objectives and key topics as is described within the chapter summaries shown in the Chapter Overview section on the next page.

Table 1–1. Objectives of seven regional science plans listed by the total number of plans (of the seven) that address each objective (ID = identify).

Objectives	Total
Coordination	7
Sharing Information	7
Communication	6
ID Science Needs	6
Adaptive Management	5
ID Science Gaps	5
Measure Success	3
Quality Assurance	2
Update Plan	1

Table 1–2. Topics of seven regional science plans listed by the total number of plans (of the seven) that address each topic.

Topics	Total
Research	7
Monitoring	7
Synthesis	5
Modeling	4
Science Applications	4
Funding/Selection	3

CHAPTER OVERVIEW

The SNAP Science and Research Strategy is a living document meant to share information on science and research activities on Southern Nevada public lands. It is expected to be updated and changed over time. Below are brief descriptions of the content of each chapter of this first edition of the Strategy.

Chapter 1 *Introduction*

Provides a description of the Southern Nevada Agency Partnership including its vision, mission and geographic scope. Provides an overview of the Strategy.

Chapter 2 *Organization and Responsibilities*

Discusses the roles and responsibilities of the individuals and groups who share in administering and implementing the SNAP Science and Research Strategy.

Chapter 3 *Adaptive Management*

Explains the role of science in adaptive management, describes a process for the synthesis of science findings, and suggests a process for incorporating new knowledge in planning and decision-making.

Chapter 4 *SNAP Science and Research Needs and Priorities*

States SNAP Science and Research Strategy goals, sub-goals, science questions, and priority questions for science and research activities.

Chapter 5 *Developing and Updating the SNAP Science and Research Needs Assessment*

Details the process for prioritizing SNAP needs relevant to the SNAP Science and Research Strategy. Prioritization occurs annually and results in a Needs Assessment document.

Chapter 6 *Synthesis*

Describes the purpose and audience for a synthesis report; the approach for preparing a synthesis report is detailed and explained using a specific example.

Chapter 7 *Outreach Strategy*

Provides an outreach plan to inform external research organizations about the SNAP Science and Research Strategy. It also encourages their participation in meeting priority science needs.

Chapter 8 *Quality Assurance*

Details the SNAP quality assurance program plan, which includes a process for standardizing data collection protocols over time. A key quality assurance component of the SNAP Science and Research Strategy is its review process.

Chapter 9 *Science Coordination and Information Sharing*

Focuses on facilitating science activities through data and information management. Included are mechanisms to increase the exchange of data and information, reduce the duplication of efforts, and encourage science and monitoring efforts both within SNAP agencies and with other entities in the Mojave Desert region.

Chapter 10 *Funding Needs and Sources*

Discusses funding needs for components of the SNAP Science and Research Strategy and reviews potential sources of funding for SNAP science and research projects.

Chapter 11 *Strategy Evaluation*

Describes a process for identifying emerging science needs, conducting periodic synthesis of science findings, and carrying out revision of the SNAP Science and Research Strategy.

Geographic Scope

SNAP activities are mainly centered in Southern Nevada's Clark County. But also included are portions of the Lake Mead National Recreation Area in Arizona, USFWS- and USFS-managed lands in Lincoln and Nye Counties, and all lands and activities managed by the Southern Nevada District Office of the BLM (Figure 1-4). To create a consistent, ecosystem approach, SNAP coordinates its activities with other federal, state and local agencies, as well as affected/interested parties throughout Southern Nevada and surrounding areas.

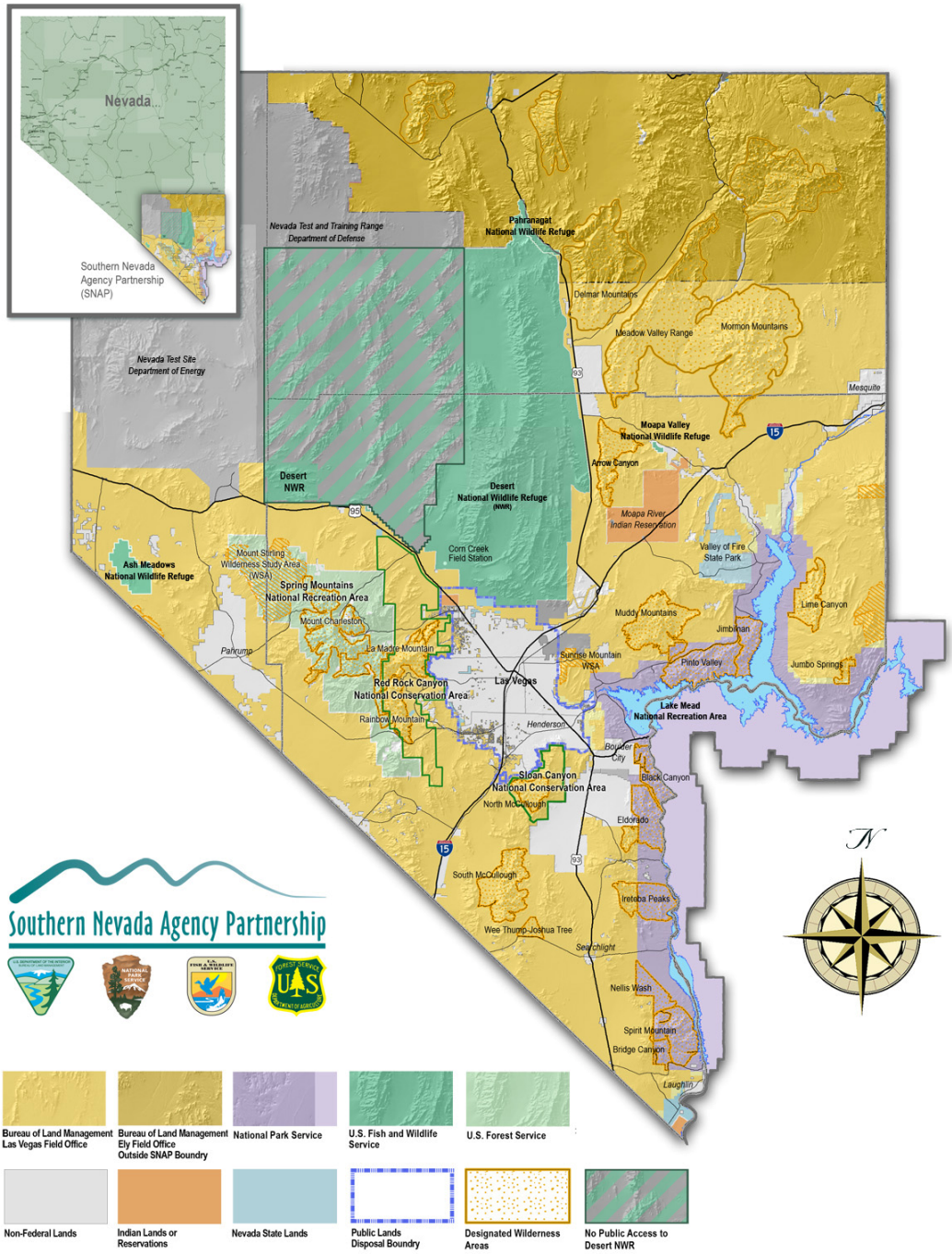


Figure 1-4. Map of Clark County illustrating the location of SNAP activities (by agency) in the state of Nevada.

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Chapter 2
Organization and Responsibilities

Southern Nevada Agency Partnership (SNAP)

SNAP was established as a forum for four land management agencies (BLM, NPS, USFWS, and USFS) to address common issues pertaining to Southern Nevada. The SNAP Board is an entity for cooperative management. Individual board members maintain the managerial authority of their own agencies. SNAP teams, such as the interagency science and research team, are authorized to make operational decisions regarding implementation of their shared programs, but final authority rests with the SNAP Board. As such, the SNAP Board reviews and approves all work related to the SNAP Science and Research Strategy.

The goals of this partnership are to:

A. Develop and implement interagency programs and projects that enhance each agency's ability to meet its mission.
B. Overcome institutional barriers that hinder interagency work.
C. Increase its capacity to manage the federal lands.
D. Be a model and mentor of interagency public/private partnerships.

Within its charter, the SNAP Board defines its roles and responsibilities as a series of tasks. The tasks that are directly pertinent to the interagency science and research team and the SNAP Science and Research Strategy, are as follows:

Task 3. Develop and issue guidance to implement SNAP and interagency goals, objectives, plans, and initiatives
Task 4. Charter interagency teams to implement goals, objectives, plans, and initiatives
Task 5. Manage agency staff performing SNAP work (e.g., teams, etc.)
Task 7. Resolve barriers within agencies
Task 8. Secure funding for SNAP initiatives
Task 10. Build capacity through external partners and other collaborators
Task 13. Maintain awareness of initiatives that affect SNAP
Task 14. Promote public, agency, and congressional awareness and support for SNAP goals and initiatives

Interagency Science and Research Team

The interagency science and research team focuses on science and research activities in Southern Nevada relative to natural resources and ecosystem health, while recognizing the important role of past and present human use of the landscape. The team is chartered by the SNAP Board to make recommendations regarding the scope of science, and research goals and objectives for SNAP partner agencies, enlisting such expertise as it deems necessary. By its charter, the interagency science and research team has an important role in facilitating and enhancing interagency science endeavors for Southern Nevada. The team meets regularly to discuss current issues and evaluate the status of team goals and objectives. The interagency science and research team performs the following functions:

- Reviews science and research proposals as requested by the SNAP Board;
- Provides analyses for SNAP Board consideration regarding science, and research needs and priorities;
- Updates the SNAP Science and Research Strategy as needed;
- Coordinates periodic reviews of the SNAP Science and Research Strategy as it is updated;
- Seeks funding opportunities, and leverages resources to meet SNAP science and research needs;
- Recommends science and research goals, needs, and priorities responsive to practical agency objectives, and with the intent of reducing redundant efforts;
- Evaluates ongoing science and research projects, and incorporates results into future science and research projects;
- Informs land management decisions;
- Provides synthesis of knowledge acquired through science and research to improve land use and management;
- Coordinates with appropriate entities on science and research elements (of habitat conservation plans and regional conservation initiatives) jointly affecting SNAP agencies to meet mutual objectives;
- Promotes scientifically informed and integrated approaches to effective, efficient, and adaptive management; and
- Conducts outreach with the broader scientific community resulting in increased partnerships and informed land management decisions.

Key SNAP science and research program activities include actions by the SNAP Board and the SNAP Science Panel (see below for a description of the SNAP Science Panel). A matrix summarizing the roles of these three groups in carrying out these activities is shown in Table 2-1.

TEAM LEAD RESPONSIBILITIES

The team lead is the primary contact for dissemination of team-related information, including contact with the SNAP Board. However, this duty may be delegated to other team members as the need arises. The team lead meets regularly with the program facilitator to assign tasks and set agendas. This is accomplished by assessing the needs and topics for future meetings. The team lead position may rotate on an annual basis among federal agency team membership, if desired.

MEMBER RESPONSIBILITIES

Members attend and fully participate at all team meetings. The team may delegate ad hoc roles to other individuals within their agency as needed. Agencies may invite subject specialists to meetings, unless specifically restricted by the team. For purposes of decision-making, no agency has more than one vote at any given time regardless of how many agency personnel may be present at any meeting of the team.

Team members represent his/her agency of employment. When a question or problem arises that requires resolution by an agency, the designated agency team member takes the issue through his/her agency's chain of authority for recommendations. The team member then presents the results to the team for discussion.

PROGRAM FACILITATOR RESPONSIBILITIES

This individual facilitates team meetings to ensure that all agenda items are addressed, that meeting objectives are met, and that there is consensus among the team. The program facilitator records all pertinent discussions and transcribes a summary for dissemination to the team using the appropriate mechanism. Other duties, such as drafting of documents and presentations, and outreach coordination are delegated to the program facilitator as the need arises. If this position is filled by an outside partner or contractor, the facilitator must comply with the conflict-of-interest policy of this strategy. Other facilitation staff may be recruited as necessary.

SNAP SCIENCE PANEL

The interagency science and research team invites experts from the extramural, research community and federal agencies to form the SNAP Science Panel. Participation on the SNAP Science Panel is voluntary and subject to funding. The SNAP Science Panel does not reach consensus decisions, but individual members provide individual input and advice at the request of the interagency science and research team. The team interprets any input and advice that the SNAP Science Panel members generate, and is responsible for taking action with the approval of the SNAP Board. Specific subject-matter experts may be requested to participate in team discussions and provide information the team might need for the evaluation of questions or decision points. Selection of these individuals rests with the interagency science and research team and the SNAP Board, in light of guidelines related to conflict of interest and Federal Advisory Committee Act (FACA) guidelines.

Participating experts do not have a decision-making vote on the interagency science and research team. Members of the SNAP Science Panel must comply with the conflict-of-interest policy of this strategy. At the request of the interagency science and research team, the SNAP Science Panel may perform any of the functions[1] listed below:

a. Meets at least once annually with the interagency science and research team;
b. Reviews the overall SNAP Science and Research Strategy, with special emphasis on prioritization and next steps;
c. Reviews periodic updates of the Strategy;
d. Assists the interagency science and research team by providing input into and reviewing the annual Needs Assessment (which includes prioritizing needs, emerging issues, and next steps);
e. Conducts (technical) peer-reviews or identifies suitable peer-reviewers for proposals;
f. Provides needed scientific and technical expertise and information;
g. Reviews synthesis documents and provides input;
h. Assists in programmatic reviews as requested and develops a findings report;
i. Assists the interagency science and research team in leveraging resources to address agency science needs, including outreach to the broader scientific community; and
j. Assists in the organization of symposia or workshops on specific topics of interest.

[1] Taken together, the listed functions are beyond the scope of any one volunteer panel. Therefore, either multiple panels or a single panel with multiple sub-groups or ad hoc groups will complete the tasks.

Table. 2-1. Responsibilities matrix for Strategy implementation. Within the SNAP Science and Research Strategy, major implementation activities require actions by the SNAP Board, the interagency science and research team, and the SNAP Science Panel. The individual responsibilities of the interagency science and research team (abbreviated "S&R" team in the table) extend beyond what is shown in the matrix, as described in this chapter.

Task	**SNAP Board** *reviews/approves*	**S&R Team** *prioritizes/recommends*	**SNAP Science Panel(s)** *reviews/provides input*
SNAP Science and Research Strategy	Reviews and approves the Strategy and its periodic updates.	Updates the Strategy and coordinates periodic reviews of the Strategy as it is updated; incorporates Science Panel reviews as appropriate.	Conducts periodic reviews of the Strategy as it is updated.
Needs Assessment, Implementation and Monitoring Plan	Reviews and approves the annual Needs Assessment document, and implementation and monitoring plan.	Identifies priorities for the annual Needs Assessment, prepares the draft document, participates in a joint meeting with the SNAP Science Panel, considers the input of the Panel and SNAP Board, and finalizes and publishes the document. Prepares a recommended implementation and monitoring plan.	Participates in the annual joint meeting with the interagency science and research team, and reviews and provides input into the annual Needs Assessment, and implementation and monitoring plan.
Annual Report	Reviews and approves the annual report.	Prepares the annual report.	
Proposal Review	Reviews recommendation report.	Conducts management reviews and interprets technical reviews. Writes recommendation report.	Conducts (technical) peer-reviews or recommends suitable peer-reviewers.
Leveraging Resources	Reviews and approves funding-related activities.	Recommends priorities for funding needs and activities.	Provides input regarding funding priorities, identifies opportunities, and facilitates preparation of funding requests.
Outreach	Reviews and approves outreach materials and meets with executives of research institutions to discuss goals and science priorities. Attends symposia to the extent possible, and reviews proceedings.	Prepares materials and oversees implementation of outreach strategy and its components. Coordinates meetings of the SNAP Board and executives of research institutions.	Shares SNAP research priorities (outreach materials) with their home institutions and others. Assists in the organization of symposia and workshops as appropriate.
Synthesis Documents	Reviews and approves synthesis reports.	Prioritizes synthesis report topics, and coordinates document development and distribution.	Provides input regarding priorities, and reviews synthesis reports.
Programmatic Review	Determines priorities for programmatic* review and reviews findings. * any SNAP program with relevance to the Strategy.	Recommends priorities for review of SNAP science and research programs and activities. Coordinates the overall review. Provides management review and SNAP Science Panel findings report to program, activity leaders, and the SNAP Board.	Provides needed technical expertise and input. Individuals on the panel facilitate and organize specialty reviews (relevant to program being reviewed) to create a findings and recommendations report.

Chapter 3
Adaptive Management

Background

Every day the federal government must make complex land management decisions on the basis of assumptions and incomplete information. Land management agencies in Southern Nevada are no exception. The adaptive management approach outlined in this chapter explains how implementation of this science and research strategy will help to reduce uncertainties, increase knowledge, and improve decision-making in the future where there has been no formal interagency adaptive management process in the past.

Various definitions of "adaptive management" exist (Figure 3-1). For the purposes of this strategy, the following amalgam is used: *A decision process informed by and adapted on the basis of the evaluated results of monitored management actions, as well as management-initiated and independent research activities that are designed to reduce uncertainties surrounding the action in question*.

Definitions of Adaptive Management

Adaptive management is a decision 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. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity.

To further clarify, the National Research Council explains, "[Adaptive management] is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent an end to itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders" (Williams, 2007).

Adaptive management is a process that integrates project design, management, and monitoring, to provide a framework for testing assumptions, adaptation and learning (Margoluis, 1998).

Adaptive management is the process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans (Haynes, 2006).

Figure 3-1. The illustration shows three different variations of the definition of adaptive management.

As noted in *Adaptive Management: The U.S. Department of the Interior Technical Guide* (Williams, 2007), Adaptive management is not applicable to all resource management situations. Consideration of adaptive management is warranted when:

a) There are consequential decisions to be made

b) There is an opportunity to apply learning
c) The objectives of management are clear
d) The value of reducing uncertainty is high
e) Uncertainty can be expressed as a set of competing, testable models, and
f) An experimental design and monitoring system can be put in place with a reasonable expectation of reducing uncertainty.

An adaptive management approach involves exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions.

Adaptive Management Process

In order to improve land management decisions, an adaptive management process has been designed. It will integrate science and research conducted by the SNAP agencies and outside scientists into the standard adaptive management conceptual model shown below.

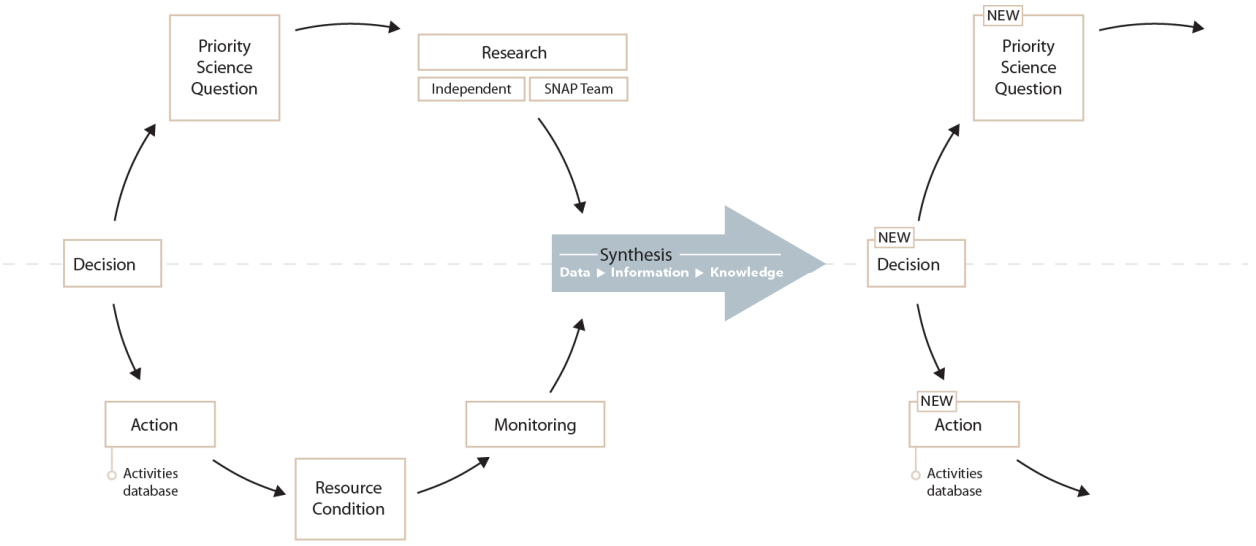


Figure 3-2. Conceptual model of adaptive management that includes both monitoring and research approaches.

The adaptive management process begins with a federal **decision** to implement some type of land management action. The diagram shown in Figure 3-2 is used to assist with this explanation. The decision has been made recognizing that there is some uncertainty in the likelihood of success of that action due to the variability of natural or human processes, unforeseen circumstances, or a lack of knowledge.

Once a management decision has been made, **actions** are taken to implement this decision. This initiates the activities shown in the bottom loop of the diagram beginning on the left. Over time, the management **action** may have an impact on the **condition of the resources**. Resources are **monitored** following the

action to determine the nature of this impact and whether or not the intended result has been achieved or is making progress towards those goals. Monitoring results are **synthesized** to improve our understanding of how management actions are impacting resources and whether or not alternative management actions are needed. The process of synthesis includes the summarization of monitoring **data** into **information** and the interpretation of this information into **knowledge**. This knowledge can then be used in the decision-making process, and the bottom loop (**monitoring** approach) can begin again with new decisions, new actions, and continued monitoring.

Through this process, it is understood that for every decision there is some uncertainty in the likelihood of its success; and this is due to the variability of natural or human processes, unforeseen circumstances, or a lack of knowledge. To reduce the level of uncertainty over time, SNAP will initiate research for high priority issues (**research** approach). At the point of making the management decision, the sources of uncertainty are disclosed. This is translated into **science questions** that need to be answered to assist in decision-making in the future.

The specification of science questions is followed by focused **research** efforts. This research can be guided and conducted by the SNAP teams, or it can be undertaken by research partners in federal research agencies, universities, or other organizations. As with monitoring data, research **data** will also need to be summarized into **information** and interpreted to assist with the gaining of new **knowledge**. This knowledge is then combined with that obtained through the monitoring approach to assist with decision-making in the future. Figure 3-2 depicts this process as a loop where research and monitoring occur simultaneously so there are results to inform a future decision. In reality, the timing of monitoring and research rarely coincides to inform the next decision, but at some point information becomes available from both approaches to reduce uncertainty and improve management decisions.

Both the monitoring and research approaches require science-based activities. Monitoring involves the collection and assessment of information on measurable attributes to evaluate whether the goals of management are being met, and whether or not the integrity of the systems and processes are being maintained. Research often involves a systematic study with the purpose of gaining a fuller scientific knowledge or understanding. Often, hypotheses are formulated and tested. Research efforts seek to discover, interpret, or revise our understanding of different aspects of the resources being managed.

In addition to monitoring and research, other science-based activities can contribute to the gaining of knowledge. This type of outside information may trigger new or change research questions/priorities.

Implementing the Adaptive Management Process

An adaptive management process requires the implementation of coordinated actions. The subsequent chapters of this strategy describe each of the actions in more detail. The diagram shown in Figure 3-3 illustrates how each of the chapters fit within the adaptive management process.

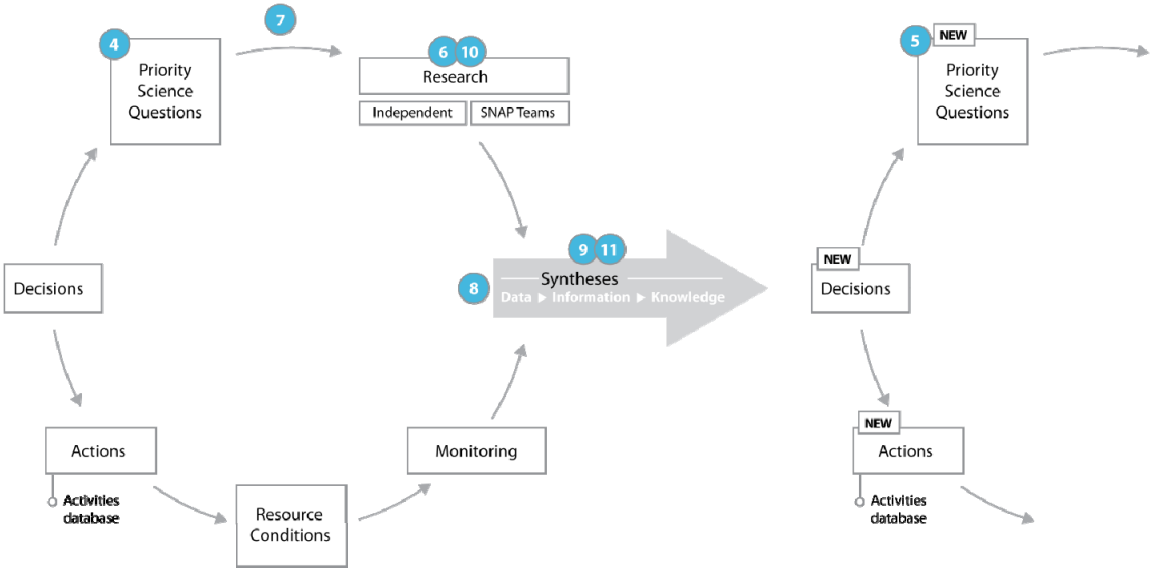


Figure 3-3. Diagram showing which chapters of the SNAP Science and Research Strategy address each of the components of the adaptive management process. The numbers highlighted on the diagram refer to chapters in this strategy.

Chapter 4 of the Strategy lists the priority SNAP science questions. Chapter 5 describes a process for updating these questions on an annual basis. Chapter 6 focuses on synthesis, and summarizes the current research activities of SNAP teams as well as the capabilities of other research organizations in the region. Chapter 7 provides an outreach plan to inform research organizations of the priority science questions and to encourage their participation in research. The purpose of Chapter 7 is to connect the "box" with the priority research questions (Figure 3-3) with those agencies capable of conducting the research within or outside of the SNAP teams. Chapter 8 describes a quality assurance process for research and monitoring activities to ultimately develop authoritative data sources needed for the assessment process. Chapter 9 describes the data management activities that will be needed to share these data across agencies.

In this strategy, Chapter 10 relates previously-funded projects to the priority science questions, and discusses the needs and options for future funding. Chapter 11 describes the reporting activities that are needed for the adaptive management process to complete its cycle each time. In particular, a need for the SNAP teams to identify performance measures that can serve as a basis for periodic reporting is discussed. Other options such as workshops and conferences are suggested to help with the synthesis of all monitoring and research information on specific topics.

Keys to Success

The "principles for success" described within the Northwest Forest Plan's *The First 10 Years (1994-2003) A Synthesis of Monitoring and Research Results* (Haynes, 2006) have been adapted, here, as seven keys for the SNAP Science and Research Strategy's adaptive management process. These keys are shown below:

1. **Engaging regional executives in guiding learning.**
   Executive support lends authority to the SNAP Science and Research Strategy and increases the likelihood that knowledge gained through this process will be incorporated into future decisions at multiple scales.

2. **Committing to quality record keeping.**
   Securing, properly archiving, and making accessible records relevant to or generated as a result of implementing the SNAP Science and Research Strategy will be vital to learning.

3. **Building institutional capacity through employee training.**
   Planning and implementing an adaptive management process for a given project is complex and requires commitment by all participants. Training may be needed in regard to designing management experiments and interpreting monitoring results.

4. **Maintaining and valuing cooperation between researchers and partners.**
   A critical mechanism for meeting the science and research needs of SNAP agencies is through development and maintenance of partnerships with the broader scientific community. Because time is a commodity in short supply, partnerships must be highly effective and equitable to all sides and valued to ensure that participants will continue to invest their time in a partnership effort.

5. **Developing long-term funding strategies.**
   The value of maintaining monitoring and research activities, to inform adaptive management, needs to be recognized in budgetary and strategic planning.

6. **Diversifying practices.**
   In reducing uncertainty, it is important to be open to trying multiple approaches.

7. **Maintaining SNAP teams.**
   The SNAP Science and Research Strategy sets priority needs, that are intended to improve the ability of approximately 11 interagency teams to accomplish their science and research goals. In turn, the data and results attained through the work of these teams provide the information necessary to increase knowledge and reduce uncertainties for better land management.

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Chapter 4
SNAP Science and Research Needs and Priorities

Background

The core purpose of the SNAP Science and Research Strategy is to integrate and coordinate scientific research programs in Southern Nevada, and to improve the efficiency and effectiveness of these programs. This includes identifying and articulating highest priority SNAP science and research needs, sharing resources and funds from other sources, and eliminating redundancy between research programs within focus areas. This chapter details the goals, sub-goals, science questions, and contributing questions that provide the framework for prioritizing SNAP science and research needs. The basis for their development was individual agency goals, the SNAP Board vision, the interagency science and research team's charter goals, the input of individual agency specialists, and input from interdisciplinary scientists obtained during several planning workshops. Figure 4-1 demonstrates how the framework of the Strategy was built. Note in the graphic that information acquired through the process of implementing the Strategy feeds back into itself.

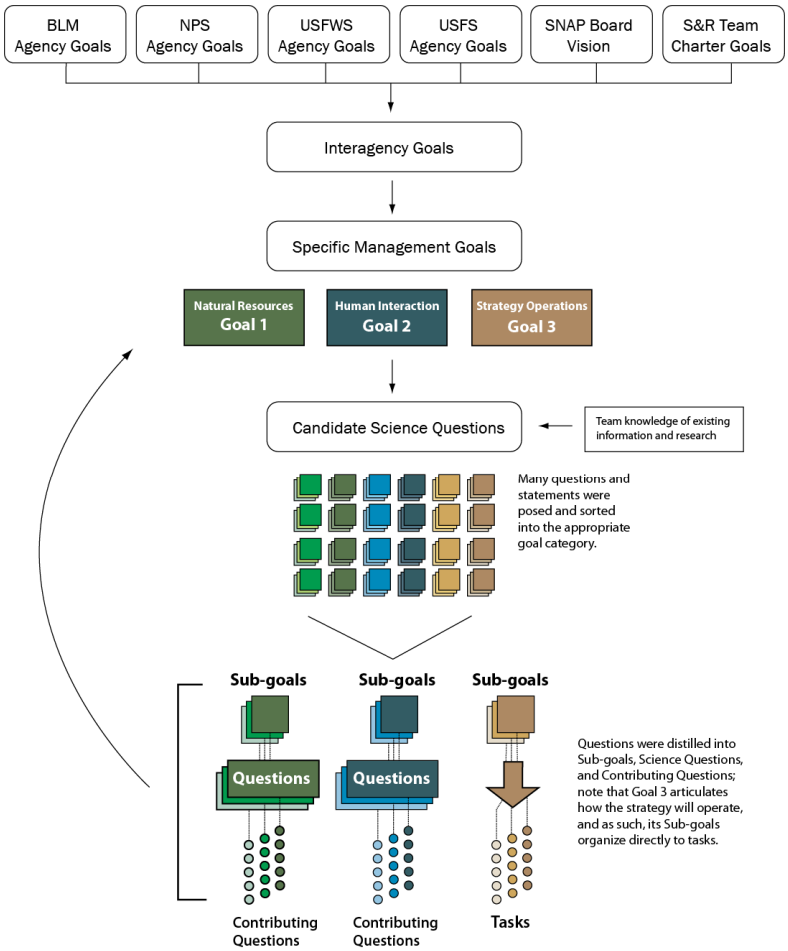


Figure 4-1. Flow diagram illustrating the development of the Strategy's framework. The goals, sub-goals, science questions, and contributing questions of the SNAP Science and Research Strategy tier off agency goals. Specific content was derived from questions generated by agency staff and scientists participating in one of several workshops.

Prioritization of SNAP Science and Research Needs

Appendix 4-A details the history of the SNAP agencies' arrival at the goals, sub-goals and questions outlined in this chapter. As noted, the goals and sub-goals were established through cooperative efforts with agency specialists, scientists and researchers, and the interagency science and research team using the most current research and knowledge. The goals and sub-goals were identified as the main themes. The science questions were prioritized within each sub-goal with "a" as the highest priority question to address.

It is intended that the goals of the Strategy will likely remain relatively static, as will many of its sub-goals. However, the Strategy is intended to be flexible and fluid, and portions of it – particularly the science questions and contributing questions – are expected to adjust during annual and periodic reviews, as research provides answers, needs change, and as new priorities arise. The SNAP Science and Research Strategy goals, sub-goals, science questions and contributing questions in this chapter are the framework for the Needs Assessment, which will identify, evaluate, document, and communicate the science and research needs and priorities of SNAP on an annual basis. Priority science questions direct new research to relate to Strategy goals. The next chapter (Chapter 5) details the components and process involved in developing the annual Needs Assessment.

Goals, Sub-goals, and Questions

Within the context of agency missions:

GOAL 1 Restore, sustain, and enhance Southern Nevada's ecosystems.

Sub-goal 1.1
Manage wildland fire to sustain Southern Nevada's ecosystems

Science question

a. What are effective pre-fire strategies for maintaining ecosystem health in Southern Nevada?

Contributing Questions

- How do we sustain and maintain appropriate amounts of fire in healthy ecosystems?
- How do we reduce fire in non-adapted ecosystems where fire has been artificially increased?
- How do we restore or mimic fire in fire-dependent ecosystems where fire has been excluded?
- What management practices could reduce fire occurrences that result in unwanted type conversion?
- How effective are fuel treatments in restoring fire to its natural role in the ecosystem?

b. What are the effective post-fire practices for maintaining ecosystem health in Southern Nevada?

- What are the most effective short-term and long-term restoration treatments?
- Do post-fire practices affect populations of listed species?

c. What are the effects of current fire management strategies on the long-term health of ecosystems in Southern Nevada?

- What suppression strategies and techniques can be used in Southern Nevada's ecosystems to minimize impacts?
- What suppression strategies and techniques can set the stage for post-fire recovery in both fire-dependent and fire-intolerant ecosystems?

d. What effect does the changing role of fire have on the health of Southern Nevada's ecosystems and on species biodiversity?

- What effects does fire have on the desert seed bank (both native and exotic)?
- What effects have fires had on the conditions of "biodiversity hotspots" and spring areas?
- What effects do non-native plants have on fire behavior, frequency, and intensity?
- What role should fire play today in areas with invasive plant species?

e. What is the historic role of fire in Southern Nevada, what is its current role, and is that role changing?

- What is the history of wildfire starts and spreads?
- How do today's fire patterns compare to historic fire patterns?
- Is there a way to predict future fire conditions?

Sub-goal 1. 2
Protect Southern Nevada's ecosystems from the adverse impacts of invasive species

a. What are the known or potential species of concern and what are their basic biological attributes related to invasiveness?

- What is the current distribution and abundance of known invasive species within Southern Nevada, or nearby within the desert ecoregion?

- What ecophysiology, genetics, and population biology characteristics or transfer mechanisms are related to invasiveness, and which ones are available for characterizing invasiveness?

b. What are the effects of invasive species?

- What are the effects of invasive species on community structure and ecosystem function?
- What are the values that are at risk, and the socioeconomic impacts, due to invasive species?

c. What are effective management methods for investigation, prevention, control, and eradication of invasive species?

- What are the vectors for invasion that provide the agency with opportunities for prevention?
- What are the most effective means of early detection and inventory?
- What are the thresholds at which treatment is necessary for protection of the ecosystem?
- What are the most effective methods of treatment available for high priority invasive species?
- What are the methods for evaluating the effectiveness of treatment programs?

Sub-goal 1.3
Restore and sustain proper function of Southern Nevada's watershed and landscapes

a. What are the effects of 'external' (anthropogenic) activities to the health of the landscape?

- What approaches can be used to predict trends and future conditions of the landscape?
- How are management actions affecting the health of the landscape?
- What human activities are modifying (e.g., fragmentation) or sustaining the health of the landscape?
- What role does 'disturbance' play in maintaining a healthy and sustainable ecosystem?

b. What are the ecosystem processes that modify or sustain the health of the landscape?

- What are the dynamics and 'interrelationships' of the physical and biological elements in a healthy ecosystem, and what are the key physical and biological attributes of a healthy and sustainable landscape?

- What approaches (e.g., physical and biological monitoring, indicator species) can be used to predict trends and future conditions of the landscape?
- What role does climate change play in modifying the current ecosystem, and what role has it played and will it play in the future?

c. What are the hydrodynamics of both surface and subsurface water that sustain or modify the health of the landscape?

- How is water use (whether by non-human or human consumption) affecting water quantity and quality within the landscape?
- What are the dynamics between surface water and ground water?
- What is the spatial relationship of surface water within the landscape?

d. What are effective techniques for restoration[2] of the landscape?

- What are key baseline parameters that are needed for establishing/developing appropriate restoration[2] techniques?
- What are criteria or key elements that can evaluate successful restoration (i.e., biological recovery)?

Sub-goal 1.4
Sustain and enhance Southern Nevada's biotic communities to preserve biodiversity and maintain viable populations

a. What are the key threats and stressors and their effects on sensitive species, habitats of concern, and ecological systems?

- How are the direct and indirect threats and stressors affecting sensitive species (e.g., distribution, reproduction, etc.) and affecting habitats of concern?
- What are the best methods or techniques for measuring the impact of key threats and stressors on sensitive species, habitats of concern, and ecological systems?
- What is the critical impact threshold for sensitive species or habitats of concern?
- What are the key threats and stressors and their effects on sensitive species?
- How do we protect sensitive species, habitats of concern, and ecological systems from key threats and stressors?
- How do we reduce key threats and stressors to sensitive species, habitats of concern, and ecological systems?

[2] Restoration includes "reclamation."

b. How do management actions affect sensitive species, habitats of concern, and ecological systems?

- Which management actions have an effect on sensitive species and habitats of concern, and how do these species or habitats respond?
- Which key conservation measures maintain or enhance resources or species viability?
- How does the composition (e.g., size, shape, etc.) of conservation areas influence the persistence of species and habitats of concern?
- What is the optimum or effective size of corridors such that fragmented habitats and ecological systems function properly?
- Are the benefits gained for sensitive species, habitats of concern, and ecological systems worth the cost of implementation of specific management actions?
- What could be done differently under existing management actions to improve or more effectively benefit sensitive species, habitats of concern, and ecological systems?
- How do we monitor management actions to determine their effectiveness?

c. What are the life history and ecology of sensitive species, and the ecology of habitats of concern?

- What are the key habitat requirements and important habitat areas for sensitive species?
- What are the population structure, genetics, and dynamics of sensitive species?
- What is the current and historical distribution of sensitive species populations and habitats of concern?
- What is the status and trend of sensitive species and habitats of concern?
- What are the important resources or ecological characteristics associated with habitats of concern?
- What is the current and historical distribution of habitats of concern?
- What abiotic processes drive ecosystem function, and plant, animal, and community viability?

Within the context of agency missions:

GOAL 2 Provide for responsible use of Southern Nevada's lands in a manner that preserves heritage resources and promotes an understanding of human interaction with the landscape.

Sub-goal 2.1
Develop an understanding of human interactions with the environment through time.

a. **How has the environment changed with human occupations through time?**
    - What characterized environmental and climatic settings at different time periods?
    - Did humans use different environmental zones, and if so, how?
    - What influences did humans have on the landscape through history?
    - Did changes in the environment influence human use and occupation of the landscape?
    - Did human interactions with each other influence the environment or the utilization of available resources?

b. **During what specific time periods have people been in Southern Nevada?**
    - What technologies can be used to identify and refine the chronology of human occupation?
    - Did resource use vary through time?

Sub-goal 2.2
Preserve heritage resources through responsible use of Southern Nevada's lands.

a. **What non-destructive techniques can be used to identify, record, analyze, and/or document collectible and non-collectible heritage assets?**

b. **What non-destructive techniques can be used for the protection and long-term preservation of heritage assets?**

Sub-goal 2.3
Manage current and future authorized Southern Nevada land uses in a manner that balances public need and ecosystem sustainability.

a. **What are the impacts of authorized land uses and what are effective actions to minimize impact?**
    - What impacts result from linear disturbance?

- For uses that generate noise and light pollution, what are the impacts on species?
- How do authorized land uses contribute to invasion by exotic species? How can that contribution be minimized?
- How do authorized land uses such as inholdings and site-type rights-of-way affect the quality of surrounding areas?
- Which stipulations are most ecologically effective and cost effective for minimizing impacts (e.g., flood control and tortoise fence vs. on-site biologist monitor, salvaging yucca and cactus, salvaging topsoil, and reseeding)?
- How do existing authorized land uses encourage other unintended or illegal land uses (e.g., power line corridors might encourage off-highway vehicle uses or dumping)?
- What is the impact of introducing towers (e.g., cell phone towers and power lines) into an otherwise low-shrub community such as Piute Valley?
- What are feasible and effective ways of controlling soil erosion without impacting sensitive plants and animals?
- What are the impacts (e.g., on soil erosion, underground water resources, and species) of installing renewable energy plants? What are the best designs, techniques, and technologies to minimize these impacts?
- How can roads be designed to maintain wildlife corridors (e.g., for desert bighorn sheep and tortoise)?
- What are effective road maintenance techniques that minimize resource impacts (e.g., to air, soil, and water quality, and to species)?
- How much disturbance can plant and animal communities tolerate (i.e., where would you put the power line if you knew)? Which plant and animal communities are more tolerant to disturbance?
- What is the most effective way for reclaiming an area after use?

b. What are the demands for resources on public lands?

- How can capacity rights-of-way be increased without making corridors wider?
- Where is the potential for future land-use demands (e.g., energy development, transportation, mineral extraction, etc.)?
- How can future land uses be met while providing land for other uses (e.g., recreation, species habitat, clean water and air, etc.)?
- Where is the demand for sand and gravel operations, and how far away from urban areas can they be located to remain cost effective?
- How do we provide for federal land disposals, and maintain resource values and areas?

Sub-goal 2.4
Provide for appropriate (type and location), quality, and diverse recreational experiences, resulting in responsible visitor use on federal lands in Southern Nevada

a. What are the market demands and trends for recreation on public lands?

- What is the projected increase in visitation over time?
- What types of use will increase over time?
- What are the likely locations of visitor use in the future?
- What is the "niche" for each federal agency?
- Where are the opportunities for shared facilities or resources?
- What are effective recreation strategies to meet future demand and trends?

b. How can federal agencies meet recreational needs and provide quality recreational experiences without compromising resources?

- What are the use limits on the resource? Identify high and low capacity areas. What are the impacts of use limits on visitor experience?
- What are ecosystem values for residents and visitors?
- What activities pose impacts to resources or threats to resource integrity?
- How are resources disturbed across the landscape in relation to activities that may impact resources or threaten resource integrity?
- What forms of recreation are compatible with sensitive species/habitats in the refuges?
- What is the visitor carrying capacity for recreation activities on Southern Nevada public lands in relation to sensitive endemic species?
- What human activities occur on Southern Nevada public lands, and how do they impact the resources and other visitors?
- What activities at what locations pose a higher safety risk?
- What effect does fire have on recreation and the urban interface?

c. What are current visitor-use patterns and characteristics?

- What are the cultural differences and trends in hard-to-observe activities such as gathering?
- What is the state of visitor satisfaction with Southern Nevada public land areas, including transportation, quality of experience, recreation opportunities, etc.?
- What values are commonly held and what values may conflict?
- What do local and non-local visitors, tribes, and adjacent property owners value about Southern Nevada public lands and what are their "special places"?
- Who is using public lands in Southern Nevada, which locations are most sought after for which uses, and what benefits do users obtain from those lands?

Sub-goal 2.5
Promote an effective conservation education and interpretation program to improve the quality of resources and enhance public use and enjoyment of Southern Nevada public lands.

a. Are our conservation education and interpretation actions effective?

- What are the methods and criteria for monitoring and evaluating the effectiveness of conservation education and interpretation programs?
- How should effectiveness monitoring be incorporated into new programs?
- What baseline parameters are needed to be able to measure the effectiveness of our actions?
- Which current conservation education efforts are effective (and ineffective), and why?

b. How are our messages best communicated?

- To what degree, and in what sense, do public land visitors (various audiences) value Southern Nevada public lands?
- What aspects of Southern Nevada's ecosystems are most valued by residents and visitors?
- Which methodologies, tools, techniques, and strategies are effective for conservation education and interpretation, and for which audiences?
- How can we best target products to respond to the needs and values of our various audiences, and to benefit public land resources?
- What are appropriate mechanisms for establishing and maintaining effective partnerships for conservation education and interpretation, and what are key elements of successful partnerships?

c. What key messages are necessary to enhance resource stewardship in Southern Nevada?

- What are the critical components of a key message?
- What are, or should be, our key messages regarding cultural and natural resources, appropriate land use, responsible recreation (including off-highway vehicle, OHV, use), restoration, safety, and wilderness?
- What strategies and processes should be used to encourage SNAP-participating agencies and their partners to input information into, and share and reinforce key messages throughout Southern Nevada?

GOAL 3 Promote scientifically-informed and integrated approaches to effective, efficient, and adaptive management.

Sub-goal 3.1
Develop and maintain a science strategy to guide and facilitate Southern Nevada resource management decisions to meet SNAP science and research goals 1 and 2.

Tasks

- Provide adequate funding to maintain the Strategy.
- Maintain the interagency science and research team for staffing and coordination of the program, and any other workgroups or boards needed to operate the Strategy.
- Convene a SNAP Science Panel.
- Review and update the Strategy as necessary, review and update sub-goals and science questions every five years, and prioritize science and research needs annually prior to budget decisions.
- Analyze information and recommend additional needs and/or management actions.

Sub-goal 3.2
Establish a transparent process for interagency and interdisciplinary analysis and assessment of SNAP science and research needs, proposals, projects, and products.

- Provide a quality control process, including peer-review.
- Require in contracts, the publication (i.e., submission to journals and presentations at conferences) of results, and present results on the project web pages.
- Establish a procedure for the review of results and findings that includes development of recommendations and a prioritized annual Needs Assessment.
- Develop a SNAP Science and Research Strategy web page.

Sub-goal 3.3
Engage the broader scientific community through outreach and partnership participation, and by seeking their input and resources to meet priority research needs.

- Invite members of the broader scientific community, its sub-groups, and ad hoc groups to participate on the SNAP Science Panel.
- Publish an annual Needs Assessment document, which is distributed to the broader scientific community.

- Facilitate delivery of agency, and cooperator data and information, to inform others about SNAP Science and Research Strategy goals.
- Work with other organizations with similar goals and interests (e.g., Desert Managers Group, Mojave Initiative, etc.), and participate in their symposia and workshops.
- Develop and implement a marketing/outreach strategy to engage the broader scientific community.

Sub-goal 3.4
Implement an adaptive management process to synthesize Southern Nevada science and research findings to inform and improve future management decisions and actions.

- Synthesize science and research findings.
- Assist agencies in the development of short- and long-term indices of success.
- Complete state-of-the-science analyses every five years.
- Hold regular meetings with the SNAP Board, with an emphasis on discussing synthesis findings and management implications.
- Fill gaps in science and research.

Sub-goal 3.5
Ensure effective linkages among SNAP agencies, its teams, and partners for the dissemination of knowledge, and sharing of data, results, data collection and management systems, staff, and resources.

- Publish an annual Needs Assessment document for distribution to SNAP agencies, its teams, and partners.
- Develop scientifically defensible monitoring protocols that can be implemented on an ecosystem level and across jurisdictional boundaries.
- Share data and knowledge through meetings, workshops, and symposia.
- Prepare annual reports and five-year reports as a mechanism to certify, receive, and analyze, synthesize and interpret data.
- Facilitate delivery of agency, and cooperator data and information, to inform others about SNAP Science and Research Strategy goals.

Chapter 5
Developing and Updating the SNAP Science and Research Needs Assessment

Background

This chapter describes the elements of the SNAP Science and Research Needs Assessment and provides a timeline for conducting the process. The Needs Assessment identifies, evaluates, documents, and communicates SNAP's science and research needs and priorities on an annual basis, enabling priority questions to direct new research related to Strategy goals. Through the Needs Assessment, SNAP agencies guide internal programs, and give focus to the types of SNAP science and research projects that can be developed for different types of funding. In conducting the annual Needs Assessment, the interagency science and research team considers:

1) the goals, sub-goals, science questions and contributing questions described within this strategy (Chapter 4);
2) synthesis of incoming data and information resulting from work conducted in response to the previous years' Needs Assessments;
3) current management concerns;
4) input from federal agency staff and scientists;
5) the SNAP Science Panel (Chapter 2);
6) the SNAP Board; and
7) suggestions from the broader science community through the SNAP science and research web page (Chapter 7).

The Needs Assessment is structured around the topics represented by the SNAP Science and Research Strategy sub-goals. In turn, incoming data responding to the Needs Assessment are organized by topic area, as are the resulting syntheses and interpretive reports. These sub-goals/topics are:

- Fire
- Invasive Species
- Biodiversity
- Watersheds and Landscapes
- Cultural Resources
- Historic Context
- Recreation
- Land Use
- Conservation Education and Interpretation

Annual Prioritization of SNAP Science and Research Needs

The annual Needs Assessment document communicates SNAP's science and research needs to the broader scientific community and to potential research partners. It will be made available, as broadly as possible, to agencies and other institutions. The annual Needs Assessment will be posted to the SNAP science and research web page and also through an interagency open announcement using available procurement solicitation methods.

The annual Needs Assessment serves a variety of functions. It will document suggested high priority resource actions and science needs based upon available knowledge and existing conditions. It can guide interagency activities within existing budgets, and provide information to potential science partners with resources to apply to joint efforts. The Needs Assessment can provide information on the development of science and research projects and associated funding requests for the Southern Nevada Public Land Management Act (SNPLMA), Multiple Species Habitat Conservation Plan initiatives, the Healthy Lands Initiative, or other funding programs. During the first three years of Strategy implementation, the first round of syntheses will be prepared, through contracts or agreements, with updates every five years thereafter (Chapter 11).

ANNUAL NEEDS ASSESSMENT PROCESS AND PRODUCT

A process has been designed for conducting an annual needs assessment and arriving at a Needs Assessment document (Figure 5-1). In October of each year, the interagency science and research team will invite concept papers from other SNAP teams, agency resource managers, federal and state agency scientists, and the broader science community interested in providing suggestions through the SNAP science and research portion of the SNAP.gov web site. The focused science and research needs identified in the concept papers will be combined with agency priority needs identified by the SNAP Board into a Needs Assessment report. Annual Needs Assessments will also take into consideration synthesis reports as they are created.

The interagency science and research team will develop the first draft Needs Assessment document in February of each year. The team will use its member's professional judgment, knowledge, and experience in regard to the immediate and long-term needs for SNAP public lands in Southern Nevada, upcoming funding opportunities, and regional and national priorities. Also contributing to the assessment are this strategy, current management issues, and existing science and resource-related programs (Chapter 6, Appendix 6-A).

The draft Needs Assessment document will undergo peer-review by members of the SNAP Science Panel (Chapter 2), and will be discussed at a joint meeting with the interagency science and research team in March. Members of the SNAP Science Panel will not be eligible for funding consideration arising from Needs Assessments or SNAP products developed during their participation. If necessary, the interagency science and research team will revise the draft Needs Assessment document based upon suggestions from the SNAP Science Panel's input. All decisions on the final draft Needs Assessment rest within the SNAP Board, as proposed by the interagency science and research team.

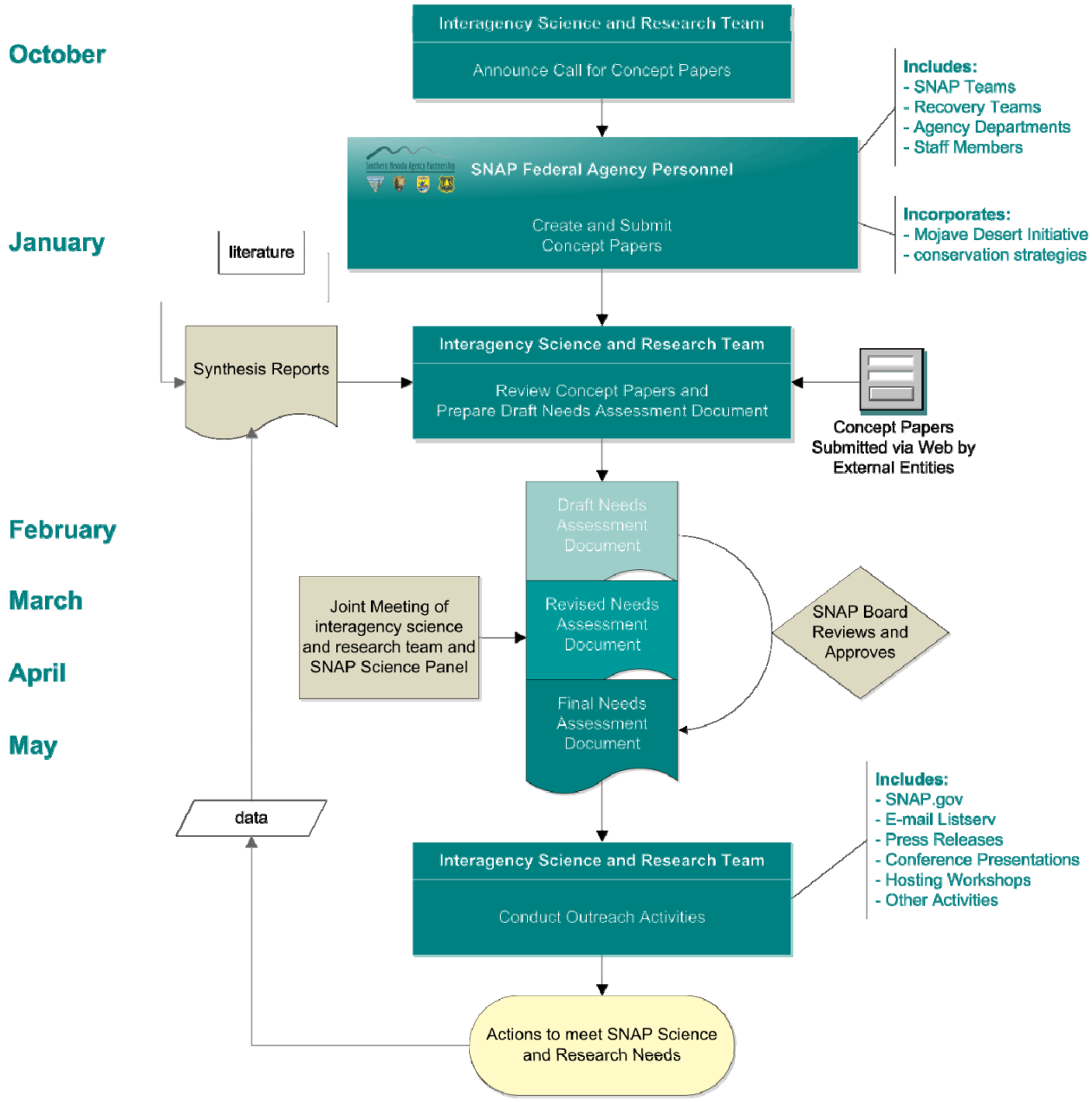


Figure 5-1. Arriving at an annual Needs Assessment document.

In April, the draft is presented to the SNAP Board for approval. In May, the final document is published, and is used as the basis for outreach materials (Chapter 7), that are to be distributed within the agencies and to the broader scientific community.

The Needs Assessment will be posted to the SNAP science and research web page following approval by the SNAP Board. An interagency open announcement for soliciting partnerships following all appropriate procurement laws, regulations, and policies will be posted on a site such as www.grants.gov to ensure open, transparent competition. An interagency technical panel composed of resource managers and scientists will evaluate responses to the open announcement in order to identify partners to address

unfunded science and research needs. The proposed timing for convening of the technical panel evaluation is August, to provide time for selected proposals to be refined and submitted to a variety of agency funding sources that occur during the fall of each year. Such actions may include sponsorship of the proposal to an appropriate funding source (shared, outside, or internal) and partnership with agency staff on a final proposal.

The final document will include background information, current management concerns, recommended needs and actions, and priority science questions for management consideration to meet SNAP needs for each sub-goal. A general outline of the Needs Assessment document is provided in Appendix 5-A.

CONCEPT PAPERS

In November of each year, the science and research team will invite agencies and scientists to identify critical science and research needs and priorities for SNAP. Those needs will be submitted as concept papers in January. SNAP agencies will submit their concept papers to the science and research team as directed in the solicitation. Scientists within the broader scientific community will be invited to provide suggestions through the SNAP science and research web page. The interagency science and research team will meet with the SNAP Board to determine if there are agency priorities not identified by other parties that should be addressed in the upcoming year.

Concept papers are not draft proposals or detailed descriptions of work statements. They are intended as a tool to enhance dialog on high-priority, generic issues or actions based upon existing resource conditions. Concept papers are limited to one page; the template is provided in Appendix 5-B. The format of the concept papers will describe the relationship and relevance of the suggested need to the SNAP Science and Research Strategy, the urgency of meeting the need, and the accessibility of resources to meet the need. The needs identified form a key information base for the science and research team to establish the initial draft annual Needs Assessment. Information shared in the concept papers is understood to be preliminary and conceptual, and will require further development and refinement should SNAP decide to prioritize the described need.

ANNUAL WORKPLANS FOR SNAP AGENCIES

In addition to requesting concept papers, the interagency science and research team will also solicit from the agencies, information regarding their planned activities for the next year such as mitigation, conservation, and inventory and monitoring activities. This information will be documented in an annual Implementation and Monitoring Work Plan that will inform the development of the annual Needs Assessment by identifying those activities that have been prioritized for implementation by the agencies, and their potential relationship with research needs.

SNAP SPECIES OF MANAGEMENT CONCERN AND ANNUAL PRIORITIZATION

The more than seven million acres of SNAP public lands in Southern Nevada encompass eleven distinct and fragile ecosystems that support many species and their habitats. These species include those of interest or of management concern to SNAP agencies (Appendix 5-C). The majority of these key species of interest to SNAP agencies are represented on the Nevada Natural Heritage Program (NNHP) *Animal and Plant At-Risk Tracking List*.[3] The NNHP systematically collects information on Nevada's at risk, rare,

[3] At the time this document was published, the latest version of the *Animal and Plant At-Risk Tracking List* is dated March 2007 and is available at http://www.heritage.nv.gov.

endangered, and threatened biological features. Within the context of agency missions and regulatory requirements, SNAP-participating agencies strive to sustain or recover at-risk species and prevent extirpation of species on any of its collective lands. A list of SNAP Species of Management Concern in Appendix 5-C is organized by taxa, and the rationale for inclusion of species is noted.

This list of species, along with the other tools and processes described in this chapter, will be used to provide an additional level of focus to SNAP science and research efforts. In general, science and research projects on species will concentrate on those species identified as Species of Management Concern. This will be applicable when addressing science questions or contributing questions under any of the sub-goals, in particular Sub-goal 1.4, "Sustain and enhance Southern Nevada biotic communities to preserve biodiversity and maintain viable populations". Each annual Needs Assessment will identify the top priority species for science and research activities for that year, as well as any corresponding science questions and contributing questions.

The interagency science and research team will use information to rank the top priority species for science and research activities each year. This information will be in the form of species priorities identified in concept papers, and also provided by SNAP teams and the SNAP Board, obtained from synthesis reports, and current management concerns. The list of SNAP Species of Management Concern is intended to be flexible and fluid; and, some of the species are expected to be adjusted during the annual development of the Needs Assessment – as the status of species change, science and research needs change, science and research needs are met, and new science and research priorities arise.

JOINT MEETING OF SCIENCE AND RESEARCH TEAM AND SNAP SCIENCE PANEL

During the annual joint meeting (in March), the interagency science and research team will receive input and feedback from the SNAP Science Panel on the priorities described within the draft annual Needs Assessment. The SNAP Science Panel includes individuals who are knowledgeable of the current literature but are not involved in daily management of public land resources (see Chapter 2 for a detailed description of the SNAP Science Panel). SNAP Science Panel members may not apply for agency funding sources arising from Needs Assessment developed during their period of service. Members of the SNAP Science Panel must comply with the conflict-of-interest policy of this strategy.

For this process, the SNAP Science Panel members individually make recommendations on the following questions to the interagency science and research team:

(1) Have the right priorities been selected? If not, which ones should be?
(2) Are there any other priorities that need to be considered?

Final consideration of suggestions from the SNAP Science Panel rests with the interagency science and research team and the final approval of the SNAP Board.

Over time, as research projects are completed to address the needs of the SNAP Science and Research Strategy, the joint meeting of the interagency science and research team and the SNAP Science Panel could be expanded. Applicable future activities for this joint meeting include mini-symposia showcasing data and results, as appropriate, and gap analyses.

Activities following Publication of the Annual Needs Assessment

Following publication of the annual Needs Assessment, the interagency science and research team will work to distribute it as broadly as possible to potential science partners, within agencies, and within the broader scientific community (Chapter 7). The Needs Assessment will be posted to the SNAP science and research web page, as well as posted as an open interagency announcement as described above. Information within the Needs Assessment is available to guide potential agency research and resource activities, whether conducted entirely by agency staff and agency funding, developed with partners for application to outside funding sources, or sponsored for application to regional fund sources such as SNPLMA, Clark County Multi-Species Habitat Conservation Plan (MSHCP), or the Virgin River Habitat Conservation and Recovery Program (HCRP). In addition, the interagency science and research team will coordinate with SNAP teams and agency teams to seek opportunities to utilize existing programs and activities to meet high priority needs. The interagency science and research team will coordinate with interested outside research parties to provide suggestions and input on research proposals submitted through the open announcement, and will direct selected outside researchers to the appropriate agency specialists for coordination and refinement of priority projects.

PROPOSALS BY SNAP TEAMS AND AGENCY PERSONNEL

Assessment tools have been developed to evaluate SNAP science and research products, including proposals put forth in response to the annual Needs Assessment. Developed proposals for projects designed to meet the priorities of the annual Needs Assessment are subject to quality control measures, which may include management reviews conducted by the interagency science and research team and technical peer-reviews conducted by experts from the broader research community. These processes are described in Chapter 8.

INTEREST EXPRESSED BY THE BROADER SCIENTIFIC COMMUNITY

Following outreach activities and the dissemination of outreach materials (Chapter 7), the interagency science and research team will welcome the broader scientific community (e.g., non-profit research entities, universities, private research groups, etc.) to consider SNAP priority science and research needs. It is anticipated that members of this community will be able to identify and select areas in which they can help meet SNAP's science and research needs. This can be achieved by partnering with SNAP agencies on an existing project or developing a new project (such as a graduate thesis/dissertation) with one of the priorities as its focus. Members of the broader research community contacting the interagency science and research team for cooperation with existing resources or for joint applications to outside funding sources will be guided by the team lead towards the appropriate agency staff member for further development of the project. This process will be conducted in a manner to ensure that agency actions follow appropriate procurement laws, regulations, and policies. The interagency science and research team, with the approval of the SNAP Board, also provides assistance and guidance to agency staff regarding establishment of partnerships and conducting joint projects.

Proposals for consideration by agency funding sources or those seeking agency sponsorship for funding sources, such as SNPLMA, Clark County MSHCP and Virgin River HCRP, will be invited through the open announcement.

It is essential that SNAP agencies make a commitment to maintaining contact with new partners from the broader scientific community. Continued relationships are necessary to ensure that data inform the SNAP

Science and Research Strategy and agency programs. Additionally, successful initial partnerships can be built upon, expanded, and used as the foundation for new partnerships.

SYNTHESIS REPORTS

Through past funding opportunities, participating agencies and their partners have completed projects with direct implications to resource management in Southern Nevada. Additionally, significant work has been accomplished through a variety of other regional conservation programs and partnerships, such as the Clark County MSHCP, and recovery plans. Regional research and monitoring programs, such as the USGS "Recoverability and Vulnerability of Desert Ecosystems," have resulted in numerous products relevant to managing Southern Nevada ecosystems. Information from a variety of relevant sources are needed to provide a holistic understanding of the current state of information regarding the status of the SNAP resources. By organizing, synthesizing, and interpreting these results around the framework of the SNAP Science and Research Strategy, the information becomes more accessible and useful to land managers and others.

The overarching topic areas for syntheses correspond to the current Strategy sub-goals. These are Fire, Invasive Species, Landscapes and Watersheds, Biodiversity, Cultural Resources, Historic Context, Recreation, Land Uses, and Conservation Education and Interpretation (Chapter 4). The first synthesis documents will be developed over the first three years of the program, through contracts or agreements with research institutions and subject matter experts. After that, it is anticipated that the synthesis documents will be updated on a five year cycle.

Synthesis reports will inform the Needs Assessments. As MacDonald and Jones (1997) note, feedback and adjustment are the two major components of the adaptive management process. "Feedback requires the transfer of information about the effects of an action to decision-makers. Adjustment requires the use of this information to redirect subsequent action." By establishing the baseline status of research knowledge regarding the lands, and the actions taken related to the currently funded projects, we will later be in a position to learn the effects these actions have had on the system. These reports will reveal gaps in data, research activities, and information. The Needs Assessments, then, can address these gaps. Because the Needs Assessments will also inform the SNAP Science and Research Strategy, they are a key element of the ongoing adaptive management component of the Science Strategy.

Notable adaptive management plans, such as the Northwest Forest Plan, have identified the need for and have implemented regular interpretive reporting as an important learning activity in the adaptive management cycle. Underscoring this belief, the authors of the Strategic Science Plan to support the Glen Canyon Dam Adaptive Management Program (GCDAMP) state: "the success of the GCDAMP is dependent not only on …the ability to produce scientific information that is relevant to management needs, but also the effective and timely use of that information by managers in the decision-making process." They go on to say that the challenge lies in distilling and synthesizing the large amounts of data into relevant, useful forms. Synthesis of results is labor and time intensive, but without translating data into useful information for improved resource management, research efforts and expense are wasted. More information on the synthesis reports that will be developed can be found in Chapter 6.

References

MacDonald, G.B., R. Arnup, and R.K. Jones. 1997. Adaptive forest management in Ontario: A literature review and strategic analysis. Forest Research Information Paper, Ontario Forest Research Institute, Ontario Ministry of Natural Resources. Sault Ste Marie, ON.

Chapter 6
Synthesis

Background

An important component of the adaptive management cycle is the synthesis of data and information from research and monitoring activities into knowledge to assist with management decisions. The preparation of a preliminary synthesis report by the interagency science and research team has recently been funded through a Conservation Initiative in Round 9 of SNPLMA. This synthesis report will take the form of specific reviews addressing priority science questions for Strategy sub-goals for the topics of fire, invasive species, landscapes and watersheds, biodiversity, cultural resources, historic content, recreation, land uses, and education (Chapter 4).

The goal of this chapter is to provide additional background on the purpose of synthesis reports and to suggest a process for the completion of the first synthesis report. The chapter begins with a description of the purpose of the synthesis report and the intended audience. A process for completing each component of the synthesis report is then described. An example is provided for the sub-goal related to invasive species. The importance of developing a database of information in addition to the report is emphasized for use in the development of future synthesis reports. It is recommended that future synthesis reports, which will follow from work done in response to this strategy, be prepared every five years.

Purpose and Audience

Through past SNPLMA funding rounds, participating agencies and their partners have completed significant work with direct implications to resource management in Southern Nevada. Additionally, significant work has been accomplished through a variety of other regional conservation programs, such as the Clark County Desert Conservation Program and the Virgin River Recovery Program. Regional research and monitoring programs, such as the USGS "Recoverability and Vulnerability of Desert Ecosystems" have resulted in numerous products relevant to managing Southern Nevada's ecosystems. The Strategy proposes to develop synthesis reports for information relevant to SNAP Science and Research Strategy goals.

A key component of these synthesis documents will be relevant information from previous SNPLMA projects. However, the intent is also to develop synthesis information from other relevant sources to provide a holistic understanding of the current state of information related to the SNAP resources outlined in the Strategy. By organizing, synthesizing, and interpreting these results around the framework of the newly developed Strategy, the information becomes more accessible and useful to land managers and others.

Furthermore, the reports will provide agency staff and partners involved in the adaptive management associated with regional Habitat Conservation Programs (HCPs), such as the Clark County MSHCP, the Virgin River HCRP, and the Mojave Desert Initiative with an understanding of what has been done or is being done outside of the HCP. This is the best way to inform regional HCPs regarding what has been learned, and as a means to increase efficiencies and reduce redundant efforts. By informing regional habitat conservation plans, the intent is to improve conservation across administrative boundaries.

By creating and sharing the proposed synthesis reports and communicating the priorities of the completed Strategy with associated groups and individuals, we improve cooperation between associated staffs, enhance efforts and make them more efficient. This is done by ensuring that they complement and build upon the accomplishments of the federal agencies and move toward common goals.

Synthesis reports will be an important first step in understanding the "baseline" status of Southern Nevada public lands and will be critical to the adaptive management process. As MacDonald and Jones (1997) note, feedback and adjustment are the two major components of the adaptive management process. "Feedback requires the transfer of information about the effects of an action to decision-makers. Adjustment requires the use of this information to redirect subsequent action." By establishing the baseline status of the lands and actions taken related to the currently funded projects now, agencies will be in a better position to predict the effects of their future actions and will have the information needed to prioritize efforts.

Additional benefits to management resulting from synthesis report creation are:

- Developing concise synthesis reports will serve as a checkpoint to determine whether work done is functionally integrated.
- Gathering results and aligning them with the sub-goals of the Strategy will reveal gaps, and will clarify where it is possible to conduct meta-analyses and where gaps exist.
- The work involved in creating the synthesis reports will help foster a result-oriented approach for future research and resource activities.
- The reports may serve as a springboard in cooperating with other SNAP teams, including those with public involvement components.
- The reports may serve as a springboard, in cooperating with agency and educational staff of partners, to incorporate research results into learning and education activities for the public.
- The reports are a convenient means of sharing information on the SNAP.gov web site.

The proposed synthesis reports are intended to advance knowledge of natural resources, cultural resources, and ecological systems within the framework of the SNAP Science and Research Strategy. For the first time, multiple projects in multiple study areas will be brought together for the purpose of understanding the multi-disciplinary implications of their results.

Synthesis of results stemming from future work prescribed by this strategy is meant to provide useful information and knowledge for improving resource management decisions and actions. Therefore, a primary audience for the synthesis report is the staff at the SNAP agencies. These staff include the senior managers (SNAP Board), mid-level managers (participants on SNAP teams), and agency subject area specialists.

A secondary audience with an interest in the report includes other agency personnel, scientists and other parties interested broadly in the management of the Mojave Desert. A third audience is the SNAP conservation education program, and agency public information, conservation education and interpretation programs. Other audiences include the U.S. Congress, the Nevada Legislature, other federal agencies, state agencies, local governments, regional agencies, regional partnerships, private interest groups, tribes, and private citizens.

Guidelines for Producing Synthesis Reports

It is proposed that the interagency science and research team assess all resource projects relating to the nine Strategy sub-goal areas and identify projects and project components, which are relevant to the SNAP Science and Research Strategy. The team will determine the best approach to take in developing the report for each goal on a case-by-case basis. Development of the reports will require the participation and involvement of the other SNAP teams, as well as other agency staff and scientists. The variable structure and nature of the projects and the teams implementing them necessitate maintaining flexible approaches. Some examples include:

- Review of data and results in project closeout reports
- Hosting workshops/workgroups
- Private team interviews
- Ad hoc committees

Although the contents will also vary among reports, in general, synthesis reports will cover the following areas:

- An overall review of previously funded conservation initiatives that address a specific interagency goal;
- Review of relevant (goal related) information from partner regional conservation programs, such as the Clark County MSHCP and the Virgin River HCRP;
- Review of relevant information from other regional research initiatives, such as the USGS "Recoverability and Vulnerability of Desert Ecosystems" and the NPS Mojave Network Vital Signs Monitoring Program;
- Alignment of information collected by these projects to the Strategy's goals, sub-goals, and science questions;
- Description of how information collected answers or informs science questions;
- Identification of a selection of metrics to monitor progress;
- Synthesis of project information to overall patterns;
- Implications of this synthesis to interagency resource management; and
- Identification of information gaps requiring further study, which will be used to inform a Strategy-related Needs Assessment for future conservation initiative funding rounds and to apprise outside researchers of SNAP science and research needs.

The preparation of synthesis reports will require staffing from the participating SNAP agencies in close working relationships with appointed lead staff and contractors or cooperating scientists. An agency, contractor or cooperator will coordinate the effort to complete the report. Each report will be subject to internal and external peer-review to ensure the quality, reliability, and credibility of the resulting information before it is made available in print.

ESTABLISH A SYNTHESIS TEAM

The preparation of a synthesis report begins with the selection of individuals to participate on a synthesis team. Due to the wide variety of topics being addressed by the overall synthesis report, it will be important to identify specific individuals who are capable of being the primary authors for each of the topic areas. An overall coordinator should be selected to assist these authors and provide them with the support they need to accomplish their tasks. The team will need to meet periodically to coordinate their

activities and to share information needed for the overall report. The primary authors are anticipated to be research scientists whose services are acquired through contracting or cooperative agreements. Overall project coordinators may be agency personnel, or research scientists acquired through contracting or cooperative agreements. The rest of the synthesis team is anticipated to be composed of agency personnel.

NARROW THE PRIORITIES

Many of the sub-goals and associated priority science questions as currently stated in Chapter 4 are broad in scope. It will be necessary for the interagency science and research team to prioritize synthesis report topics by selecting from the list of contributing questions those topics of most urgent need for review and synthesis. Establishment of criteria for relevancy will help further focus the types of data and information to retrieve. The primary author for each synthesis chapter, in consultation with the interagency science and research team, should identify the intended scope for their report and prepare an annotated outline. This outline will then be reviewed and approved by the synthesis team, the interagency science and research team and other interested SNAP teams.

CREATE A DATABASE

Creation of a database to support synthesis activities is an important step in preparation of the synthesis report. This database will contain geospatial information that may be useful to each member of the synthesis team such as framework data for roads, major vegetation communities, special land use designations, trails, and land status. In addition, this database will provide a repository for data collected during the preparation of the synthesis report and will facilitate the sharing of data between synthesis team members.

It may not be possible to create an all-encompassing geodatabase at the beginning of the first synthesis report. For the first synthesis report, the synthesis teams will work closely with the SNAP Geographic Information Systems (GIS) team to develop a baseline GIS platform for analyzing and displaying synthesis information. Existing roads databases, and restoration and weed databases developed by the Southern Nevada restoration team will provide valuable initial reference geospatial information.

COLLECT INFORMATION

Members of the synthesis team will conduct a focused, but systematic, information search for data and information relevant to their prioritized topic. Data and information for the synthesis report can be obtained from a variety of sources. These sources are depicted in Figure 6-1. The SNAP teams and other agency specialists will be a primary source of data and information for the synthesis team. The success in the preparation of a synthesis report will be somewhat dependent on the involvement of the SNAP teams as source of information and direction for the authors. Information collected through a review of data and results from completed projects by these individuals will be very valuable to the synthesis team members.

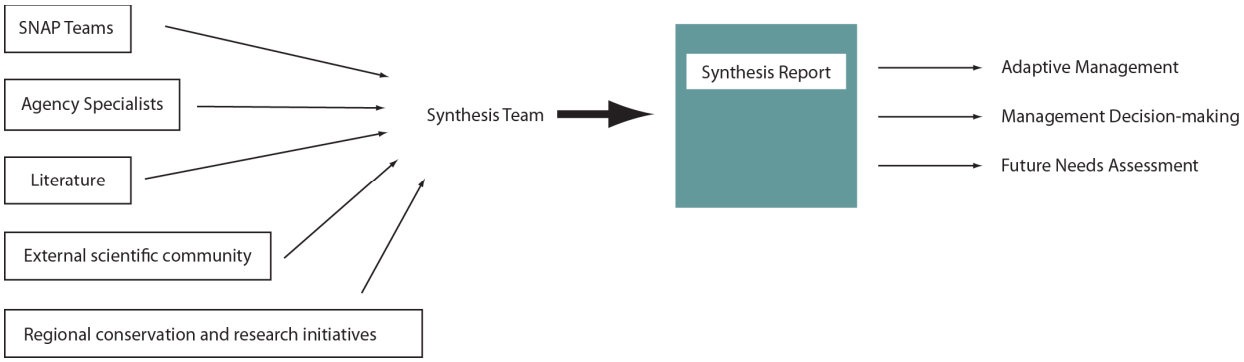


Figure 6-1. Sources and uses of data and information in the synthesis process.

Other important sources of information are regional conservation or research programs within the Mojave desert, such as the Clark County MSHCP, the Virgin River HCRP, the USGS "Recoverability and Vulnerability of Desert Ecosystems" program, and the NPS Mojave Network Inventory and Monitoring Program.

Appendix 6-A provides information on the roles of other SNAP teams and information about existing projects conducted with SNAP agencies and other federal research agencies. It also includes programs that may be of use in conducting the first synthesis.

Literature review is a component of data collection for the synthesis team. In addition, the broader scientific community should be contacted for input. This might be accomplished through the hosting of workshops or workgroups, interviewing researchers, or participation at scientific meetings. It will be important not to overlook information that might be obtained from other interested parties including state and local agencies. From the relevant data and information identified, synthesis team members will also have to consider the quality and validity of the materials found, and assess their appropriateness for use in meta-analyses and the synthesis report.

UNDERTAKE DATA SYNTHESIS ACTIVITIES

The synthesis of data into information, and then information into knowledge and understanding is a challenging task. Important components in this process are summarization, synthesis, and prediction. The first step is to summarize the data collected from a variety of sources into meaningful information. Another part is to put that information into a framework that is easy to interpret or understand. Several tools are available to help with this process including the development of models. These can be conceptual, statistical or numerical. The value of these models depends on their ability to synthesize information and to accurately describe current conditions. Of increasing value are those models that can be used in a predictive mode to help managers assess the implications of alternative management decisions. A detailed discussion of any meta-analyses conducted and their implications to management should be prepared.

In addition to summarizing information into a working conceptual model, the synthesis activities should include a description of how information collected answers or informs science questions; identification of a selection of metrics to monitor progress; synthesis of project information to overall patterns;

implications of this synthesis to interagency resource management; and identification of information gaps requiring further study. These will be used to inform a Strategy-related Needs Assessment for future agency funding consideration and apprise outside researchers of SNAP science and research needs.

PREPARE REPORT

Each member of the synthesis team will be responsible for the preparation of their section of the synthesis report. A final summary section will then be prepared by the overall report coordinator with the assistance of each of the chapter authors. This summary section will highlight the key findings of the individual chapters and synthesis information across chapters which are important for SNAP land managers to understand.

The interagency science and research team will ensure completion of a technical review (peer-review) of the synthesis report, and the SNAP Board will review and approve the final document. The interagency science and research team will coordinate document publication and distribution.

Major Topics within the First Synthesis Report

Although the content will vary between sections of the report; in general, the following topics will be covered in each section:

- Overall review of prior monitoring and research projects addressing specific interagency goals;
- Overall review of regional conservation plan or regional research initiative addressing specific agency goals;
- Alignment of information collected by these projects to Strategy's goals, sub-goals, and science questions;
- Description of how information collected answers or informs science questions;
- Prediction of future trends;
- Implications of this synthesis to interagency resource management;
- Identification of a selection of metrics to monitor progress; and
- Identification of information gaps requiring further study. This will be used in preparing a Strategy-related Needs Assessment for future funding, and to apprise outside researchers of SNAP science and research needs.

Example Using Invasive Species

The overall steps previously described for preparing synthesis reports will be explained in this section using the example of the sub-goal focused on the topic of invasive species (see Chapter 4).

Sub-goal 1.2

Protect Southern Nevada's ecosystems from the adverse impacts of invasive species.

Priority Science Questions

a. What are the known or potential species of concern and what are their basic biological attributes related to invasiveness?

b. What are the effects of invasive species?
c. What are effective management methods for investigation, prevention, control, and eradication of invasive species?

ESTABLISH A SYNTHESIS TEAM

The first step will be to select a primary author to prepare the chapter on invasive species for the report and to participate on the synthesis team. If a federal expert is not available to conduct this effort, then the services of an established regional expert should be obtained through standard federal procurement processes.

NARROW THE PRIORITIES

From the list of sub-goal 1.2's contributing questions, the chapter author will work with the interagency science and research team to select those topics of most urgent need for review and synthesis. For example, the author may consider the most important topic is to identify those invasive species of greatest risk to the long-term health of Southern Nevada ecosystems. A list of key species may be developed and a chapter outline prepared to answer the priority science questions related to these species. This outline would then be reviewed and approved by the other authors on the synthesis team, the interagency science and research team, and other interested SNAP teams such as the restoration team or the natural resources team.

CREATE A DATABASE

The chapter author will want to obtain as much information as is currently available to assist in answering the priority science questions. An important step will be to prepare a geodatabase to house this information as it is collected. The assistance of the SNAP GIS team will be solicited to help with this effort. Database development activities will strive to be cognizant of potential overlap with other projects and future use, and will design products (or extend existing products) accordingly.

COLLECT INFORMATION

Data will be available from a variety of sources such as the SNAP teams, federal agency specialists, state agency specialists, other regional conservation and research initiatives, and others. For example, weed information is available from the SNAP restoration team, weed specialists at each of the agencies, the Clark County Weed Sentry Survey Program, and state noxious weed specialists.

A review of the literature will be an important component of data collection for the chapter author to understand the biological attributes, effects, and potential management methods for each invasive species. The chapter author may wish to host a workshop or workgroup to assist with this effort.

UNDERTAKE DATA SYNTHESIS ACTIVITIES

The first step will be to summarize the data collected from this wide variety of sources. By collecting the information into a geodatabase, the information will be in a framework that is easy to analyze, interpret and display. In addition to utilizing GIS tools, the author may wish to develop conceptual, statistical, and/or numerical models to help interpret the information. Of particular interest will be the use of these models to predict the implications of alternative management decisions related to invasive species.

PREPARE REPORT

The chapter for the synthesis report on invasive species will then be prepared. This report will be submitted to each of the other authors on the synthesis team. The chapter author will then contribute to a final summary section prepared under the direction of the overall report coordinator. During the preparation of this section, the linkages of invasive species to other topic areas such as fire, landscape processes or biodiversity will be explored.

Long-term Approach

The preparation of synthesis reports is a demanding task requiring significant resources. Therefore, it is recommended that this effort be undertaken on a five-year cycle as in currently done for other regional ecosystem initiatives (e.g., Northwest Forest Plan). In these regions, this cycle is frequent enough to assist in the identification and management response to emerging issues, and provides for continuity of staff with experience with prior synthesis activities.

References

MacDonald, G.B., R. Arnup, and R.K. Jones. 1997. Adaptive forest management in Ontario: A literature review and strategic analysis. Forest Research Information Paper, Ontario Forest Research Institute, Ontario Ministry of Natural Resources. Sault Ste Marie, ON.

Chapter 7
Outreach Strategy

Background

Over the years, important research has been conducted on Southern Nevada public lands by university researchers and other research entities to fulfill the needs of their independent research programs. Unfortunately, resource managers have not always received the data, results, or publications extending from these efforts that could have implications to land management. Furthermore, because external researchers are often unaware of the needs of the land management agencies, they may not fully consider the significance to land management when drawing conclusions from completed work or when selecting projects for new graduate students.

By articulating and distributing the identified science and research needs for Southern Nevada public lands, researchers gain the insight to add – to their programs – research aspects relevant to the public lands and their management. In addition to informing interested and affected individuals about the Strategy and its goals, this outreach effort invites the broader research community to participate in the program. New, productive partnerships that benefit both sides may arise and lead, ultimately, to a more complete picture of Southern Nevada's public lands and the natural and cultural resources they support. A specific overarching goal of SNAP science and research outreach processes is to encourage two-way communication in the form of data and information exchange among SNAP teams, and between agency staff and the broader research community. The team values the contribution these groups make to improve understanding of the shared resource.

Outreach Methods

All outreach activities are implemented in cooperation with the SNAP public affairs team, whose mission is to provide high quality communication services throughout SNAP, resulting in increased awareness and support of initiatives and accomplishments. Outreach materials are distributed under the authorization of the SNAP Board.

TARGET AUDIENCE: SNAP TEAMS AND PARTNERS

Outreach within SNAP-participating agencies makes strategic goals accessible to other SNAP teams and their partners. It is important that teams consider how their existing programs and activities might interconnect with the SNAP science and research program and/or how they might incorporate elements of the Strategy into their respective programs.

Desired outcomes of outreach to SNAP teams and partners include:

- Awareness of, and support for, SNAP science and research needs and priorities.
- Productive interaction to meet shared science and research goals.
- Use of the SNAP science and research Strategy to guide research activities and decision making within individual programs.

Implementation guidance (dependent upon funding) strives to:

- Evaluate the current level of interaction and partnership among teams with particular focus on what is working well and where barriers lie. This information will be used to help decrease barriers and guide outreach to this audience.
- Promote the concept that program efficiency and effectiveness can be increased by working together to meet shared goals.
- Develop and promote web pages detailing SNAP science and research needs and accomplishments.
- Prepare and deliver science and research updates in the form of presentations and handouts to other SNAP teams as necessary.
- Provide all teams with the Needs Assessment document.
- Invite all teams to participate in projects, and meet the needs highlighted within the letter of invitation.

TARGET AUDIENCE: BROADER RESEARCH COMMUNITY

The broader research community includes scientists and researchers working in government agencies, university departments and university-housed institutes and centers, other institutions of higher education, independent research firms, and non-profit science organizations with an interest in arid lands research. Specific examples of potential entities to be contacted through this outreach effort are listed in Appendix 7-A.

Within the broader scientific community are important partners that can help meet many SNAP science and research needs based upon the SNAP Science and Research Strategy goals, sub-goals, science questions, and tasks. These contributions fall within existing research entity and agency fiscal resources, such as in the form of sharing data, results, and information from existing projects; adding a new aspect to future or on-going projects; or by initiating a new project (such as a thesis or dissertation). Adding to existing efforts capitalizes on the studies already being done or planned, and funded by the participating institution. This is a logical and cost-effective means to leverage resources that these individual scientists and organizations may have to offer.

Research entity contributions may also be in the form of proposals submitted for SNAP agency consideration within agency fund sources, including regional sources such as SNPLMA, Clark County MSHCP, and Virgin River HCRP. The Needs Assessment will be posted on the SNAP science web page and as an interagency open announcement, as outlined in Chapter 5. These two Internet resources will make SNAP interagency needs broadly available to interested research institutions.

Desired outcomes of outreach to the broader scientific community include:

- Awareness of the science and research needs and priorities of the SNAP-participating land management agencies. Viewing these needs as potential topics for their research.
- Development, carrying out, and providing the results of scientific studies that meet the needs identified by the SNAP Science and Research Strategy.

- Awareness of science and research needs and priorities of the SNAP-participating land management agencies to provide guidance to solicit proposals through an open announcement.

Implementation guidance (dependent upon funding):

Indirect

- Develop and maintain web pages detailing SNAP science and research needs, provide links to study results and publications, and provide links to these pages on agency web pages.
- Develop and distribute a graphic summary sheet depicting the components of the SNAP Science and Research Strategy.
- Develop and distribute an attractive, professional quality brochure or booklet that provides information about SNAP science and research needs.
- Promote the concept that information resulting from studies relevant to priority SNAP science and research needs are of value and interest to the federal land management agencies.
- Develop and distribute a welcome/introduction packet (available in print and online).
- Develop and submit articles to relevant journals and association newsletters.
- Create an e-mail list of researchers, and periodically send e-mail messages about the Strategy, needs, updates, results, successes, etc.
- Create a regular newsletter or other document to which participating entities can submit pertinent articles.

Direct

- Invite proposals addressing priority needs through wide distribution of the Needs Assessment on the SNAP science and research web page and the interagency open announcement.
- Provide opportunities for broad suggestions into Needs Assessment through a link to concept paper guidance on SNAP science and research web page.
- Request research entities to sponsor/host a special session of a relevant, existing conference.
- Conduct introductory and follow-up meetings with target entity leadership.
- Host a research symposium to showcase relevant study results.
- Attend and give oral presentations at meetings, symposia, summits, and conferences hosted by relevant members of the broader scientific community.

Other considerations involving the broader research community as the target audience include:

- Assign a central point of contact to field and address incoming calls and questions from interested parties (within the broader scientific community), and to coordinate the incoming data, information, and publications.
- Prior to conducting outreach activities to specific entities in the broader research community, identify commonalities (such as within missions, visions, or project goals) between SNAP and the entity in question. Perhaps in citing SNAP science and research needs, these entities can strengthen their own funding proposals (to other funding sources) by providing evidence of relevancy, applicability, and practical need for their proposed work. It is also conceivable that unpublished agency research findings or other materials might be of use to the broader scientific community.
- Acknowledge incoming research and information through press releases, web features, and/or other mechanisms as appropriate.

- Consider revising local research permit forms with specific questions about whether proposed work meets strategic goals, including a checkbox selection tool that allows users to identify which sub-goals they are meeting.
- Provide a data-management mechanism for research results and information to be gathered and maintained for SNAP purposes.
- Disseminate synthesis documents to participating entities with a letter of appreciation and advertisement of current research needs and opportunities.

Outreach Materials

The following suite of outreach materials help the interagency science and research team generate greater understanding of, and input into, the SNAP Science and Research Strategy. These materials are intended to be adapted and revised to suit different purposes. The materials are intended to be created with a consistent look and feel to make the program recognizable over time.

WEB PRESENCE

A SNAP science and research web presence provides a single, convenient location for SNAP members and the broader scientific community to obtain current, in-depth information about the SNAP Science and Research Strategy and its priorities. The web presence also allows broad opportunities for research entities to make suggestions as to important concepts for consideration in the annual Needs Assessment, as outlined in Chapter 5. The web pages described in Table 7-1 would be a sub-set of the SNAP.gov web site. While a major priority of the Strategy web pages is to share information among agency and external researchers, they also serve other audiences such as agency leadership and the general public.

Other web considerations include:

- Web pages should be attractive, consistent with the look and feel of the other outreach materials, easy to navigate, and kept current with the latest Needs Assessment and other content.
- It is critical that SNAP and the individual agencies link to the SNAP Science and Research web pages from their individual sites. This is an important means for SNAP and the agencies to demonstrate recognition of the Strategy and to demonstrate integration among programs.

Finally, potential funding resources for researchers (e.g., relevant National Science Foundation announcements, etc.) should be identified and posted to the web pages.

SINGLE PAGE GRAPHIC SUMMARY SHEET

A graphic summary sheet showing the basic structure of the SNAP Science and Research Strategy may be used as a convenient aid of introducing and describing the Strategy's goals and purpose to multiple audiences. Copies of the summary sheet will be distributed at meetings and workshops, and a downloadable version can be made available on the web page.

PUBLICATIONS

The SNAP Science and Research Strategy will be implemented by publishing an annual Needs Assessment document that describes projects to meet priority needs. Synthesis reports (Chapter 11) will

reveal research, data, and knowledge gaps relevant to the Strategy. This information, in combination with priority questions identified within the Strategy (based upon agency concept papers and SNAP

Table 7-1. Suggested major web content areas and components.

General Information	SNAP Science and Research Goals	Section for Researchers
• Brief overview about the SNAP Science and Research Strategy	• Sub-goal menu page (clicking on a sub-goal takes the viewer to an individual page created for the sub-goal)	• Welcome/Introduction packet (printer friendly)
• Brief overview about Southern Nevada's public lands (focusing on natural and cultural resources) including map	• Each sub-goal page features: – Sub-goal overview, including science questions and contributing questions – Current issues and priorities – Abstracts of existing projects (with information about specific contacts)	• Research "feature" (articles highlighting researchers and research activities)
• Section for news, updates, and event information	• Project photos	• FAQs
• Links to: – SNAP home page – Agency web sites	• Each sub-goal page links to: – SNAP team and partner pages – Team contact information – Contact information for associated external researchers – Project documents and fact sheets – Research and monitoring data – Journal articles and theses – Presentations (PowerPoint/Poster) – Workshop proceedings – Upcoming meetings – Funding opportunities – Plans (monitoring/land use) – Synthesis Reports (pdf) – Annual Reports (pdf) – Other publications	• Links to: – Funding opportunities (e.g., NSF, etc.) – Agency permit pages – Sub-goal pages as appropriate – Concept paper template
General Contact Information		

priorities), will define the content for a given cycle's Needs Assessment. This document is intended to further direct the types of proposals developed for Southern Nevada public lands research. In the future, when synthesis reports and interpretive reports are prepared, these documents can be distributed in addition to the annual Needs Assessment.

ELECTRONIC VISUAL PRESENTATION

An attractive, general overview PowerPoint (or other electronic presentation) will be useful in providing Strategy background and illustrating current needs and priorities at meetings, workshops, and symposia. This presentation is updated regularly so that it is always ready for use and/or distribution. In time, additional presentations will be developed to highlight past successes and to provide focus to current priority needs.

WELCOME/INTRODUCTION PACKET

The Welcome/Introduction packet[4] for researchers from the broader scientific community is designed to set a positive tone in establishing a relationship between SNAP-participating land management agencies and the broader scientific community. The packet provides researchers with helpful information about conducting research on Southern Nevada public lands. But, more importantly, it provides information about SNAP science and research needs. It also emphasizes the importance and value of sharing relevant findings with the interagency science and research team in order to benefit public land resources. The Welcome/Introduction packet is to be mailed to target audience members and distributed at meetings, symposia, conferences, etc., as appropriate. The packet also should be made available online.

The future Welcome/Introduction packet is an attractive document that should contain the following sections:

A. Welcome Statement
B. Background
    a. Southern Nevada Agency Partnership
    b. SNAP Science and Research Strategy
    c. Description of the land area and map
    d. Overview of packet contents
C. Current Management Issues
D. SNAP Science and Research Strategy's Goals, Sub-goals, and Science Questions (current priorities)
E. Appropriate Research (and Restrictions)
F. Permit Requirements
G. Non-monetary support that may be available
H. Area Information
I. Contact Information (and web address)
J. Questionnaire

Outreach Evaluation

Included in the development of each outreach product should be the identification of success metrics that will be used to evaluate the effectiveness of the product after completion. Although some desired outcomes are very qualitative in nature and thus, difficult to measure, the metrics shown below can be employed to evaluate the program.

- **Quantifying New Projects** – Using permit data, it is possible to obtain baseline information about the current number and percentage of projects that are being conducted by the broader scientific community on Southern Nevada public lands. Over the next five years, tracking new projects will help determine whether projects that meet the needs described in the SNAP Science and Research Strategy increase.

[4] Adapted from the "Science in the Park Welcome Packet" described within the *2006 NPS Alaska Region Science Strategy* by Suzanne Marcy, Ph.D.

- **Web Statistics** – Following web page development, it will be important to employ a web statistic tracking package to monitor hits, unique visitors, and download traffic. Web statistics should be analyzed in combination with other outreach measures. For example, the number of unique visitors to the web site following a promotional activity at a conference can be used to determine whether or not the advertisement methods used for the web site were effective.
- **Welcome/Introduction Packet Effectiveness** – The number of contacts made via the welcome packet should be tracked. The welcome packet includes an evaluation; results of the evaluations can be used to modify and improve the welcome packet over time.
- **Presentation Numbers** – The number of people to which presentations on the Science and Research Strategy are delivered should be tracked and correlated with quantification of new projects.
- **Collateral Use** – It is important to monitor sites where collateral documents (e.g., brochures) are distributed. Part of this monitoring is to determine whether the materials are being used and to ask for suggestions to make the materials more useful.

References

Marcy, S. 2006. Science in the Park Welcome Packet. Alaska Region Science Strategy. NPS.

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Chapter 8
Quality Assurance

Background

The purpose of this chapter is to outline the quality assurance approach for science activities conducted by the SNAP agencies. Currently, none of the four SNAP agencies have the type of structured quality assurance programs to assist with science activities that is found within federal regulatory agencies (e.g., U.S. Environmental Protection Agency and U.S. Department of Energy).

There are many ways to structure a quality assurance program. This chapter was designed to provide guidance to the four SNAP agencies on ways to improve and formalize quality assurance through all stages of procuring and implementing science and research in southern Nevada. All aspects of quality assurance are discussed in this chapter to show that it is not only a data-management process, but can result in improved project concepts and research designs, and more organized project implementation. Quality assurance is most successful as a multistep process that takes place from the initial project concept through the end of a project. This is done in order to improve the product and the process to develop that product. At the drafting of this strategy, decisions had not been made regarding the level of quality assurance that the agencies will agree to implement. Therefore, this chapter is provided as a reference for future development of SNAP quality assurance standards.

This chapter begins with a discussion of mandates and pressures to improve quality and resulting implications to the SNAP agencies. Next, a description of quality assurance definitions and concepts is provided. Alternative approaches to quality assurance are discussed, followed by examples of ongoing quality assurance activities with their associated benefits. The chapter concludes with general recommendations and a specific recommendation for the implementation of a quality assurance pilot activity.

Mandates and Pressures to Improve Quality

There are a number of government-wide initiatives that require federal agencies to improve the cost-effectiveness of data management as well as improve the quality of data and information the agencies provide; some of these are shown below:

- Section 515 of the Treasury and General Appropriations Act for Fiscal Year 2001 (P.L. 106-554): requires policies to ensure "the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies."

- The President's Management Initiative, which includes e-government projects like GeoSpatial OneStop and Recreation OneStop.

- Executive Order 12906 requires all agencies to conform to Federal Geospatial Data Committee (FGDC) geospatial metadata requirements, and ensure that external customers' needs are being met.

- OMB Circular A-130 (November 2000) emphasizes treating corporate data as a valued public asset with a dollar value, and costs throughout its life-cycle. Circular A-130 ultimately derives from the Paperwork Reduction Act of 1995, which also mandates data quality.

In addition to federal mandates, the agencies need to respond to pressures from inside their agencies and from outside interests. Some examples of these are shown below:

- Budget constraints: There are many demands on the federal budget. Federal agencies must find ways to manage data resources more effectively at a lower cost. This means eliminating redundant data collection by adopting a "collect once, use many" philosophy.

- External demands: Land management agencies are facing increased scrutiny of land use decisions, and as a result, the data that support these decisions. National interest groups are more capable of comparing and analyzing data related to resources that affect their interests in different regions. High quality data are expected and required to support defensible decisions. Objective quality assured measures are a necessary part of this.

- Land use planning initiative: BLM is updating and modernizing land use plans (LUPs) to be "Living Plans" accessible on the Internet, conforming to graphical and content standards. This will require that the data supporting these plans be consistent and accessible. The Information Technology-Resource Management Land Use Plan (IT-RMLUP) Project, which is leading this change, has a strong data management component.

- Data sharing: In addition to promoting internal efficiencies, the public increasingly demands that the federal government reduce waste by using other agencies' data. BLM data are routinely used by other governmental agencies, as well as businesses and the general public. Expectations for information increase continually, and can be expected to increase indefinitely, along with expectations for use of current technologies, convenience, display, accessibility, completeness.

Quality Assurance Concepts

Quality assurance is defined as "an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer" (EPA 2001). The acronym for quality assurance is QA. This is sometimes confused with quality assessment or quality control (QC); both of which are components of a quality assurance program. Short definitions of each of these terms are provided in Figure 8-1.

QA Concepts	
Quality Assurance	Overall system of management activities designed to assure quality data are generated
Quality Control	Operational techniques and activities that are used to ensure that products or services are designed and produced to meet or exceed requirements
Quality Assessment and Evaluation	Application of statistical tools to determine if the uncertainty in the data are appropriate to support programmatic decisions

Figure 8-1. Quality assurance definitions.

As stated in the preceding definition, QA consists of a variety of activities throughout all phases of a project, from planning to implementation, documentation, assessment, and reporting. A common misunderstanding regarding QA is that it consists only of quality control activities such as developing protocols, verifying that these protocols are being followed, and checking the resulting data for errors.

It is now recognized that the achievement of high-quality data requires important QA activities during the planning of a project. Examples of these activities include, setting objectives for data quality, and evaluating whether or not these objectives are met through re-measurements and associated statistical analysis of measurement error. The overall goal is not only to be able to achieve and then document the level of quality for a data set, but to develop an ongoing improvement process so that the level of quality continues to improve over time.

Alternative Approaches to Quality Assurance

Several options can be considered in relation to the implementation of quality assurance for SNAP science and research activities. The two opposite extremes are the *craftsman-artisan approach* and the *formal programmatic approach* (Taylor, 1987). The craftsman-artisan approach relies on each individual scientist to provide high-quality data sets upon completion of their projects. Overall quality is controlled through the peer-review process and not through the implementation of a structured quality assurance program.

A *formal programmatic approach* provides a structure and recommended activities to assist with the achievement of high-quality data sets. The effectiveness of this approach depends on the willingness of the participants to undertake those activities meant to assure the quality of the data being collected. To estimate if these quality objectives are being met, some of these activities will require additional effort such as the selection of measurement-quality objectives or the re-measurement of observations. A support system will also be required to help implement this type of program.

The *craftsman-artisan approach* is most appropriate when research studies of limited scope are conducted by a few individuals, particularly if the data are not expected to be used in legal proceedings. A formal programmatic approach is most appropriate when a large number of participants are conducting similar measurements. In this situation, a structured quality assurance programs helps organizations and individuals to work together to achieve overall program goals, including reliable interagency datasets (Palmer, 2003).

Quality Assurance for SNAP Science and Research Activities

Table 8-1 describes the recommended quality assurance program for science and research occurring on public lands managed by SNAP. We encourage independent researchers to follow this model when conducting research that will provide information for public land management.

Table 8-1. A formalized programmatic approach for quality assurance activities and tools (from Palmer and Landis, 2002). The level of work associated with implementing or applying these tools will vary greatly depending on the complexity and size of the project. Items marked with an asterisk are considered required steps to ensure quality.

Project Phase	Activity	Tools
Pre-planning	Develop proposal	• Peer-review by internal management • Peer-review by external technical expert(s)
Planning	**Develop a detailed project plan***	• Experimental design • Measurement quality objectives (MQOs) • QA strategy • Data management plan • Standard operating procedures (SOPs)
Implementation	**Conduct training and certification of trainees***	• Training guide and certification forms
	Collect, record and control data*	• Scientific notebooks, field forms, data recorders
	Collect and control samples* (if required)	• Sample labels and sample handling procedures
	Calibrate and maintain field and laboratory equipment*	• SOPs
	Conduct audits*	• Field audit form
	Re-measurements*	• Field data collection forms, re-measurement schedule
Assessment	**Data review, verification and validation***	• Data entry checks, illegal data filters, outlier detection, internal consistency checks
	Assess quality of data*	• Statistical analysis of re-measurement data
Analysis and Reporting	**Prepare report***	• Modeling • Statistical analysis of validated data • Data synthesis • Quality assessment
	Finalize data set*	• Finalize metadata • Distribute • Archive
	Finalize report*	• Peer-review • Final editing
Continual improvement	Conduct annual reviews of project	• Debriefing reports, client interviews, system audits

Examples of Quality Assurance Activities

EXAMPLE 1 – PEER-REVIEW

Peer-review is an important component of the recommended QA program at the pre-planning and reporting stages of a project. It provides an unbiased review that ensures that fatal flaws and improvements are identified before projects are funded and reports are published.

In 2007-2008, the NPS solicited proposals to monitor the abundance and ecological effects of a recent invasion of Lake Mead by quagga mussel (*Dreissena bugensis*). The NPS sought the opinions of external scientists to help identify the proposals with the highest technical merit and those meeting program objectives. Five different proposals were received and external technical peer-reviewers were selected and provided with proposal evaluation criteria. Insights gained through the review process led to the development and funding of two projects. The peer-review process contributed not only to the selection of proposals, but to technical improvements of the selected proposals.

The interagency science and research team tested a similar process during development of the SNAP Strategy to identify the value of peer-review at the pre-planning stage. See Appendix 8-A for a description of the process used.

EXAMPLE 2 – DEVELOPMENT OF COMMON DATA COLLECTION STANDARDS

The SNAP restoration team decided that a joint database of disturbance assessment and restoration activities would benefit all the agencies. They recognized that this could not be accomplished unless they first agreed to some common protocols and definitions for data elements. Over a period of several months, restoration specialists from each of the four SNAP agencies met to develop standards for data collection activities associated with recording disturbances and subsequent restoration efforts. Agencies began to collect data according to these standards, and programming began for an interagency database.

At that time, a restoration ecologist from the USGS initiated a study to evaluate the effectiveness of ongoing restoration activities. The USGS ecologist anticipated that the effectiveness of different restoration approaches would depend on the plant community and soil type associated with the disturbances being treated. Therefore, representative sites were selected that spanned the restoration approaches and ecosystem types of the different agencies. The ecologist was able to obtain data using the common standards developed. These data were easily stratified into different classes of interest, and representative sites were randomly selected for ecological research.

EXAMPLE 3 – UNDERSTANDING THE VALUE OF RE-MEASUREMENTS

Annual bird surveys are conducted by SNAP agencies to understand population trends for various important species in Southern Nevada. A wildlife biologist from one of the agencies is interested in using bird observations to develop a habitat model for one of these species. A statistician assisting with the development of this model inquired if replicate measurements had ever been made to determine the accuracy of these observations. Because independent estimates had not been made of the accuracy of the locations, the development of the habitat model was more difficult to complete within desired error limits. As a result, the biologist decided to devote a component of the next survey to the independent re-measurement of key survey variables.

EXAMPLE 4 – DATA VERIFICATION

SNAP agencies have been conducting monitoring studies of desert tortoises for many years. A biologist was interested in summarizing the data for one of these studies. The researcher found that the labeling system on tortoises had changed over the years and it was difficult to consolidate all of the information for any individual tortoise. After some difficulty, the collected information was compiled into one database, but the data needed to be checked.

It was decided that there were certain attributes that should not change over time. For example, the sex of any given tortoise should remain constant, and the width of a tortoise's shell should not decrease. Using these attributes, the data were checked for each of the tortoises being monitored, and several inadvertent errors were found in the data set. These errors were corrected, resulting in the development of an improved long-term dataset.

Recommendations

GENERAL RECOMMENDATIONS

Information important to natural resource management is generated within each agency through inventory, monitoring, research, and planning efforts. Data collected in association with other agency activities, such as biological and cultural surveys for power line construction or vegetation analyses for grazing permit renewals, can also provide information for the agencies. It is important that SNAP agencies establish internal QA processes so that new data are useful in addressing uncertainties associated with ecosystem condition and/or how it will respond to management actions. These QA processes should also be applied to data and reports associated with any land-use activity that impacts natural or cultural resources, that impacts the quality or quantity of habitat of a species, or that changes the character of the landscape. The following items are recommended as components of an internal QA process.

- **Metadata** - Require FGDC metadata for all GIS data. In addition to the FGDC required fields, metadata for scientific data should include study methods, hypotheses, limitations of future use, and expectations of how long the data will be valid. Location of where the associated report is filed should also be included in the metadata.
- **Retain Data** – Maintain all raw data, summary data, and results of analyses to allow the data to be re-analyzed to verify accuracy.
- **QA Review** – Perform quality assurance of data prior to its release.
- **Peer-review** – Require all releasable reports to be expertly reviewed to verify and validate the results and conclusions. Internal peers, a supervisor, or an outside expert may do these reviews.
- **Data Catalog** – Maintain a catalog of all data collected in association with the SNAP Science and Research Strategy and all data sources used to make adaptive management decisions. The catalog will identify where both electronic and hard copy data are located, their source, date collected, limitations of future use, and expectations of how long the data will be valid.
- **Publication Release** – Submit reports to agency libraries so they are available to all agency staff and recorded in agency library catalogs.

Through these efforts, SNAP agencies will improve the quality of the information that they use internally and share with others.

RECOMMENDATION – QA PILOT

As previously mentioned, the four federal SNAP agencies do not currently require the implementation of a formal QA program for their science activities. However, many ongoing and proposed projects could benefit from a more structured QA approach, particularly if the project involves several agencies and many participants. It is important to recognize that the benefits that accrue from implementing a structured QA approach outweigh their associated costs.

A pilot study is therefore recommended that would utilize a structured QA approach for an ongoing interagency science activity. This study would utilize QA activities such as those identified in Table 8-1 to assist with the implementation of the science project. The associated costs and benefits of the QA activities would be documented and reported to the SNAP Board. If successful, the program would be considered for expansion to other SNAP science projects, where appropriate.

The pilot study would be organized as illustrated in Figure 8-2. The staff responsible for the implementation of the QA program would be the data stewards in each agency. Data stewards are subject matter experts within their business subject area who are responsible for creation of data standards, determining data requirements, ensuring data quality for that data, review of data for completeness, and coordinating data sharing. The interagency data steward would be responsible for the overall QA pilot in addition to QA activities related to the development of the interagency database.

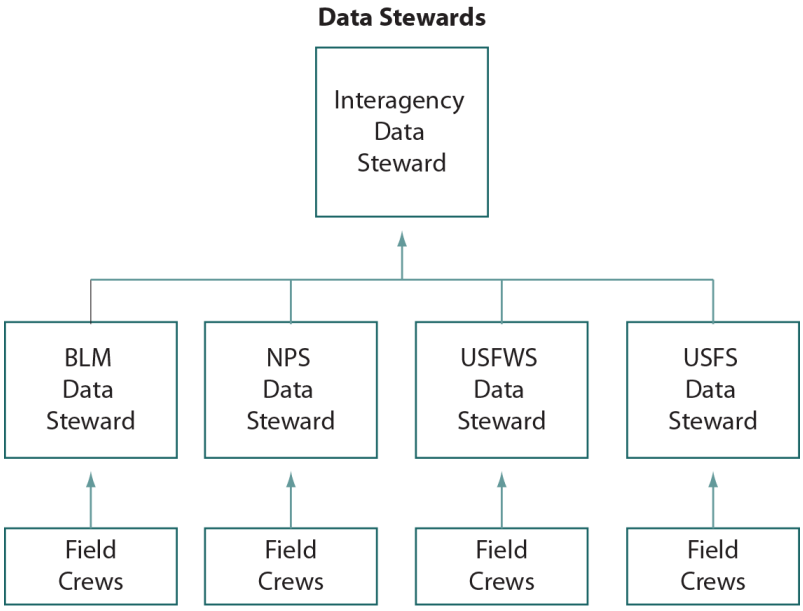


Figure 8.2. Proposed organizational structure for a quality assurance pilot program.

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Chapter 9
Science Coordination and Information Sharing

Background

The interagency science and research team needs to provide a means of coordination (between management and science activities) within SNAP-participating agencies that is relevant to the SNAP Science and Research Strategy. These processes meet sub-goal 3.5 (Chapter 4), which states, "Ensure effective linkages among SNAP agencies, its teams, and partners for the dissemination of knowledge and sharing of data, results, data collection and management systems, staff, and resources." Activities[5] that will help ensure effective linkages include:

- Defining information needs, and meeting those needs in a comprehensive manner that brings together SNAP teams, individual agency experts, and scientists from the broader research community;
- Gathering and disseminating needed scientific information in a manner that is cost effective, inclusive of all existing activities, and identifies synergies between activities;
- Providing information gathered from monitoring, modeling, and research in a form and a timeframe that feed directly into complementary scientific interpretations, management planning, and implementation; and
- Sharing among scientists and managers all information relevant to improving research and management decision-making, including those decisions that may be directed primarily at achieving goals and answering priority science questions.

The purpose of this chapter is to describe and organize the activities that meet sub-goal 3-5.

Coordination

The annual Needs Assessment document and implementation and monitoring work plan (see Chapter 5) are the most significant coordination efforts within the SNAP Strategy. To ensure that planning and evaluation efforts are accomplished regularly and according to a consistent schedule, a timeline has been prescribed for completing the annual Needs Assessment, and implementation and monitoring plan. These documents will identify where needs lie and specify those responsible for performing the work.

In future years, the 5-year synthesis reports (Chapters 6 and 11) will serve as formal communications describing, synthesizing, and evaluating the work that has been completed. Outreach activities described within the Strategy (Chapter 7) include a variety of methods and materials that will help communicate aspects of the SNAP science and research program both internally and to the broader scientific community. The various entities and groups involved, and the types of coordination activities that need to be carried out by the interagency science and research team are summarized in Table 9-1.

[5] adapted from: *A Science Strategy to Support Management Decisions Related to Hypoxia in the Northern Gulf of Mexico and Excess Nutrients in the Mississippi River Basin.*

Table 9-1. SNAP science and research coordination activities.

Group or Entity	Coordination/information-sharing activity carried out by the interagency science and research team
SNAP Board	Updates to SNAP Board, Quarterly Reports, Annual Needs Assessment (Chapter 5), Synthesis Reports (Chapter 6, 11)
SNAP teams	Annual Needs Assessment (Chapter 5), Outreach Activities (Chapter 7)
Interagency science and research team	Regular team meetings and frequent communication (Chapter 2)
Agency staff	Updates to staff through internal mechanisms (e.g., staff meetings) by individual team members, Annual Needs Assessment (Chapter 5), Outreach Activities (Chapter 7)
Broader scientific community	Outreach Activities (Chapter 7), Attendance and participation in meetings by members of the interagency science and research team

Additional Coordination with External Programs

A variety of programs and groups external to SNAP exist that are relevant to science and research activities on Southern Nevada public lands. Examples of the types of groups pertinent to each topic area are listed below.

Natural Resources

- Clark County Multiple Species Habitat Conservation Program
- Colorado Plateau Federal Managers Group
- Desert Managers Group
- Lower Colorado River Multi-Species Conservation Program Steering Committee
- Mojave Desert Initiative
- Nevada Biodiversity Initiative
- USGS Recoverability and Vulnerability of Desert Ecosystems
- Virgin River Habitat Conservation and Recovery Program

Cultural Resources

- Archaeo-Nevada Society
- Friends of Gold Butte
- Nevada Archaeological Association
- Nevada State Historic Preservation Office
- Southern Nevada Rock Art Association

Land Use

- Clark County Department of Comprehensive Planning

Recreation

- City of Henderson Parks and Recreation
- Clark County Department of Parks and Recreation
- Leave No Trace
- Valley of Fire State Park

Conservation Education and Interpretation

- Clark County School District
- Las Vegas Natural History Museum
- Nevada Natural Resource Education Council
- Nevada Outdoor School
- Nevada State Museum, Las Vegas
- Red Rock Canyon Interpretive Association

Members of the interagency science and research team already participate in many of the groups related to the Natural Resources topic area. Groups relevant to other topics are attended by members of other SNAP teams. Appropriate SNAP team members (or appointed staff) will continue to attend these various program meetings, and present or provide input based on the SNAP Science and Research Strategy at these meetings. Additionally, agency staff will relay updates to the interagency science and research team as appropriate.

The SNAP natural resources team, interagency science and research team, GIS team, and agency staff will utilize information from the Needs Assessment in developing individual agency and interagency proposals to the SNPLMA, the Clark County MSHCP, and the Virgin River HCRP. The interagency science and research team will coordinate with the natural resources team and the SNAP Board to recommend priority projects and ensure mechanisms for coordination and information exchange with the various regional conservation planning initiatives.

Data and Information Sharing

One of the major outreach activities for the Strategy is the development of web pages (Chapter 7) to organize information and provide a convenient way for individuals to learn about other SNAP science and research activities, and thus coordinate efforts. The web pages will be developed and organized around the sub-goals of this strategy (see Chapter 7, Table 7-1, for suggested web page content). This overall Science Strategy, current and past annual Needs Assessments and synthesis reports will be available on the web site.

The web pages provide structure for information management and for the collection, organization, storage, and retrieval of information. Validation and quality control of the data and information submitted are described in Chapter 8. Collection will occur during synthesis activities. SNAP teams are also encouraged to provide updates to the web coordinator on a quarterly basis. While the web pages are meant to serve a variety of audiences, sections containing sensitive information will be password-protected and limited in their accessibility.

References

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Chapter 10
Funding Needs and Sources

Background

The SNAP-participating agencies are committed to providing a consistent scientific approach across agency boundaries; and the SNAP Science and Research Strategy is a key mechanism for achieving that goal. Besides agency commitment, consistent funding is also necessary to successfully implement the SNAP Science and Research Strategy. At the time of publication, the SNAP Science and Research Strategy does not have dedicated funding to ensure its long term implementation. Grant funding through the SNPLMA has been approved to implement the program for three years, including the annual Needs Assessment, synthesis reports, and facilitation of federal labor associated with the interagency science and research team. Future funding or commitment of existing resources by all four SNAP federal agencies will be required to implement and maintain the Strategy into the future.

This chapter outlines the components of the SNAP Science and Research Strategy that require funding, the type of funding, and potential sources of funding with associated timelines.

Funding Needs

Table 10-1 details the components or tasks of the SNAP Science and Research Strategy that require funding, an estimated funding amount (if possible to project), and the type of funding potentially available.

Table 10-1. Funding needs for the SNAP Science and Research Strategy (*indicates estimates as of 2008; ** indicates other sources of potential types of funding discussed within the chapter).

Process Components/Tasks	Estimated Amount or Range of Funding*	Potential Types of Funding
Interagency Science and Research Team	Total amount could range from $45,000 to $60,000 per year (variance due to differing salaries for employees). Based on an average of 1/10 of full time employee x 4 agencies (26 work days per year x 4) to provide the minimum time necessary to accomplish the tasks below; additional time and funding would be needed if tasks warrant the investment.	• Appropriated funds • Other sources** (see next section)
Program Facilitator for the Interagency Science and Research Team	$45,000 to $100,000 per year dependent on the amount of activity required to assist in implementing the Strategy (e.g., coordinate and facilitate accomplishment of tasks below).	• Appropriated funds • Other sources (see next section)
SNAP Science Panel	$36,000 to $72,000 per year depending on the amount of time and travel required to provide annual input into the Strategy. Based on nine panel members attending four meetings per year, three work days for preparation, and travel costs.	• In-kind contribution (from Panel member's agency or entity) • Appropriated funds • Other sources (see next section)

Process Components/Tasks	Estimated Amount or Range of Funding*	Potential Types of Funding
Synthesis Documents	From $25,000 to $50,000 per topic reviewed. Varies dependent on type and number of projects and information being reviewed or synthesized.	• Other sources (see next section) • Utilization of existing synthesis document(s) created by other groups
Outreach, including annual Needs Assessment	Ranging from $5,000 to $75,000 with variation based on the number of outreach documents produced, workshops or meetings held, symposia attended, and other outreach performed.	• Appropriated funds • Other sources (see next section) • Utilization of existing forums for outreach (e.g., conferences or symposia held by other groups)
Implementation and Monitoring Plan	Ranging from $5,000 to $10,000 per year depending on the number of projects or management decisions that warrant implementation monitoring.	• Appropriated funds • Other sources (see next section)
Annual Report	Production cost of approximately $1,000.	• Appropriated funds • Other sources (see next section)
Programmatic Review	$10,000 to $100,000 every 5 years; will vary dependent upon the extent of updates to the Strategy.	• Appropriated funds • Other sources (see next section)

Project Components/Tasks	Estimated Amount or Range of Funding*	Potential Types of Funding
Science and Research Proposals or Projects	Projects could range from $50,000 to $8,000,000 each, with multiple projects per year. Total annual amount varies depending on proposal or project.	• Appropriated funds • Other sources (see next section)
Proposal Review	$1,000 to $25,000 per year depending on the number of proposals reviewed. Outsource cost is $150 - $250 per peer-review.	• Appropriated funds • Other sources (see next section)

Potential Sources of Future Funding

APPROPRIATED FUNDS OR INTERNAL AGENCY FUNDING

Each agency – singly or combined – can utilize appropriated funds or special, internal agency funding to support science and research projects that would meet the goals of the SNAP Science and Research Strategy. Timelines for funding vary by agency.

DEPARTMENT OF DEFENSE

Strategic Environmental Research and Development Program (www.serdp.org)

The Strategic Environmental Research and Development Program (SERDP) is the Department of Defense's (DoD) environmental science and technology program, planned and executed in full partnership with the Department of Energy and the Environmental Protection Agency, with participation by numerous other federal and non-federal organizations. To address the highest priority issues confronting the Army, Navy, Air Force, and Marines, SERDP focuses on cross-service requirements and pursues high-risk/high-payoff solutions to the Department's most

intractable environmental problems. The development and application of innovative environmental technologies support the long-term sustainability of DoD's training and testing ranges as well as significantly reduce current and future environmental liabilities.

SERDP funds environmental research and development through a competitive process. There are usually two solicitations annually: a Core Solicitation and a SERDP Exploratory Development (SEED) Solicitation. Because both government and private sector parties may compete for SERDP funds, there are two announcements for each solicitation: (1) a Call for Proposals to the federal sector and (2) a Broad Agency Announcement (BAA) for the private or non-federal sector. The Core Solicitation provides funding in varying amounts for multi-year projects and is typically released in mid-November. SEED proposals are limited to a maximum of $150,000 and a period of performance of one year, and are typically released in November. SERDP responds to the high-priority requirements of the DoD. From these requirements and the underlying SERDP Strategic Guidance, Statement of Need (SON) documents for the SERDP focus areas are developed for each solicitation on an annual basis. These SONs are the core of each solicitation. Only proposals addressing the SONs will be reviewed. SERDP uses a multiple step competitive process to select projects for funding.

Research categories include: Environmental Restoration; Sustainable Infrastructure (including natural and cultural resources); Weapons Systems & Platforms; and Munitions Management. Numerous projects funded in the past through SERDP (especially the Sustainable Infrastructure category) are relevant to the Strategy. Federal staff will be made aware of the types of funding available through SERDP to work with their partners in developing proposals for research that would meet the goals of the SNAP Science and Research Strategy.

Legacy Resource Management Program (www.dodlegacy.org/legacy/index.aspx)

In 1990, Congress passed legislation establishing the Legacy Resource Management Program to provide financial assistance to the DoD efforts to preserve our natural and cultural heritage. The program assists DoD in protecting and enhancing resources while supporting military readiness. A Legacy project may involve regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, Native American consultations, and/or monitoring and predicting migratory patterns of birds and animals. Three principles guide the Legacy program: stewardship, leadership, and partnership. Stewardship initiatives assist DoD in safeguarding its irreplaceable resources for future generations. By embracing a leadership role as part of the program, DoD serves as a model for respectful use of natural and cultural resources. Through partnerships, the program strives to access the knowledge and talents of individuals outside of DoD.

Areas of emphasis are established for the Legacy Program annually. The areas of emphasis (for 2009) include: Integrated Natural Resources Management; Regional Ecosystem Management Initiatives; Invasive Species Control; Monitoring and Predicting Migratory Patterns of Birds and Mammals; Economics of Historic Preservation; Cultural Resources Data Management; Communication, Partnerships, and Public Awareness; Context and Model Development; Readiness and Range Sustainment; National and International Conservation Initiatives; and Cooperative Conservation. Although projects may take more than one year to complete, all Legacy Program funds must be obligated and, sometimes, expended by the end of the fiscal year in which they are received. Therefore, it is imperative that requests for funds are for a single year, and that appropriate obligation and expenditure mechanisms are available. In addition, all Legacy Program-funded efforts must have a stand-alone product, within one year of receipt of funds, even if this is not the final project outcome. Requests for proposals are typically announced in the spring (May) with pre-proposals due by the fall (September).

Funds are typically released before the year's end (December).
Because many of the federal lands in Southern Nevada are adjacent to military lands with similar resource issues, federal staff will be made aware of the types of funding available through the Legacy Program to work with local DoD installations in developing proposals for research that would meet the goals of the Legacy Program, as well as the SNAP Science and Research Strategy.

DEPARTMENT OF THE INTERIOR (DOI; www.doi.gov)

Healthy Lands Initiative

The Secretary of the Interior launched the Healthy Lands Initiative (HLI) in 2007 to accelerate land restoration, increase productivity, and improve the health of public lands in the Western United States. The goal of the Initiative is to preserve the diversity and productivity of public and private lands across the landscape. The Initiative will enable and encourage local BLM managers to set priorities across a broader scale and mitigate impacts to an array of resources in ways not previously available to them.

The BLM, NPS and USGS may receive federal appropriated funds through this program. Partnerships are an integral part of the Initiative. Public-private cooperation, incentives for landowners and private industry, and other non-traditional approaches will engage stakeholders while generating additional funds and resources. Partners to date have included the USFS, National Resources Conservation Service, state wildlife or game and fish departments, landowners, energy and utility industries, conservation districts, universities, and local conservation groups.

During the 2007-2008 fiscal year, the BLM focused its landscape-level restoration efforts on southwest Wyoming, the northwest and southeast portions of New Mexico, south-central Idaho, southwest Colorado, Utah, and the three-corner area of Idaho, Oregon, and Nevada. In the 2009 fiscal year, two other areas will be added, northwest Colorado and parts of California.

Birds Forever Initiative

The Birds Forever Initiative, a joint effort of the USFWS and the USGS, would expand and improve the health of wild bird habitat, strengthen educational outreach programs and work in partnership with states, local communities, conservation organizations and other bird-loving partners to reverse the precipitous decline in wild bird populations.

Recognizing and supporting the vital role that the USFWS plays in bird conservation in this hemisphere, the President's 2009 fiscal year budget request for the USFWS calls for sustaining increases of $35.9 million in the 2008 DOI budget for wildlife refuges to conserve, protect, and enhance more than 200,000 acres of vital stopover habitat for migratory birds—the equivalent of 150,000 football fields.

The USFWS also would receive an $8.0 million increase under this Initiative to support targeted planning and broad-scale activities to address threats to bird species. This includes a net increase of $3.8 million for monitoring and assessment of birds, $196,000 for conservation grant programs, and $4.0 million for Migratory Bird Joint Ventures.

The planned actions will apply the concepts of adaptive management and strategic habitat conservation to create urban bird treaties, collaborate on joint ventures for waterfowl, work with Mexico to enhance

bird habitats in their country, improve the status of five bird species over the next five years, and compile a 2009 State of the Birds report.

Under the President's Initiative, 36 bird species will be targeted in priority areas by expanding current partnership programs. Partnering with other conservation groups, the DOI will collect scientific data to monitor and document changes in numbers and distribution across landscapes. Interior agencies will also engage citizens in protecting birds though urban bird "treaties," which help cities to understand the needs and stressors of birds.

The USGS would receive a $1 million increase to support this initiative, funding efforts to better understand large-scale drivers of migratory bird population, and habitat change such as global warming, deforestation and urban development. This initiative supports monitoring efforts including the Breeding Bird Survey and other migratory bird monitoring activities.

DEPARTMENT OF THE INTERIOR AND DEPARTMENT OF AGRICULTURE

Joint Fire Science Program (www.firescience.gov)

The Joint Fire Science Program (JFSP) was created by Congress in 1998 as an interagency research, development, and applications partnership between the U.S. DOI and the USDA. JFSP was established through a six-agency partnership to fill the gaps in knowledge about wildland fire and fuels. Funding priorities and policies are set by the JFSP Governing Board, which includes representatives from the BLM, NPS, USFWS, Bureau of Indian Affairs, USGS, and five representatives from the USFS.

The Program is uniquely positioned to tailor wildland fire research in response to the emerging needs of policymakers and fire managers. An annual cycle of proposal solicitation, review, and funding ensures timely response to evolving conditions. Research projects complement and build on other federal research programs, such as those in the USFS Forest and Rangeland Research Stations, USGS, and National Fire Plan. Synthesis of research findings and targeted delivery to managers are essential components of the Program. Land managers regularly use results from JFSP projects to plan and implement fuels treatments, support fire management decisions, restore lands affected by fire, and meet regulatory requirements.

In response to congressional direction, the JFSP develops science-based knowledge and tools to support federal, tribal, state, and local agencies and their partners in the following areas:

- Fuel inventory and mapping
- Fuel treatment planning, scheduling, and risk assessment
- Fire effects and fire behavior
- Monitoring and evaluation
- Restoration of fire-adapted ecosystems
- Post-fire stabilization and rehabilitation
- Remote sensing
- Developing and integrating research information for local land managers

Between 1998 and 2006, the Program funded 380 research projects. A highly competitive, peer-review process consisting of land managers, technical specialists, and scientists ensures that the very best proposals are accepted for funding. On average, about 20 percent of the submitted proposals are selected. Announcements for proposals could be requested at various times throughout the year, but typically

open in October and close in November or December. Requests for proposals target specific areas of interest or tasks.

ENVIRONMENTAL PROTECTION AGENCY (www.epa.gov)

National Center for Environmental Research

The National Center for Environmental Research (NCER) is one of seven research organizations that comprise the EPA's Office of Research and Development (ORD). NCER's mission is to support high-quality research by the Nation's leading scientists that will improve the scientific basis for national environmental decisions. One of NCER's highest priorities is ensuring that the Nation has an adequate and well-trained scientific workforce that can address tomorrow's complex environmental issues (http://es.epa.gov/ncer/about/).

Federal staff will be made aware of the types of funding available through the EPA to work with their partners in developing proposals for research that would meet the goals of the SNAP Science and Research Strategy.

Science to Achieve Results: Building a Scientific Foundation for Sound Environmental Decisions

Science to Achieve Results (STAR) research is funded through Requests for Applications (RFAs) that are derived from the ORD Strategic Plan and from research plans for specific topics developed by ORD. RFAs are prepared in cooperation with other parts of the Agency and concentrate on areas of special significance to the EPA mission. Examples of past STAR RFAs, applicable to the SNAP Science and Research Strategy have focused on air toxics, health effects of particulate matter, drinking water, water quality, ecosystem assessment and restoration, and endocrine disrupting chemicals.

Enhance the STAR Program

The EPA Experimental Program to Stimulate Competitive Research (EPSCoR) program funds proposals from EPSCoR states, such as Nevada, which were developed in response to EPA STAR solicitations (see http://www.epa.gov/ncer/rfa/), passed peer-review, and fell near the cut-off for funding by the reviewing program. This mechanism operates internally within EPA and does not require any action on the part of the applicant.

The goal of the EPA EPSCoR program is to fund high quality research while allowing investigators to gain experience in the competitive grants process and to become familiar with the EPA STAR program. EPA plans to use its limited EPSCoR resources through this process and will no longer issue separate EPSCoR solicitations.

GRANT PROGRAMS FOR NON-PROFIT ORGANIZATIONS, STATE AND LOCAL ENTITIES, AND PRIVATE LANDOWNERS

There are numerous grant programs (including some mentioned in this chapter) available for non-profit organizations, state and local entities, and private landowners. Working in partnership with these entities or individuals, SNAP agency staff could assist in developing proposals for science and research projects that would meet the goals of the SNAP Science and Research Strategy, while also meeting the needs of the entities or individuals. Timelines vary depending on the grant program.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA; www.nasa.gov)

Research Opportunities in Space and Earth Science (ROSES)

Supporting research in science and technology is an important part of NASA's overall mission. NASA solicits this research through the release of various research announcements in a wide range of science and technology disciplines. NASA uses a peer-review process to evaluate and select research proposals submitted in response to these research announcements. Researchers can help NASA achieve national research objectives by submitting research proposals and conducting awarded research. NASA research funding opportunities can be found at: http://nspires.nasaprs.com/external/.

A solicited research ROSES program area that is applicable to the SNAP Science and Research Strategy is "Biodiversity."

NATIONAL ENDOWMENT FOR THE HUMANITIES (www.neh.gov)

Created in 1965, the National Endowment for the Humanities (NEH) is an independent grant-making agency of the United States government dedicated to supporting research, education, preservation, and public programs in the humanities. NEH grants typically are awarded to cultural institutions, such as museums, archives, libraries, colleges, universities, public television, radio stations, and to individual scholars.

Under NEH, Collaborative Research Grants support original research undertaken by a team of two or more scholars. They also support research coordinated by an individual scholar that, because of its scope or complexity, requires additional staff and resources beyond the individual's salary. These grants support full-time or part-time activities for periods of one to three years. Support is available for various combinations of scholars, consultants, and research assistants; project-related travel; field work; applications of information technology; and technical support and services. Eligible projects include:

- research that significantly adds to knowledge and understanding in the humanities;
- conferences on topics of major importance in the humanities that will benefit ongoing research;
- archaeological projects that include the interpretation and communication of results (projects may encompass excavation, materials analysis, laboratory work, field reports, and preparation of interpretive monographs);
- translations into English of works that provide insight into the history, literature, philosophy, and artistic achievements of other cultures; and
- research that uses the knowledge, methods, and perspectives of the humanities to enhance understanding of science, technology, medicine, and the social sciences.

NATIONAL SCIENCE FOUNDATION (www.nsf.gov)

The NSF is an independent government agency, established by Congress in 1950 that supports fundamental research and education in all the non-medical fields of science and engineering. With an annual budget of approximately $6.02 billion, NSF funds approximately 20 percent of all federally-supported basic research conducted by the United States' colleges and universities (http://www.nsf.gov/about/glance.jsp).

Federal staff will be made aware of the types of funding available through NSF to work with their partners in developing funding proposals for research that would meet the goals of the SNAP Science and Research Strategy. Listed below are examples of NSF program funding areas that would be applicable to meeting goals of the Strategy. Although these areas pertain to the 2008 fiscal year, they are likely to be available in the future. A list of all active NSF funding opportunities is available at:

http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=date. In addition, from the NSF homepage (http://www.nsf.gov/), it is possible to join an e-mail list to receive updates on specific funding areas of interest.

Directorate for Biological Sciences

Research Coordination Networks in Biological Sciences (Full proposals are due in June)

Division of Environmental Biology

Ecological Biology (Full proposals are accepted in July)
Ecosystem Science (Full proposals are accepted in July)
Population and Evolutionary Processes (Full proposals are accepted in July)
Long Term Research in Environmental Biology (Full proposals are accepted in July)
Opportunities for Promoting Understanding through Synthesis (Full proposals are accepted in January and July)
Systematic Biology and Biodiversity Inventories (Full proposals are accepted in July)

Division of Earth Sciences

Sedimentary Geology and Paleobiology (Full proposals are accepted in July and January)

Division of Behavioral and Cognitive Science

Cultural Anthropology (Full proposals are accepted in January and August)
Cultural Anthropology Scholars Award (Full proposals are accepted in January and August)
Physical Anthropology (Full proposals are accepted in July and December)
Geography and Regional Science (Full proposals are accepted at various times during the year)

Division of Research on Learning in Formal and Informal Settings

Informal Science Education (Full proposals are accepted in December, and require a Letter of Intent)

Division of Biological Infrastructures

Undergraduate Research and Mentoring in the Biological Sciences (Preliminary proposals are due in September, with full proposals accepted in March)

NEVADA SYSTEM OF HIGHER EDUCATION

System Sponsored Programs Office and Nevada EPSCoR (www.nevada.edu/epscor)

The System Sponsored Programs Office (SSPO) receives federal, state and county awards for Nevada System of Higher Education (NSHE) statewide programs. EPSCoR programs are administered through the SSPO office. The goal of the EPSCoR is to stimulate sustainable improvements in the quality of academic science and technology infrastructure of eligible states. These research programs request that cost sharing is provided by the state and the NSHE institutions. Through the EPSCoR programs solicitations, poster sessions, scholarships and faculty research initiatives are focused on NSHE faculty, students and national laboratory collaborations.

SOUTHERN NEVADA PUBLIC LAND MANAGEMENT ACT (www.blm.gov)

The SNPLMA became law in October, 1998, followed by amendments in 2002 and 2004. It allows the BLM to sell public land within a specific boundary around Las Vegas, Clark County, Nevada. The revenue

derived from land sales is divided between the State of Nevada General Education Fund (5%), the Southern Nevada Water Authority (10%), and a special account available to the Secretary of the Interior for the following purposes:

- Acquisition of environmentally-sensitive land in Nevada, with priority given to lands within Clark County;
- Capital improvements at the Lake Mead National Recreation Area, the Great Basin National Park, the Desert National Wildlife Refuge Complex, the Red Rock Canyon National Conservation Area, and other areas administered by the BLM and the USFS in Clark, Lincoln, and White Pine Counties, including the Spring Mountains National Recreation Area;
- Development and implementation of a multi-species habitat conservation plan in Clark County;
- Development of parks, trails, and natural areas in Clark, Lincoln, and White Pine Counties in Nevada [Washoe County, Nevada, is eligible until December 31, 2011, to submit nominations for funds to acquire land (not to exceed 250 acres) and develop one regional park and natural area, pursuant to a cooperative agreement with units of local government or regional governmental entities];
- Conservation initiatives on federal land in Clark, Lincoln, and White Pine Counties, Nevada, administered by the DOI or the USDA;
- Lake Tahoe Restoration projects;
- Development and implementation of multi-jurisdictional hazardous fuels reduction and wildfire prevention plans for the Lake Tahoe Basin, the Carson Range in Douglas and Washoe Counties and Carson City in Nevada, and the Spring Mountains in Nevada;
- Projects to carry out the Eastern Nevada Landscape Restoration Project in White Pine and Lincoln Counties in Nevada;
- Reimbursement of costs incurred by the BLM for implementation of the Act; and
- Reimbursement of any costs incurred by the BLM to clear debris from and protect land located in the disposal boundary that is reserved for affordable housing.

The SNPLMA funding category relevant to the SNAP Science and Research Strategy is Conservation Initiatives *(www.blm.gov/nv/st/en/snplma.html)*. The timeline for SNPLMA funding varies by year, but the best-case scenario is detailed below:

SEPT.-OCT.	Notification: agencies and local entities create concepts and narrow down what will be submitted
OCT.-NOV.	Full submission packages are due
DEC.-FEB.	Vetting process, scoring, and informing of the decision makers, local subcommittees, and Partners Working Group
APR.-JULY	Meeting of the SNPLMA Executive Committee. Recommendations are prepared and nominations are presented to the Secretary of the Interior.
NOV.	Secretary of the Interior makes a final decision on which nominations will be funded
MARCH	Agency staff begin submitting task orders/intergovernmental funding packages. The first task order for a project may be submitted up to a year after the Secretary of the Interior makes the funds available.

Through past funding rounds, participating agencies and their partners have completed significant projects with direct implications to resource management for both resource protection and resource use. Fifty-five Conservation Initiatives projects relevant to SNAP Science and Research Strategy goals and sub-goals — and totaling more than $100 million — have been funded across Rounds 4-6. In Appendix

10-A, relevant Conservation Initiatives funded in rounds 4-6 are organized according to the topics reflective of each SNAP Science and Research Strategy sub-goal. The SNPLMA program should continue to be utilized for funding by federal staff, when appropriate, to meet the goals of the SNAP Science and Research Strategy.

UNIVERSITY OFFICES OF SPONSORED PROGRAMS

Agency staff working with university investigators might suggest that investigators contact their Office of Sponsored Programs to help them uncover additional opportunities.

Chapter 11
Strategy Evaluation

Background

The goals of this chapter are to describe a process for evaluating the overall success of the SNAP Science and Research Strategy, and to continually improve and increase the effectiveness of the Strategy over time. The key components of this evaluation process are three separate reports, which include (1) an annual report of the interagency science and research team, (2) an annual Needs Assessment (see Chapter 5), and (3) a periodic synthesis report (see Chapter 6). Based upon the information contained in these reports, the current Strategy may be updated or refined. The annual report and the updating of the Strategy are described in this Chapter. The process for development of the annual Needs Assessment and the synthesis report are described in Chapters 5 and 6, respectively. A timeline for the preparation of these reports is also provided in this Chapter.

Interagency Science and Research Team Annual Report

The purpose of the interagency science and research team annual report is to provide the SNAP Board with a progress review of Strategy implementation. Table 11-1 illustrates the criteria that will serve to provide initial guidance in the preparation of the first annual report.

Table 11-1. Success criteria for use in annual report preparation of the interagency science and research team.

Strategy Chapter	Topic	Success Criteria
2	Organization	• Completion of assigned tasks and responsibilities • Effectiveness of these activities
3	Adaptive Management	• Implementation of adaptive management model including completion of synthesis reports
4 and 5	Science Needs	• Completion of annual Needs Assessment, and implementation and monitoring work plan
6	Synthesis	• Completion of task • Incorporation of results into annual Needs Assessment
7	Outreach	• Review of outreach activities • Success with outreach activities as evidenced by: – submitted proposals – number of projects funded per priority science question – listing of entities conducting research pertinent to the Science Strategy – accomplishment of other criteria described within Chapter 7
8	Quality Assurance	• QA activities undertaken such as peer-reviews, audits, re-measurements • Results of QA pilot
9	Coordination	• Review of coordination activities including number and outcome

Strategy Chapter	Topic	Success Criteria
10	Funding	• Ongoing project funding per priority science question
11	Strategy Evaluation	• Review of recommendations from prior annual reports • As appropriate, completion of Strategy updates

The timeframe for the annual report should be the federal fiscal year (October – September) with an annual report completion date in November. This report should be concise, pre-planned, and follow a similar format each year.

In addition to evaluating success criteria, the annual report should include a "looking ahead" section. This section will provide a program of work for the next year, including any recommended interim adjustments to the implementation of the SNAP Science and Research Strategy.

Updates to the SNAP Science and Research Strategy

An important component of the continual improvement process is the periodic updating of the Strategy. Certain aspects of this strategy may prove to be difficult to implement while new ideas may prove to be more successful. An opportunity for annual adjustments to the Strategy is provided through the preparation of the annual reports and the associated annual program of work. Other changes may be identified during the preparation of the annual Needs Assessments and the periodic synthesis reports or by direction from the SNAP Board. Though the exact criteria (or thresholds) that may trigger an update of the Strategy have not been identified, a critical element would be the relevancy of the Strategy to the conclusions found in those reports. For instance, if the annual Needs Assessment consistently identifies research questions/topics that are not included or identified in the Strategy, this could be basis for an update. Similarly, if the synthesis report concludes that little if any change has occurred in baseline conditions, there may be the need to modify one or more of the processes or goals within the Strategy. In summary, the preparation of an updated version of the SNAP Science and Research Strategy provides an opportunity to improve it over time.

Timelines

The timeline shown in Table 11-2 is proposed for the preparation of reports.

Table 11-2. Proposed timeline for the preparation of reports by the interagency science and research team (S&R = Science and Research).

Year	Annual Report	Science Needs Assessment	Synthesis Report	Update to the S&R Strategy
2009	X	X	X	
2010	X	X	X	
2011		X		X
2012	X	X		
2013	X	X		
2014	X	X	X	

Year	Annual Report	Science Needs Assessment	Synthesis Report	Update to the S&R Strategy
2015	X	X	X	
2016		X		X
2017	X	X		
2018	X	X		
2019	X	X	X	
2020	X	X	X	
2021		X		X

This timeline proposes the following features:

- Annual reports are prepared each year with the exception of the year when an update to the SNAP Science and Research Strategy is prepared.
- A science Needs Assessment will be prepared each year.
- The first synthesis reports will be prepared in 2009 and 2010, as currently funded. Each future synthesis report will be prepared every five years. It is anticipated that these reports will take two years to complete.
- The first update to the SNAP Science and Research Strategy will be in 2011. This update will be based on lessons learned early in the implementation of this strategy, and as a result of completing the first synthesis report. Updates will be undertaken following a five-year cycle.

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Appendices

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Appendix 4-A
Arriving at Goals, Sub-goals, and Science Questions

The development of the SNAP Science and Research Strategy's goals, sub-goals, and science questions is based on individual agency (BLM, NPS, USFS, and USFWS) goals, the SNAP Board vision, the interagency science and research team's charter goals, and the input of individual agency specialists. In addition, seven regional, interagency science plans were also studied to gain an understanding of key topics and objectives identified by other entities. In Chapter 4, Figure 4-1 graphically depicts the Strategy's development process. The main goals developed as part of the Strategy are presented below. Through the efforts described below, the goals and sub-goals were identified as the main themes; however, the interagency science and research team determined not to prioritize them in relation to each other. It was determined appropriate to prioritize the science questions within each sub-goal in relation to the other science questions.

GOAL 1

Three workshops were held to arrive at the sub-goals and science questions that fall under Goal 1. The first two events were SNPLMA-funded Mojave Desert Ecosystem Health Assessment workshops. These were sponsored by the interagency science and research team, and conducted and documented by the Desert Research Institute (DRI) under a cooperative agreement. The purpose of these two workshops was to seek scientific opinion on research priorities for Southern Nevada. At the first workshop, held in May 2006, a panel of 13 scientists met with SNAP agency resource specialists to discuss management questions and concerns, which had been summarized in a pre-circulated document. DRI presented the results of these discussions in a report[6] organized by research themes, and included a synopsis of individual SNAP agency questions and concerns, a summary of the most current research and knowledge, and new pertinent research for each theme. It also included a list of 57 suggested priority research areas for the agencies. At the second DRI-organized workshop, held in August 2006, participants generated a prioritized list of research needs for Southern Nevada, together with lists of stressors and gaps in knowledge.[7] Almost 90 scientists, including university researchers as well as state, federal, and local agency employees attended this workshop, which featured 13 discipline/theme-focused breakout groups.

At the August 2006 workshop, scientists and agency participants prioritized research topics for Southern Nevada by voting for their three highest priorities. Based on number of votes each topic received, a top 10 list was prepared, which showed, strikingly, that the top three priorities of scientists and agency staff were identical. Furthermore, the two groups had similar priorities throughout the top 10 list, although actual ranking differed.

[6] and [7] See "Ecological Health Assessment in Southern Nevada – Reports on Workshops in May and August 2006 and associated documents" edited and compiled by Judith Lancaster, David Mouat, and Paul Buck. Desert Research Institute, Las Vegas, NV.

Top 10 topics selected by scientists		Top 10 topics selected by all participants	
1	Integrated water-ecology model	1	Integrated water-ecology model
2	Alternative futures	2	Alternative futures
3	Ecological effects of invaders	3	Ecological effects of invaders
4	Urbanization effects	4	Restoration potential
5	Mechanisms of invasion	5	Fire effects
6	Fire effects	6	Spring system biotic integrity
7	Restoration potential	7	Mechanisms of invasion
8	Biophysical and socioeconomic indicators	8	Prioritization for conservation by filling information gaps
9	Spring system biotic integrity	9	Biophysical and socioeconomic indicators
10	Threshold level of natural and artificial habitat	10	Visitor use patterns and characteristics

Following these two DRI-organized workshops, the interagency science and research team established a framework by which the priority topics (and other important topics) could be addressed. Using agency strategic goals, the team looked for commonalities. The agreed upon structure included three major goals (1) natural resources, (2) human interaction, and (3) approach (i.e., Strategy operations). Statements were drafted for each of these goals, and each goal was further divided into draft sub-goals. Questions and statements documented by DRI within proceedings' documents were organized by appropriate sub-goal. The team then consolidated, removed duplicates, and further refined these questions to form priority science questions and contributing questions under each natural resource sub-goal.

Goal 1, Natural Resources, was the focus of the SNAP Science and Research Natural Resources Management Workshop held September 13, 2007. Following a presentation by Rebecca Gravenmier[8] about the process used in the development of the Northwest Forest Plan, four concurrent breakout group sessions were held, one for each of the Goal 1 sub-goals. The members of the interagency science and research team served as session leads. Agency staff participants validated sub-goals and reviewed, revised, and prioritized science questions, and reviewed contributing questions (sub-goal contributors are listed in the acknowledgements section of the workshop proceedings).

GOAL 2

Portions of the documents and information for Goal 1 produced from the workshops were used by the interagency science and research team as the starting point for many of Goal 2 (Human Interaction) sub-goals and science questions. The cultural resources team and the recreation/off-highway vehicle team participated in the final editing and refinement of respective sub-goals within Goal 2 for their discipline. Sub-goal 2.3 relating to authorized land uses, and sub-goal 2.5 related to conservation education and interpretation were developed with ad hoc committees of agency subject matter experts working with the interagency science and research team. Sub-goal 2.5 and related science questions for conservation education also relied on a previously published "SNAP Conservation Education Strategy" document developed by the Public Lands Institute at the University of Nevada, Las Vegas.

GOAL 3

The Strategy Operations goal, sub-goals, science questions and contributing questions were initially drafted by the interagency science and research team. The team then met with the Executive Director of the SNAP Board to further refine and finalize this goal, which is organized by sub-goals and tasks.

[8] Rebecca Gravenmier is the Planning Contact for the Station Director's Office, USDA Forest Service, Pacific Northwest Research Station

Appendix 5-A
Outline of Annual Needs Assessment Document

The annual Needs Assessment is organized around the sub-goals of the SNAP Science and Research Strategy, which are (1) Fire, (2) Invasive Species, (3) Landscapes and Watersheds, (4) Biodiversity, (5) Cultural Resources, (6) Historic Context, (7) Recreation, (8) Land Use, and (9) Conservation Education and Interpretation. The document is prepared by the interagency science and research team based upon professional knowledge of the area and local programs, input from agency staff and scientists, and, when available, with findings presented within the synthesis documents.

Outline

Executive Summary
General Overview

The following sections are completed for each of the nine sub-goals:

a. Sub-goal
b. Priority science question/contributing question(s)
c. Background, existing information, and status of relevant work
d. Current management perspective
e. Recommendations

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Appendix 5-B
Concept Paper Template

Concept Paper for Annual SNAP Science and Research Needs
(Actual document is an electronic form)

1.) What is your science question or need?
Goal (drop down box): Sub-goal (drop down box):

Science Question:

2.) Background and Benefit. Discuss (a.) ongoing research, (b.) why this need is important to management?, and (c.) why this need should be included in this year's Needs Assessment?

3.) Name_____ Email_____

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Appendix 5-C
SNAP Species of Management Concern

The majority of key species of interest to SNAP listed in this appendix are represented on the Nevada Natural Heritage Program (NNHP *Animal and Plant At-Risk Tracking List*.[9] The NNHP systematically collects information on Nevada's at risk, rare, endangered, and threatened biological features. Within the context of agency missions and regulatory requirements, SNAP-participating agencies strive to sustain or recover at-risk species and prevent extirpation of species on any of its collective lands. Species are on this list because they are: 1) at-risk species with high Global or State Ranks (G1, G2, G3; S1, S2, S3); and/or 2) endemic species; and/or 3) other species of interest that rely on the seven million acres of SNAP public lands in Southern Nevada to maintain viable populations.

The following list of SNAP Species of Management Concern is organized by taxa. This list is intended to be flexible and fluid. Some of the species are expected to be adjusted during the annual development of the Needs Assessment (Chapter 5) – as the status of species change, science and research needs change, science and research needs are met, and new science and research priorities arise.

AMPHIBIAN

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Relict leopard frog	*Rana onca*	LC	-	Yes	G1	S1

BIRDS

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Northern goshawk	*Accipiter gentilis*	NL	-	Yes	G5	S2
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	C	-	Yes	G5T3Q	S1B
Southwestern willow flycatcher	*Empidonax trailii extimus*	LE	Yes	Yes	G5T1T2	S1B
American peregrine falcon	*Falco peregrinus anatum*	DM	-	Yes	G4T4	S2
Bald eagle	*Haliaeetus leucocephalus*	DM	-	Yes	G5	S1B,S3N
Blue grosbeak	*Passerina caerulea*	NL	-	-	G5	S3B
Phainopepla	*Phainopepla nitens*	NL	-	Yes	G5	S2B
Summer tanager	*Piranga rubra*	NL	-	-	G5	-
Vermillion flycatcher	*Pyrocephalus rubinus*	NL	-	-	G5	-

[9] At the time this Strategy was prepared, the latest version of the *Animal and Plant At-Risk Tracking List* was dated March 2007 and is available at http://heritage.nv.gov.

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Yuma clapper rail	*Rallus longirostrus yumanensis*	LE	No	Yes	G5T3	S1
Arizona bell's vireo	*Vireo bellii arizonae*	NL	-	-	G5T4	-

FISHES

	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Meadow Valley Wash desert sucker	*Catostomus clarki* ssp. *2*	NL	-	Yes	G3G4T2	S2
Devils Hole pupfish	*Cyprinodon diabolis*	LE	No	Yes	G1	S1
Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	LE	Yes	Yes	G2T2	S2
Warm Springs pupfish	*Cyprinodon nevadensis pectoralis*	LE	No	Yes	G2T1	S1
Pahrump poolfish	*Empetrichthys latos latos*	LE	No	Yes	G1T1	S1
Pahranagat roundtail chub	*Gila robusta jordani*	LE	Yes	Yes	G3T1	S1
Virgin River chub	*Gila seminuda*	LE	Yes	Yes	G1	S1
Virgin River chub (Muddy River population)	*Gila seminuda* pop. 2	NL	-	Yes	G1T1Q	S1
Virgin River spinedace	*Lepidomeda mollispinis mollispinis*	NL	-	Yes	G1G2T1	S1
Moapa dace	*Moapa coriacea*	LE	No	Yes	G1	S1
Woundfin	*Plagopterus argentissimus*	LE	Yes	Yes	G1	S1
Moapa speckled dace	*Rhinichthys osculus moapae*	NL	-	Yes	G5T1	S1
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	LE	Yes	Yes	G5T1	S1
Pahranagat speckled dace	*Rhinichthys osculus velifer*	NL	-	Yes	G5T1Q	S1
Meadow Valley speckled dace	*Rhinichthys osculus* ssp. 11	NL	-	-	G5T2	S2
Razorback sucker	*Xyrauchen texanus*	LE	Yes	Yes	G1	S1

INVERTEBRATES

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Ash Meadows naucorid	*Ambrysus amargosus*	LT	Yes	-	G1	S1
Warm Springs naucorid	*Ambrysus relictus*	NL	-	-	G1	S1
Acastus checkerspot	*Chlosyne acastus robusta*	NL	-	-	G4G5T1	S1
Spring Mountains dark blue	*Euphilotes ancilla purpura*	NL	-	-	G5T2	S1S2
Morand's checkerspot	*Euphydryas chalcedona morandi*	NL	-	-	G5T2	S2
Spring Mountains comma skipper	*Hesperia colorado mojavensis*	NL	-	-	G5T3	S3
Charleston ant	*Lasius nevadensis*	NL	-	-	G1?	S1
Nevada admiral	*Limenitis weidemeyerii nevadae*	NL	-	-	G5T2T3	S2S3
Amargosa naucorid	*Pelocoris shoshone amargosus*	NL	-	-	G1G3T1	S1
Spring Mountains icarioides blue	*Plebejus icarioides austinorum*	NL	-	-	G5T2	S2
Mt. Charleston blue	*Plebejus shasta charlestonensis*	NL	-	-	G5T2	S2
Giuliani's dune scarab beetle	*Pseudocotalpa giulianii*	NL	-	-	G1	S1
Moapa pebblesnail	*Pyrgulopsis avernalis*	NL	-	-	G1G2	S1S2
Blue Point pyrg	*Pyrgulopsis coloradensis*	NL	-	-	GH	SH
Spring Mountains pyrg	*Pyrgulopsis deaconi*	NL	-	-	G1	S1
Corn Creek pyrg	*Pyrgulopsis fausta*	NL	-	-	G1	S1
Southeast Nevada pyrg	*Pyrgulopsis turbatrix*	NL	-	-	G2	S2
Carole's fritillary	*Speyeria carolae*	NL	-	-	G2G3	S2S3
Moapa Warm Spring riffle beetle	*Stenelmis moapa*	NL	-	-	G1	S1

MAMMALS

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Pale lump-nosed bat	*Corynorhinus townsendii pallescens*	NL	-	Yes	G4	S2
Spotted bat	*Euderma maculatum*	NL	-	Yes	G4	S2
Allen's big-eared bat	*Idionycteris phyllotis*	NL	-	Yes	G3G4	S1
Silver-haired bat	*Lasionycteris noctivagans*	NL	-	Yes	G5	S3

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Pahranagat Valley montane vole	*Microtus montanus fucosus*	NL	-	Yes	G5T2	S2
Fringed myotis	*Myotis thysanodes*	NL	-	Yes	G4G5	S2
Palmer's chipmunk	*Neotamias palmeri*	NL	-	Yes	G2	S2
Hidden Forest Uinta chipmunk	*Neotamias umbrinus nevadensis*	NL	-	Yes	G5TH	SH
Big free-tailed bat	*Nyctinomops macrotis*	NL	-	Yes	G5	S1S2
Bighorn sheep	*Ovis canadensis nelsoni*	NL	-	Yes	G4T4	S4

REPTILES

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Western redtail skink	*Eumeces gilberti rubricaudatus*	NL	-	-	G5	S2
Desert tortoise	*Gopherus agassizii*	LT	Yes	Yes	G4	S2S3
Banded Gila monster	*Heloderma suspectum cinctum*	NL	-	Yes	G4	S2

PLANTS

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Rough angelica	*Angelica scabrida*	NL	-	-	G2	S2
Charleston pussytoes	*Antennaria soliceps*	NL	-	-	G1G2	S1S2
Sticky ringstem	*Anulocaulis leiosolenus* var. *leiosolenus*	NL	-	-	G4T3	S2
Las Vegas bearpoppy	*Arctomecon californica*	NL	-	CE	G3	S3
King's rosy sandwort	*Arenaria kingii* ssp. *rosea*	NL	-	-	G4T2	S2
Clokey milkvetch	*Astragalus aequalis*	NL	-	-	G2	S2
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*	NL	-	CE	G4T2T3	S2S3
Clokey eggvetch	*Astragalus oophorus* var. *clokeyanus*	NL	-	-	G4T2	S2
Spring Mountains milkvetch	*Astragalus remotus*	NL	-	-	G2	S2
Ash Meadows milkvetch	*Astragalus phoenix*	LT	Yes	CE	G2	S2
Upswept moonwort	*Botrychium ascendens*	NL	-	-	G2G3	S1

Common Name	Scientific Name	Federal Protection	Critical Habitat	State Protection	Global Rank	State Rank
Dainty moonwort	*Botrychium crenulatum*	NL	-	-	G3	S1?
Slender moonwort	*Botrychium lineare*	NL	-	-	G5T4Q	S2S3
Spring-loving centaury	*Centaurim namophilum*	LT	Yes	CE	G2Q	S2
Las Vegas cryptantha	*Cryptantha insolita*	NL	-	-	GHQ	SH
Jaeger whitlowgrass	*Draba jaegeri*	NL	-	-	G2	S2
Charleston draba	*Draba paucifructa*	NL	-	-	G1G2	S1S2
Ash Meadows sunray	*Enceliopsis nudicaulis* var. *corrugate*	LT	Yes	CE	T2G5	S2
Nevada willowherb	*Epilobium nevadense*	NL	-	-	G2	S2
Pahrump Valley buckwheat	*Eriogonum bifucatum*	NL	-	-	G2	S2
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*	C	-	-	G5T2	S1S2
Sticky buckwheat	*Eriogonum viscidulum*	NL	-	CE	G2	S2
Clokey greasebush	*Glossopetalon clokeyi*	NL	-	-	G2	S2
Ash Meadows gumplant	*Grindelia fraxinopratensis*	LT	Yes	CE	G2	S2
Charleston ivesia	*Ivesia cryptocaulis*	NL	-	-	G2	S2
Jaeger ivesia	*Ivesia jaegeri*	NL	-	-	G2G3	S2S3
Ash Meadows ivesia	*Ivesia kingii* var. *eremica*	LT	Yes	CE	G3T1T2	S1S2
Ash Meadows blazingstar	*Mentzelia leucophylla*	LT	Yes	CE	G1Q	S1
Amargosa niterwort	*Nitrophila mohavensis*	LE	Yes	CE	G1	S1
White-margined beardtongue	*Penstemon albomarginatus*	NL	-	-	G2	S2
Bicolored beardtongue	*Penstemon bicolor* ssp. *bicolor*	NL	-	-	G3T2Q	S2
Rosy two-colored beardtongue	*Penstemon bicolor* ssp. *roseus*	NL	-	-	G3T3Q	S3
Jaeger beardtongue	*Penstemon thompsoniae* ssp. *jaegeri*	NL	-	-	G4T2	S2
Clokey's catchfly	*Silene clokeyi*	NL	-	-	G2	S2
Charleston tansy	*Sphaeromeria compacta*	NL	-	-	G2	S2
Charleston kittentails	*Synthyris ranunculina*	NL	-	-	G2G3	S2S3
Charleston grounddaisy	*Townsendia jonesii* var. *tumulosa*	NL	-	-	G4T3	S3
Charleston violet	*Viola charlestonensis*	NL	-		G3Q	S2S3

Key

Federal Protection:

LE = Listed Endangered - in danger of extinction in all or a significant portion of its range

LT = Listed Threatened - likely to be classified as Endangered in the foreseeable future if present trends continue

PE = Proposed Endangered

PT = Proposed Threatened

C = Candidate for listing

DM = Delisted, Monitor - delisted from the list of threatened and endangered species with post-delisting monitoring necessary

NL = Not listed

Critical Habitat:

Yes - species has designated critical habitat published in the Federal Register.

State Protection:

Fauna:

Yes - species protected under Nevada Revised Statute (NRS) 501.

Flora:

CE = Critically endangered - species whose survival requires assistance because of overexploitation, disease or other factors or because their habitat is threatened with destruction, drastic modification or severe curtailment (NRS 527.260-.300)

CE# = Recommended for listing as critically endangered

Global and State Ranks:

G = Global rank indicator, based on worldwide distribution at the species level

T = Global trinomial rank indicator, based on worldwide distribution at the infraspecific level

S = State rank indicator, based on distribution within Nevada at the lowest taxonomic level

1 = Critically imperiled and especially vulnerable to extinction or extirpation due to extreme rarity, imminent threats, or other factors

2 = Imperiled due to rarity or other demonstrable factors

3 = Vulnerable to decline because rare and local throughout its range, or with very restricted range

4 = Long-term concern, though now apparently secure; usually rare in parts of its range, especially at its periphery

5 = Demonstrably secure, widespread, and abundant

_H = Historical; could be rediscovered

_Q = Taxonomic status uncertain

? = Assigned rank uncertain

For populations of migratory species, additional qualifiers added to rank include:

B_= Breeding status within Nevada

N_= Non-breeding status within Nevada

Appendix 6-A
Current Activities and Capabilities of SNAP Teams and Partner Organizations

SNAP agencies have independently conducted and sponsored significant scientific research efforts for studies on, or related to, the lands they administer. The current activities and capabilities of existing SNAP teams that can play an important role in executing the SNAP Science and Research Strategy are described within this chapter. The Desert Tortoise Conservation Center and the Lake Mead Native Plant Nursery, which are agency facilities, are also described. In addition, the agencies have completed, or are currently involved in, numerous science and research projects in partnership with other organizations. These projects are conducted through contracts or agreements.

Current SNAP Team Science Activities

SNAP teams conduct many different science activities including research, monitoring, quality assurance, and reporting. Below are the missions of each SNAP team followed by a few examples of relevant science activities that they perform.

ANTI-LITTER AND DESERT DUMPING TEAM

Mission

To reduce litter and dumping by identifying root causes and solutions through education and awareness programs, clean-up of public lands, and enforcement efforts.

Example science activities

- Pursue studies, as appropriate, into the root causes of littering and dumping behavior.
- Continue monitoring of the Spring Mountains pilot program.
- Maintain statistics on all clean-ups and provide to appropriate personnel.
- Develop a GIS dump-site database and mapping system.

CULTURAL RESOURCES TEAM

Mission

To manage heritage resources in Southern Nevada through identification, evaluation, preservation, conservation, and public outreach that include cultural landscapes, archeology, historic structures, traditional cultures and places, cultural material remains, scientific specimens, and archives.

Example science activities

- Enhance knowledge of heritage resources throughout Southern Nevada.
- Create management and protection programs for heritage resources throughout Southern Nevada.
- Participate in preserving Native American cultural traditions through studies and programs.
- Develop professional and public outreach programs on heritage resources throughout Southern Nevada.

CULTURAL SITE STEWARDSHIP TEAM

Mission

To promote the preservation and documentation of cultural resource sites through the establishment and utilization of a Cultural Site Stewardship Program.

Example science activities

- Monitor the condition, and discourage the degradation, of cultural sites.
- Monitor the effectiveness of the funding being used to support the program.
- Monitor the effectiveness of the program as reflected in the satisfaction of the volunteers.

GEOGRAPHIC INFORMATION SYSTEMS AND DATA MANAGEMENT TEAM

Mission

To develop a seamless system of geospatial data across federal land management agencies in Southern Nevada and to provide Geographic Information Systems support to interagency projects and programs.

Example science activities

- Develop a geospatial base-data set that is accurate, seamless, documented, and compatible with individual agency standards and SNAP program goals.
- Develop geospatial project data that are accurate, seamless, and compatible with SNAP project objectives.

RECREATION/OFF-HIGHWAY VEHICLE TEAM

Mission

To work with each other and our surrounding communities to promote natural and cultural resource stewardship by providing appropriate and sustainable recreation opportunities.

Example science activities

- Complete a comprehensive social science survey of visitors and Southern Nevada residents in relationship to the federal lands.

RESOURCE PROTECTION AND LAW ENFORCEMENT TEAM

Mission

To provide a unified and effective approach for the management, conservation, preservation, and protection of natural and cultural resources and visitors on Southern Nevada's public lands.

Example science activities

- Identify a resource protection message and work with the SNAP public affairs team on a media campaign.

RESTORATION AND INVASIVE SPECIES TEAM

Mission

To promote restoration of public lands surrounding the Las Vegas Valley through education, community involvement, research, and project implementation.

Example science activities

- Coordinate with the interagency science and research team, and integrate research relating to restoration , including effectiveness monitoring, basic research, or ecological questions.
- Establish and implement protocols for documenting disturbances and treatments, and feed that information into an interagency database.
- Develop and implement long-term monitoring sites of restoration efforts.
- Develop a clearing house for weed data and interagency restoration information by working with the SNAP GIS and data management team.

VOLUNTEER TEAM

Mission

To encourage, support, and build volunteerism to conserve, protect, enhance, and foster an appreciation of the diverse natural, cultural, and recreational areas in Southern Nevada.

Example science activities

- Evaluate, revise, and refine a joint volunteer recruitment process, which includes, but is not limited to, litter clean-up, research, restoration, outdoor education, invasive weed removal, trail maintenance, native plant propagation, and cultural and natural resource-site stewardship.

WILDERNESS TEAM

Mission

To work together using a shared approach to planning and management of Southern Nevada's wilderness areas. Each agency's strengths and resources will be utilized for efficient, effective, and seamless management. The public will see wilderness as whole areas that are not divided by agency boundaries. The team will leave a legacy of interagency wilderness planning, stewardship, and education excellence.

Example science activities

- Maintain interagency wilderness stewardship and monitoring projects.
- Develop an acoustical database in at least four wilderness locations.
- Develop an interagency wilderness monitoring strategy.

Existing Research Facilities within the SNAP Agencies

BUREAU OF LAND MANAGEMENT - LAS VEGAS FIELD OFFICE

Desert Tortoise Conservation Center
The Desert Tortoise Conservation Center (DTCC) is a 222-acre facility located on the BLM's 11,014-acre Desert Tortoise Conservation Center Management Area in the southwestern Las Vegas Valley. The DTCC was established in 1990 for scientific research and as a holding area for desert tortoises displaced by urban development or other human land uses. The BLM has been primarily responsible for overseeing management of the DTCC, with several partners involved in daily operations. Numerous research projects have been conducted at the DTCC on topics that include tortoise nutrition, reproduction, disease, social interactions, and the effectiveness of conservation actions.

The quantity and quality of habitat surrounding the facility provides an ideal location for on-site training and applied research. Other key features of the facility include:

- Ability to conduct research in highly controlled to semi-natural enclosures;
- Availability of tortoises of different size classes, sexes, captive histories, and health status; and
- Potential use of equipment including egg incubators and plant drying ovens

The DTCC is operated through a Memorandum of Understanding between several entities that include the BLM, the USFWS, and the Nevada Department of Wildlife (NDOW). Permits for conducting research at the DTCC must be obtained from the USFWS and NDOW.

Past or ongoing projects relevant to SNAP agencies

- Physiology and behavior of desert tortoises
- Transmission of upper respiratory tract disease
- Desert tortoise nutrition studies
- Reproductive and behavioral endocrinology of desert tortoises
- Behavioral responses to barriers by desert tortoises

Information on key desert tortoise research needs can be obtained in the most recent recovery plan for the tortoise or by contacting the USFWS Desert Tortoise Recovery Office.

DTCC Contacts
Carrie Ronning (BLM)
Kim Field (USFWS)
Cris Tomlinson (NDOW)

LAKE MEAD NATIONAL RECREATION AREA

Lake Mead National Recreation Area Native Plant Nursery
The Lake Mead National Recreation Area Native Plant Nursery (LAME NPN) began in 1992 as a holding facility for purchased and salvaged plants. Currently, LAME NPN produces more than 40,000 specimens of native Mojave Desert plant species annually, including wetland and riparian plants, desert shrubs, cacti, as well as higher elevation plants not commercially viable or available. In its operation, the facility contributes to the understanding of seed storage, propagation of regional plants, and effectiveness of outplanting methods.

The propagated plants are available to agency restoration, rehabilitation, and native landscaping projects. Agencies benefiting from propagated plant material include BLM, NPS, USFWS, USFS, the Southern Nevada Water Authority, the Federal Highway Administration, and others. Features of the facility include:

- Accessibility to a variety and large volume of native plant material for revegetation and research purposes;
- Use of three professional-grade greenhouses with solar-powered electrical backup; and
- Availability of a super-insulated, fire- and rodent-proof seed storage building.

The facility is staffed by NPS employees and volunteers; and operation of the facility, for the most part, is grant funded.

LAME NPN Contact
Alice Newton (NPS)

Federal Research Agencies and Programs

The local land management agencies can also draw upon federal research agencies to meet their science and research needs. These resources are summarized below. This is not intended to be an exhaustive list, but a wide representation of research entities known to have appropriate subject matter expertise and who are active in the geographic region.

ARGONNE NATIONAL LABORATORY

www.anl.gov

Argonne National Laboratory is one of the U.S. Department of Energy's largest research centers. Chartered in 1946, it is also the nation's first national laboratory. Argonne National Laboratory research falls within the following five broad categories:

- Basic Science
- Scientific Facilities
- Energy Resources
- Environmental Management
- National Security

Federal agencies work with Argonne National Laboratory through cooperative agreements and other types of agreements.

Past or ongoing projects relevant to SNAP agencies

- Report: Deitenmeyer S., Wescott, K., and Comello V., 2006, *Summary of Local, State, and National Outdoor Recreation Visitor Survey Results and Recommended Additional Surveys to Assist Land Management Agencies in Southern Nevada*. Argonne National Laboratory, Argonne, IL.

JOINT FIRE SCIENCE PROGRAM

www.firescience.gov

The JFSP was created by Congress in 1998 as an interagency research, development, and applications partnership between the U.S. Department of the Interior and the U.S. Department of Agriculture. Funding priorities and policies are set by the JFSP Governing Board, which includes representatives from the BLM, NPS, USFWS, Bureau of Indian Affairs, USGS, and five representatives from the USFS. JFSP was established through a six-agency partnership to fill the gaps in knowledge about wildland fire and fuels.

Past or ongoing projects relevant to SNAP agencies

- Measuring effects of native plant species traits on resource reduction and competitive ability with *Bromus rubens* and *B. schismus* species
- Measuring outplanting success for burn revegetation along a species trait gradient
- Measuring seeding success with water manipulation and exclusion of rodent granivory

NATIONAL PARK SERVICE INVENTORY AND MONITORING PROGRAM

http://science.nature.nps.gov/im

A primary role of the NPS Inventory and Monitoring Program is to collect, organize, and make available natural resource data, and to facilitate the transformation of data into information through analysis, synthesis, and modeling. Inventory and monitoring of vital signs (indicators of ecosystem health) is carried out by 32 networks of parks with similar ecosystems.

Past or ongoing projects relevant to SNAP agencies

- The Mojave Desert Network contains the Lake Mead National Recreation Area, Death Valley National Park, Joshua Tree National Park, Mojave National Preserve, Great Basin National Park, Parashant National Monument, and Manzanar National Historic Site. In 2007, the NPS Mojave Inventory and Monitoring Network completed its initial overall monitoring plan (Chung-MacCoubrey, 2007). The plan includes ecosystem conceptual models, and outlines anthropogenic drivers and stressors for the Mojave Desert, their potential ecological effects, and relevant vital signs, as outlined in Table 6-1.

- In 2004 the NPS Mojave Desert Network conducted a "Vital Signs Workshop" attended by more than 60 interdisciplinary scientists who evaluated key vital signs for ecosystem health within the Mojave Desert. Table 6-2 compares these top 20 priority vital signs with findings from the Ecological Health Assessment Workshop funded by the SNPLMA and organized and documented by the Desert Research Institute.

Table 6-1. Key anthropogenic drivers and stressors for the Mojave Desert Network, their potential ecological effects, and relevant vital signs as published in *Mojave Desert Network: Draft Phase III Report* by Chung-MacCoubrey *et al.* (2007).

Driver/Stressor	Ecological Effects	Relevant Mojave Network Vital Sign
Invasive Species	• Increased fire frequency • Community shifts and biodiversity loss • Altered groundwater dynamics • Altered soil nutrient cycling	• Invasive/exotic plants • Fire and fuel dynamics • Vegetation change
Water Quantity Alteration	• Decreased surface water levels • Altered riparian communities • Loss of aquatic habitats • Loss of biodiversity	• Basic meteorology • Surface water dynamics and quality • Groundwater dynamics • At-risk populations, riparian birds
Land Use Change/Development	• Increased groundwater extraction • Soil disturbance • Habitat loss or fragmentation • Altered surface water	• Groundwater dynamics and chemistry • Vegetation change • Landscape dynamics, riparian birds • At-risk populations, small mammals
Air Quality Degradation	• Nitrogen deposition • Establishment of invasive plants • Lake acidification	• Wet/dry deposition, ozone, particulates • Soil chemistry/nutrient cycling • Surface water quality
Altered Disturbance Regime (dry systems)	• Altered nutrient dynamics • Increased soil erosion and deposition • Altered fire regime • Increases in exotic species	• Soil chemistry/nutrient cycling • Soil disturbance, erosion/deposition • Fire and fuel dynamics • Invasive/exotic plants
Recreation/Visitation	• Increased trampling and soil erosion • Spread of invasive plants • Disturbance/collection of wildlife	• Soil disturbance, erosion/deposition • Biological soil crusts • Invasive/exotic plants • Reptiles
Climate Change	• Altered temperature, precipitation, deposition and flow regimes	• Basic meteorology • Vegetation change
Water Quality Degradation	• Impacts to wet and dry system flora and fauna	• Surface water quality and dynamics • At-risk species
Soil Alteration	• Increased soil erosion and deposition • Loss of protective soil crusts • Reduced infiltration and increased runoff • Habitat loss	• Soil erosion/deposition, disturbance • Biological soil crusts • Soil hydrologic function • Small mammals

Table 6-2. Comparison of NPS Vital Signs to DRI-organized Ecological Health Assessment Workshop Priority Topics. Similar topics are coded with the same color (e.g., visitor use-related topics are coded with a purple dot).

Ecological Effects Identified in NPS Vital Signs Workshop	Top 10 Topics selected by all participants at the Ecological Health Assessment Workshops	Top 10 Topics selected by scientists at the Ecological Health Assessment Workshops
Groundwater dynamics and chemistry	Integrated water-ecology model	Integrated water-ecology model
Surface water dynamics and chemistry	Alternative futures	Alternative futures
Occurrence of invasive plants – status and trends, early detection	Ecological effects of invaders	Ecological effects of invaders
Air chemistry: ozone, visibility and particulates, wet and dry deposition	Restoration potential	Urbanization effects
Weather – Basic meteorology	Fire effects	Mechanisms of invasion
Riparian Vegetation Communities	Spring system biotic integrity	Fire effects
Riparian Bird Communities	Mechanisms of invasion	Restoration potential
Visitor Use, Visitor Satisfaction, Visitation	Prioritization for conservation by filling information gaps	Biophysical and socioeconomic indicators
Soil: Chemistry, Nutrient Cycling, Hydrologic Function, Erosion and Deposition	Biophysical and socioeconomic indicators	Spring system biotic integrity
	Visitor use patterns and characteristics	Threshold level of natural or artificial habitat

Scientists have prioritized various indicators that are critical to understand for long-term ecosystem sustainability within the Mojave Desert. The three indicators, (1) surface and groundwater ecology, (2) alternative futures, and (3) ecological impacts of invaders, were given top-priority at the DRI Southern Nevada Ecological Health Assessment workshops, and are consistent with high-priority indicators that have emerged from similar workshops conducted by other agencies for the Mojave Desert. These workshops converge on a set of important categories of indicators to understand: surface and groundwater dynamics and ecology, an understanding of visitor uses, use patterns and impacts, understanding impacts from urbanization, understanding the ecological effects of invasive species, understanding vegetation and soil dynamic indicators of ecosystem health, and monitoring basic climate data. New concerns related to fire occurrences have been added as fire frequencies in the Mojave Desert have increased in recent years. These increased fire frequencies are related to increases in invasive species and fuels.

USDA NATURAL RESOURCES CONSERVATION CENTER
TUCSON PLANT MATERIALS CENTER

www.nrcs.usda.gov

The Tucson Plant Materials Center (Tucson PMC) cooperates with city, state, and federal agencies to achieve the goal of conserving natural resources in the Sonoran and Mojave Deserts of the southwestern United States. The Tucson PMC provides information related to plant materials for land improvement and protection, pollution control, wildlife enhancement, and the improvement of our natural resources. Its current priorities include soil erosion control on rangelands, critical areas and retired farmland; controlling wind erosion and promoting low water use ornamental vegetation; water quality improvement through agroforestry, erosion control along stream courses using native riparian species such as cottonwood and willow; and winter cover crops for cotton rotations such as legumes, annual grasses and grains.

Past or ongoing projects relevant to SNAP agencies

- The Tucson PMC assisted the Southern Nevada Restoration Team (SNRT) to produce a genetically diverse alkali sacaton population adapted across Southern Nevada, and helped local growers to produce the species as a seed source for large-scale restoration.

U.S. ENVIRONMENTAL PROTECTION AGENCY - LANDSCAPE ECOLOGY

www.epa.gov/nerlesdl/land-sci/intro.htm

A local U.S. EPA office is located on the campus of the University of Nevada, Las Vegas, and is administratively part of the EPA's Office of Research and Development, National Exposure Research Laboratory, Environmental Sciences Division, Landscape Ecology Branch (http://www.epa.gov/esd/). Its mission is to protect and improve the natural environment for present and future generations, taking into account the environmental, social and economic principles of sustainable development. Each division within EPA has research foci, which for the EPA Environmental Sciences Division include:

1) Regional Vulnerability Assessment (ReVA);
2) Multi-Resolution Land Characteristics Consortium (MRLC);
3) Landscape Ecology Projects;
4) Regional Applied Research Effort (RARE);
5) Trace Organic Analysis; and,
6) Vacuum Distillation for Identifying Volatile Pollutants.

Research projects between EPA and other federal or state agencies or institutional partners are considered contingent upon negotiation. In general, project funds are needed to pay for any expenses beyond that of current EPA staff salaries. The UNLV campus office recently completed the Nevada portion of the five-state GAP Analysis Project[10] developed by the USGS. The UNLV campus office is also fully capable of providing project support for digitized mapping products.

EPA's usual and customary research protocol includes the creation of research plans (i.e., research designs) that are peer-reviewed. After peer-review of the research plan, the project is implemented and data are analyzed. The results are published in appropriate peer-reviewed journals and, as appropriate, results may be presented in EPA sponsored symposia or similar meetings.

[10] See http://gapanalysis.nbii.gov/portal/community/GAP_Analysis_Program/Communities/GAP_Home/

Past or ongoing projects relevant to SNAP agencies

- Southwest Regional Gap Analysis Project (SWReGAP) conducts biodiversity mapping and assessment for the five-state region encompassing Arizona, Colorado, Nevada, New Mexico, and Utah. The primary objective of this project is to use a coordinated approach to create detailed, seamless maps of land cover, habitat for native terrestrial vertebrate species, land stewardship, and management status. The information is analyzed to identify animal species habitats and natural land cover types that are underrepresented on lands managed for their long-term conservation.

U.S. FOREST SERVICE ROCKY MOUNTAIN RESEARCH STATION

www.fs.fed.us/rmrs

The Rocky Mountain Research Station (RMRS), headquartered in Fort Collins, Colorado, serves a 14-state area and administers 14 research locations including the Reno Forestry Sciences Lab on the campus of the University of Nevada, Reno. Its mission is to develop and deliver scientific knowledge and technology that will help people sustain our forests, rangelands, and grasslands. Strategic program management areas include:

1. Grasslands, Shrublands, and Desert Ecosystems
2. Forests and Woodland Ecosystems
3. Air, Water, and Aquatic Environments
4. Wildlife and Terrestrial Habitats
5. Human Dimensions
6. Fire, Fuels, and Smoke
7. Inventory, Monitoring, and Analysis
8. Aldo Leopold Wilderness Research Institute

The Reno Forestry Science Lab is a unit of the Grasslands, Shrublands, and Desert Ecosystems program management area. It supports landscape-scale research of the Great Basin ecosystem. Topics include the response of upland communities (e.g., sagebrush steppe and piñon-juniper woodlands) and riparian ecosystems to past and present climate change, invasive species, altered fire regimes, and human disturbance. However, any project within the general scope of the RMRS mission can be considered for development based upon funding availability and interest. For additional information see http://www.ag.unr.edu/gbem/studies.htm.

Department of the Interior agencies can fund RMRS research projects by directly transferring money to RMRS. However, funds transferred from the management arm to the research arm of the USFS can only be used for *administrative* studies, which are limited in the types of work that can be performed. An authorized research proponent can bring a proposal for needed research to RMRS at any time. The potential for negotiating a contract or agreement for conducting the research can be discussed.

Information Delivery and Publications

Research reports are typically published as research papers in appropriate peer-reviewed journals and as in-house publications. All RMRS publications are subject to rigorous peer-review.

- ***All RMRS Publications web Site (****www.fs.fed.us/rm/publications/titles.shtml)* provides access to all RMRS electronic documents (e.g., General Technical Reports, Proceedings, Research Notes,

Research Papers, Resources Bulletins, DVDs, and video) with the option to order hard copies of paper documents.
- ***Treesearch*** **(**www.treesearch.fs.fed.us) is "a *one-stop* site for Research & Development Publications online."

Past or ongoing projects relevant to SNAP agencies

- Factors controlling watershed sensitivity to natural and anthropogenic disturbance in Great Basin watersheds
- Process-based approaches for maintaining and restoring Great Basin watersheds and riparian ecosystems
- Influence of geomorphic, hydrologic and biotic interactions on Great Basin meadow ecosystems and their current ecological condition
- Ecosystem response to prescribed burns in Great Basin piñon-juniper woodlands
- Carbon and nitrogen budgets for piñon-juniper woodlands pre- and post-fire
- Effects of changing fire regimes, increased fuel loads and invasive species on sagebrush steppe and piñon-juniper woodlands
- A regional experiment to evaluate the effects of fire and fire surrogate treatments in the sagebrush biome (www.sagestep.org)
- Determining the environmental and ecological factors that make Great Basin ecosystems susceptible to invasive plant species
- Integrated restoration strategies towards weed control on western rangelands
- The paleoecology of Great Basin ecosystems

U.S. GEOLOGICAL SURVEY

http://nevada.usgs.gov

The USGS is structured in complex hierarchal levels with field offices staffed by researchers. The national office defines broad overall goals for the agency. USGS has multiple divisions which are then divided into subfields. The subfields may be further divided into programmatic disciplines. Environmental research falls within the division of Environment and Natural Resources. A subfield within Environment and Natural Resources is the Biological Resource Division with sub-disciplines that include biology, geology, and water resources. Lastly, field offices located around the United States, including the Las Vegas Field Station, have various research foci. The USGS provides reliable scientific information to:

- describe and understand the Earth;
- minimize loss of life and property from natural disasters;
- manage water, biological, energy, and mineral resources; and,
- enhance and protect our quality of life.

The goal of the Environment and Natural Resources division is to "provide science for a changing world in response to present and anticipated needs to expand our understanding of the environment and natural resource issues on regional, national, and global scales and enhance predictive/forecast modeling capabilities."

The USGS is currently designated as the official research arm for Department of Interior agencies through its Biological Resource Division (BRD). The BRD's mission is to "work with others to provide the scientific understanding and technologies needed to support the sound management and conservation of our Nation's biological resources."

The BRD has six science centers in their western region with a regional office in Seattle, Washington. The Las Vegas Field Station, located in Henderson, Nevada, falls under the Western Ecological Research Center, headquartered in Sacramento, California. The Las Vegas Field Station currently has several research foci, which include (in no particular order of importance): 1) ecological patterns and processesof desert and animals; 2) the effects of human impacts on these ecological characteristics; and, 3) the effectiveness of approaches to mitigate the negative effects of human impacts.

The USGS Fort Collins Science Center, located in Colorado, participates in research projects in the following areas:

- Ecosystem Dynamics
- Information Science
- Invasive Species
- Policy Analysis and Science Assistance
- Trust Species and Habitats

USGS units typically enter into agreements to conduct research with other federal and state agencies as well as universities. The research scale may be as large as a five-state area or larger (e.g. GAP analysis) or may be small, local projects. Funding for local projects is obtained from competitive grants with defined research partners or from designated agency funds. Research results are typically published in professional, peer-reviewed journals or at symposia.

Existing Information Delivery and Publications

- Maps, Imagery, and Publications (http://www.usgs.gov/pubprod/)
- USGS Publications Warehouse (http://infotrek.er.usgs.gov/pubs/)

Past or ongoing projects relevant to SNAP agencies

- Belnap, J., Webb, R. H., Miller, M. E., Miller, D. M., DeFalco, L. A., Medica, P. A., Brooks, M. L., Esque, T. C., and Bedford, D., 2008, Monitoring ecosystem quality and function in arid settings of the Mojave Desert: USGS Scientific Investigation Report 2008-5064, pp. 119.
- Precipitation history and ecosystem response to multidecadal precipitation variability in the Mojave Desert region, 1893-2001
- Abundance and distribution of selected elements in soils, stream sediments, and selected forage plants from desert tortoise habitats in the Mojave and Colorado deserts, U.S.
- Dominance and environmental correlates of alien annual plants in the Mojave Desert, U.S.
- Effects of livestock watering sites on alien and native plants in the Mojave Desert
- Spatial and temporal patterns of wildfires in the Mojave Desert, 1980-2004
- Attributes of desert tortoise populations at the National Training Center, central Mojave Desert, California, U.S.
- Ecology of a population of subsidized predators: Common ravens in the central Mojave Desert, California
- Mojave Desert Conceptual Models

Cooperative Ecosystem Studies Units

Cooperative Ecosystem Studies Units (CESU) cooperative agreements are a mechanism for Department of Interior Bureaus to work with universities and non-profit partners to obtain research, technical assistance, and education in support of federal land management, environmental, and research activities. A network of 17 units exists in the United States. Each CESU is made up of federal, university, and often, other partner institutions. The scope of work that can be completed includes the biological, physical, social, and cultural sciences needed to address natural and cultural resource management issues at multiple scales within the context of the ecosystem. Federal agencies may join any CESU that will meet their needs; a one-time fee of $10,000 is required. The following CESUs would likely have expertise available to the Southern Nevada agencies.

CALIFORNIAN CESU

http://nature.berkeley.edu/cesu/contact.htm

DESERT SOUTHWEST CESU

http://cals.arizona.edu/dscesu/index.html

Past or ongoing projects relevant to SNAP agencies

- Edit and Prepare Print Layout for Lake Mead Administrative History

GREAT BASIN CESU

www.cabnr.unr.edu/gbcesu/

Past or ongoing projects relevant to SNAP agencies

- Cooperative Conservation: Increasing Capacity through Community Partnerships – Cultural Site Stewardship Program (CSSP)
- Education in the Environment: A Hands-On Student Research and Outdoor Learning Experience
- Interagency Science and Research Strategy
- Take Pride in America in Southern Nevada – A Local Litter and Desert Dumping Clean-up Program

Habitat Conservation Programs

There are a variety of habitat conservation programs in existence or under development in Southern Nevada that provide opportunities for science and research activities. The following program is currently in implementation and has historically provided funding and partnerships for research (1990 to present).

CLARK COUNTY DESERT CONSERVATION PROGRAM

www.accessclarkcounty.com/depts/daqem/epd/Documents/ccfeis.pdf

Clark County, through its Department of Air Quality and Environmental Management Division, has a Desert Conservation Program that is part of their MSHCP. The stated mission for the Environmental Planning Division is to: "develop documents that provide guidelines and direction for environmentally responsible land use within Clark County; coordinate with other entities to ensure best management

practices are used for managing environmental issues; and, manage environmental programs for compliance with laws, regulations and mandates."

Clark County is in a unique position regarding ecosystem, landscape scale research in Southern Nevada. Under the current agreement with the USFWS, Clark County administers a Section 10 Incidental Take Permit under the Endangered Species Act in partnership with the Nevada Department of Transportation and the six incorporated cities (Permittees). The Permittees have negotiated an agreement to collect a fee of $550.00 per disturbed acre of land in the County. Disturbance covered under the permit includes road expansion, municipal activities and development. Collected fees are pooled to aid in species and habitat research, among other activities. The objective of such research is to determine if the impacts of the permit for the permit-caused stresses, to species and their habitats, are adequately mitigated. Federal agencies, universities, local municipalities, non-governmental organizations (NGOs), and volunteer agencies have all competed for this pool of funds to support land management monitoring and restoration activities on public lands. Thus, Clark County, the other Permittees, and the MSHCP Stakeholder Advisory Committee, historically, have been placed in the position of deciding research values and priorities across a large portion of the SNAP geographical area. In recent years, the County has been adding staff and improving procedures to aid in managing funds dispersal and project accomplishments. Clark County has also engaged a science advisor and other technical experts to aid in evaluating project proposals and results.

Conservation actions for the MSHCP focus on conservation of the habitat of 78 covered species. Habitats for covered species are described and summarized within 11 ecosystem categories (see Chapter 1, Figure 1-2).

Existing Information Delivery and Publications
Research and restoration results are published in a biennial report.

Appendix 7-A
Potential Outreach Targets within the Broader Research Community

The broader research community includes researchers in governmental agencies and entities, science and research consulting firms, societies and non-profit organizations with a relevant interest, and traditional academic departments (e.g., biology, environmental studies, etc.), as well as university-housed institutes and centers with an interest in arid lands research. Examples of potential entities to be contacted with outreach materials are listed below.

GOVERNMENTAL AGENCIES/ENTITIES

- **Department of Defense**
- **Desert Managers Group**
- **Desert Tortoise Management Oversight Group**
- **NPS Inventory and Monitoring Program**
  - Mojave Inventory and Monitoring Network
- **Natural Resources Conservation Service**
  - Las Vegas Service Center
- **Nevada Department of Wildlife**
  - Habitat Division
  - Wildlife Diversity Division
- **San Bernardino County Museum**
- **U.S. Environmental Protection Agency**
  - National Exposure Research Laboratory (UNLV Campus)
- **U.S. Geological Survey**
  - GAP Analysis Program
  - Las Vegas Field Station
  - Western Ecological Research Center
- **USFS**
  - Rocky Mountain Research Station
  - Pacific Northwest Research Station
  - Pacific Southwest Research Station

SOCIETIES/NON-PROFIT ORGANIZATIONS

- **Audubon Society**
- **Conservation Fund**
- **Defenders of Wildlife**

- **Desert Tortoise Committee**
- **Great Basin Bird Observatory**
- **Mojave Desert Land Trust**
- **Natural Areas Association**
- **The Nature Conservancy**
- **Outside Las Vegas Foundation**
- **Sonoran Institute**
- **The Trust for Public Land**

UNIVERSITY/ACADEMIC INSTITUTIONS

- **Desert Research Institute**
  - Division of Earth and Ecosystem Sciences
  - Center for Arid Lands Environmental Management
  - Western Region Climate Center

- **California State University, San Bernardino**
  - College of Natural Sciences
  - Department of Biology
  - Department of Geography and Environmental Studies
  - Desert Studies Center
  - Environmental Education Resource Center
  - Office of Academic Research

- **Northern Arizona University**
  - Center for Sustainable Environments
  - College of Engineering and Natural Sciences
  - Department of Biological Sciences
  - Department of Environmental Sciences and Education
  - Department of Geology
  - Merriam-Powell Center for Environmental Research
  - Office of the Vice President for Research
  - Quaternary Sciences Program
  - School of Forestry

- **University of Arizona**
  - College of Agriculture and Life Sciences
  - Cooperative Extension, Gila County
  - Department of Arid Lands Resource Sciences
  - Department of Plant Sciences
  - Department of Soil, Water, and Environmental Science
  - Institute for the Study of Planet Earth
  - Laboratory of Tree-Ring Research
  - Office of Arid Lands Studies
  - SAHRA Center - Sustainability of Semi-Arid Hydrology and Riparian Areas
  - School of Natural Resources
  - Water Resources Research Center

- **University of California, Santa Cruz**
  - STEPS (Science, Technology, Engineering, Policy, and Society) Institute for Innovation in Environmental Research

- **University of California, Riverside**
  - Center for Conservation Biology
  - Center for Invasive Species Research
  - College of Natural and Agricultural Sciences
  - Department of Biology
  - Department of Botany and Plant Sciences
  - Department of Earth Sciences
  - Department of Environmental Sciences
  - Office of the Vice Chancellor for Research

- **University of Nevada, Las Vegas**
  - College of Sciences
  - Department of Anthropology and Ethnic Studies
  - Department of Environmental and Occupational Health
  - Department of Environmental Studies
  - Harry Reid Center for Environmental Studies
  - Office of the Vice President for Research and Graduate Studies
  - Public Lands Institute
  - School of Life Sciences

- **University of Nevada, Reno**
  - Academy for the Environment
  - College of Agriculture, Biotechnology, and Natural Resources
  - Conservation Genetics Center
  - Department of Anthropology
  - Department of Biology
  - Department of Natural Resources and Environmental Science
  - Office of the Vice President for Research
  - Nevada Bureau of Mines and Geology

- **University of Redlands**
  - Center for Environmental Studies
  - College of Arts and Sciences
  - Department of Environmental Management
  - The Redlands Institute

- **University of Utah**
  - Archaeological Center
  - College of Science
  - Department of Environmental Engineering
  - Department of Water Resource Engineering
  - Environmental Studies Program
  - Office of the Vice President for Research

- **Utah State University**
  - College of Natural Resources
  - College of Science
  - Ecology Center
  - Institute for Outdoor Recreation and Tourism
  - Natural Resource and Environmental Education Program
  - Natural Resource and Environmental Policy Program
  - Western Monitoring Center

Appendix 8-A
Proposal Review Process

Proposal Review Process Overview

The SNAP interagency science and research team tested a review process for science and research proposals during development of the Science and Research Strategy to determine if a science-based management review and external peer-review of proposals:

1. Improves management understanding of the merits of the proposal;
2. Provides recommendations to improve the quality and likelihood of success of the proposed project; and/or
3. Provides recommendations to improve the quality of the proposal.

The proposal review process described below was designed to inform SNAP managers for single and multi-agency proposals, projects, and products funded through an array of sources such as agency appropriated funds, Challenge Cost Share funds, National Science Foundation grants, Habitat Conservation Plan programs, SNPLMA, and others. Proposals would qualify for the review process if the projects (1) are related to and address a Science and Research Strategy sub-goal, science question, or contributing question, (2) can be statistically reviewed, and/or (3) involve researchers and/or staff with scientific expertise. These proposed projects discover, integrate, disseminate, and/or employ new knowledge to address, advance, and/or inform priority science objectives.[11]

Science and research proposals submitted to BLM through SNPLMA Rounds 7, 8 and 9 were used as trial cases. The process involved: development of proposal review criteria for external technical peer-review and internal management review; selection of external peer-reviewers; review by the external peer-reviewers; management review conducted by the science and research team; and compilation of a summary of the reviews received. This trial run produced high quality comments which resulted in the agencies submitting better quality proposals and more improved project designs. Based on this experience, the process was incorporated as a part of the pre-planning phase of the Quality Assurance chapter of the Science and Research Strategy.

Below is a description of the trial proposal review process which led to the development of the inclusion of peer-review components in Chapter 8. This process could be used to develop the pre-planning peer-review described in Chapter 8. A formalized process would need to ensure that timing, contracting requirements for outsourcing work, funding for reimbursements, etc. comply with all federal laws and regulations (such as procurement laws), and fit within the time allowed for the particular request for proposal process the federal agency is applying for.

PROPOSAL EVALUATION CRITERIA

During the trial, the SNAP interagency science and research team established clear technical and management evaluation criteria against which proposals were to be judged; specific questions associated with each criterion provided focus.[12] The criteria detailed below were developed for the evaluation of

[11] This definition is adapted from National Science Foundation, 1995, p. 13, NSF #95-24

[12] Identified as a best practice by Jeff Dowd of the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy within the 2003 presentation: *Best Practices in R&D Peer Review*, available for download at http://www.wren-network.net/events/2003-AEA/Dowd-R-D-Peer-Review.pdf

SNPLMA Conservation Initiative proposals relevant to the SNAP Science and Research Strategy. If the process is used to evaluate other proposals, projects, or products, the criteria may be modified and tailored to meet the purpose and goals of the review.

Criteria for Part 1 External Technical Peer-Review

Reviewers were asked to review their assigned proposals according to the following criteria and assign an overall numerical ranking based upon a five-point scoring system for each criterion. Note that similar, but slightly different, focus questions have been created for criteria used in the evaluation of pre-proposals. The maximum overall peer-review score for both proposals and pre-proposals is 25 points.

1. **Technical Merit:** (a) Are the problem(s), goals, objectives, and hypotheses clearly stated, well defined, and sound? Are key management issues and corresponding science needs adequately framed by the proposal? (b) Is the project plan well thought out and achievable according to its planning schedule? Is the timeframe reasonable? (c) Is there a well-defined data collection methodology? Will the collected data be adequately handled? Are the most current data collection/storage/retrieval technologies and standards being used? *5 points*
2. **Cost Effectiveness:** (a) Is the value of the project (i.e., project results) worth the cost? Is the study justified relative to existing knowledge? (b) Does the project propose to utilize the most cost-effective methods available? (c) Does the team have access to the necessary laboratory, computer equipment, and other infrastructure capacity to complete the project – or will project funds be allocated to capital outlays? *5 points*
3. **Qualifications:** (a) Are the Principal Investigator(s) and team members appropriately qualified relative to the proposed project? Have they provided indications of past success (i.e., evidence of successful past grant management, publications generated from grant-funded projects, implementation of management practices, support of graduate students)? (b) Are the Principal Investigator(s) regional subject-matter experts: are they experienced with Southern Nevada's ecosystems? (c) Is a satisfactory letter of commitment by the Principal Investigator(s) included? Are satisfactory scopes of work provided for all proposed contract work? *5 points*
4. **Creativity:** (a) Is the proposal creative and does it display original thought (i.e., is it reinventing the wheel or does it push the boundaries of science) in its advancement of management knowledge and objectives? (b) Does the proposal employ an adequate literature review that reflects current scientific understanding of the issue? (c) Are current or new methodologies, approaches, and/or partnerships proposed? *5 points*
5. **Interpretable/Interpretive Products:** (a) Are provisions for sharing data and results described, and are these methods appropriate and sufficient? Will the resulting information be useful to resource and land managers? (b) Are reports, publications, and technology transfer planned and budgeted? (c) Are methods described for creating interpretive products/public outreach materials from the study results? Are these methods appropriate and sufficient? Will the resulting materials be connected to improved resource management in a meaningful way? *5 points*

Reviewers were then asked to provide a brief written summary of their review findings for each criterion. They were asked to consider the strengths and weaknesses of the proposal concerning both its technical merit and its scientific impact and outreach potential. They were also asked to comment upon the relevance of the proposed research to improved management. Finally they were asked the yes/no question, "Should the proposal be funded?" The narrative portion of the review is not only important for

evaluating proposals, but also can be a wealth of information with which to improve the project, if funded. These remarks are also useful in re-writing the proposal for future submission if it is not funded. Thus, reviewer remarks were summarized and provided to proposal authors. Scoring results were synthesized; range and average score for each criterion were calculated and totaled, and presented to the interagency science and research team along with the original narrative summaries.

To maintain internal consistency among reviews, a concise informational packet was developed that provided clear instructions to reviewers, scoring rubric, information on conflict of interest, and an electronic peer-review worksheet. Likewise, scoring criteria and worksheets were developed for the management portion of the review.

Criteria for Part 2 Internal Management Review

The four federal members of the interagency science and research team (one from each agency) conducted their initial management review concurrently with, and independently of, the external technical review portion of the process. Members assigned an overall numerical score for each proposal by summing the scores for individual criteria, which vary in point-value. The maximum overall score possible for the management review was 35 points. Criteria are shown below.

1. **Significance of results:** (a) Does the proposal answer inter-jurisdictional questions relative to Southern Nevada's ecosystem productivity and sustainability? (b) Does the proposal address any key vital sign of a healthy ecosystem? How can the results be applied to management practices? Would the Southern Nevada ecosystem be better off if this research was done? *10 points*
2. **Management enhancement:** (a) Does the proposal address the interagency science and research team charter for sustained and enhanced management of federal lands? (b) Will the project result in improved management of partner agency lands or result in the improved conservation of key resources? *5 points*
3. **Technology transfer:** (a) Are the results/methodologies exportable or applicable to all SNAP partners? (b) Are the results/methodologies exportable or applicable to other areas (e.g., geographical or technical)? *1 point*
4. **Relevance:** Is the proposal relevant within the Southern Nevada ecosystem to one or more of the partner agencies? *3 points*
5. **Collaboration:** Are there multiple research partners with well-defined roles? (Award one point for each partner identified for a maximum of three points). *3 points*
6. **Urgency:** (a) Does the proposal address current threats to a resource? (b) Does the timing for implementation of this proposal affect the implementation of another project? (c) Does this proposal complement other funded initiatives? *8 points*
7. **Cost effectiveness:** Is the proposal cost effective and is a planning schedule included? *5 points*

Management reviewers also noted their overall opinion of the proposal and indicated whether or not they thought the proposal should be funded. The results provided on the worksheet were considered initial or preliminary impressions because the external technical reviews and the opinions of other management reviewers would be discussed more fully at the special meeting.

The results of the four management reviews per proposal were synthesized along with the results of the technical peer-reviews. The range and average score for each criterion were calculated and totaled, and

presented to the interagency science and research team along with the narrative summaries. A worksheet was designed to organize the syntheses of the reviews.

EXTERNAL TECHNICAL PEER-REVIEWERS

Scientists were invited from the extramural research community to serve as external technical peer-reviewers. In addition to being scientifically qualified, ideal reviewers are often those who also have past or current experience conducting projects with federal or other governmental agencies during the course of their careers. These individuals are in a position to best understand the goals of applied research studies to inform and improve resource management. To identify such individuals, the review coordinator examined the content of the document to be reviewed and carried out a search of relevant scientific literature. The coordinator also performed Internet searches for university, private, and governmental institutions that are likely sources of qualified peer-reviewers for a given document. For each potential reviewer, professional web sites, if available, were reviewed. These sites often included curriculum vitae and publication lists. The coordinator reviewed this information to determine overall qualifications of potential reviewers as well as to identify past or current work with governmental agencies.

If new potential reviewers were uncovered during this process (as in co-authors or students), these individuals were also considered. It is not always possible to find a perfect match (i.e., an individual with both scientific credentials and agency-resource-management experience); in those cases, the best possible match was selected. To date, external technical reviewers were limited to researchers working within the United States.

Conflict of Interest

Avoidance of conflict of interest is a key component to this process. For the purposes of this process, conflict of interest is considered to be a set of conditions in which professional judgment concerning a primary interest, such as the validity of research, tends to be unduly influenced by a secondary interest (such as financial gain).[13] To inhibit the influence of such biases on the reviews, a non-conflict-of-interest certification form (Appendix 8-A.7) was used. Each peer-reviewer was required to complete the certification form prior to conducting his/her review. The certification form was adapted from a similar form used by the National Institutes of Health; this form was also selected for use by the Tahoe Science Consortium.[14] Reviewers were asked to recuse themselves from the process if a conflict of interest is present on the basis of employment, financial benefit, personal relationship, professional association, longstanding disagreement, appearance of conflict of interest, and other conflicts as described within Appendix 8-A.7.

Confidentiality

External reviewers are expected to provide honest assessments of the proposal, project, or product under review; it is conceivable that these opinions will not always be complimentary. To protect reviewer identity, peer-reviewers were assigned a letter code. The review coordinator kept an administrative record of external peer-reviewers participating in the process. However, confidentiality was maintained and unless special arrangements were made with a particular reviewer, neither team members nor proposal authors were made aware of a reviewer's identity. All collected names were retained as future

[13] Thompson, D.F. (1993) Understanding financial conflicts of interest, *New England Journal of Medicine.* **329**: 573-576.
[14] *Peer-Review Processes for Science Activities Affecting the Lake Tahoe Basin.* Available for download at http://208.178.103.200:6202/display/2/articleDirect/index.asp?aid=1971&r=0.4570124

potential reviewers. Review of Conservation Initiative proposals through the SNAP Science and Research Strategy review process, thus far, has not been double blind. Due to time constraints, external peer-reviewers were given the names and agency association of authors to expedite the process of determining whether a conflict of interest exists.

Reimbursement

The development of the SNAP Science and Research Strategy is, itself, funded by a Round 4 SNPLMA Conservation Initiative project. These funds allowed the reimbursement for external peer-reviews for the Round 7, 8, and 9 Conservation Initiative proposals entered in this process. While it is possible to solicit voluntary reviews, it was observed that reviews are returned in a more timely fashion when a small stipend was provided.

Example Review Process and Procedures

A set of procedures for implementing the SNAP Science and Research Strategy review process (shown below) was developed and tested with SNPLMA Conservation Initiative proposals. These procedures can be adapted and applied to any proposal, project, and product relevant to the SNAP Science and Research Strategy as appropriate.

SNPLMA funding is awarded within an established process that is applied to all of its funding categories, including Conservation Initiatives. Thus, the trial peer-review for SNAP Science and Research Strategy-relevant Conservation Initiative proposals was conducted after proposals were officially submitted to the BLM in accordance with the SNPLMA call for proposals. Information from the review was provided to SNAP managers during proposal ranking. The SNPLMA nomination process is specified by the SNPLMA office and did not contain an equivalent science-based review at this time. It is important to note that, currently, the test review process was applied only to projects designed to be implemented wholly or partially within Clark County, Nevada through the member agencies of SNAP.

The following procedures show how the review process worked within a timeline that reflects the actuality of Round 9 SNPLMA Conservation Initiative process.

Nomination Period: October 23, 2007 – December 20, 2007

1. Agency and interagency project concepts were vetted through the appropriate agency review processes.
2. Interagency project concepts were presented by submitters, in person, to the SNAP Board.
3. Interagency nominations in Clark County were initialed by the SNAP Board member of each participating agency on or before December 10.
4. At the close of the nomination period, the SNAP Partnership Specialist provided a list of all interagency nominations to the SNAP Board.
5. Copies of Science Strategy-relevant proposals were provided on or before December 20, to the SNAP Executive Director who in turn, provided them to the interagency science and research team.
6. The interagency science and research team began the peer-review process as follows:

General Tasks

a. The team identified a review coordinator.

b. Team members e-mailed the review coordinator with proposal topics as soon as they were received so he/she could begin to identify and secure appropriate reviewers.

c. Electronic copies of the proposals were provided to the review coordinator by the SNAP Partnership Specialist. The team lead and the review coordinator worked with the SNAP Partnership Specialist to select proposals relevant to the SNAP Science and Research Strategy.

d. The review coordinator converted the submissions to PDFs, incorporating budget sheets and any other provided documents; files were renamed according to a consistent file-naming scheme.

e. The review coordinator reviewed the proposals to determine the areas of expertise that the reviewers must represent and to determine whether the proposal should be classified as a "pre-proposal" or a "proposal." "Pre-proposals" request funds to solicit detailed investigator proposals to address a described science need, whereas "proposals" describe the proposed work of the named Principal Investigator(s).

Tasks Pertaining to the External Technical Peer-Review

The external technical peer-review was planned and coordinated such that external reviewers had approximately one month to review the proposals. Unless otherwise noted, the following tasks were completed by the review coordinator:

a. Identified reviewers (see *External Peer-Reviewer Selection*, above for more detail). Up to five qualified researchers who best match each project were noted on a running list.

b. Once three to five candidate reviewers were identified for a given project, candidates from the above list were invited (see Appendix 8-A.1 for invitation letter); no more than two at a time, until two qualified reviewers were confirmed for each project.

   Other considerations:

   - Excellent communications and prompt responses are critical to creating a good impression of the participating agencies and the university on external reviewers, and to maximize the time available to the reviewer to complete the review. Also, the services of an individual may be requested again for a future review, so it is important that they have a good experience with the process.
   - The first invitation soliciting peer-review assistance is sent to the most closely matched, highest-level researcher on the list because he/she is most likely to be the best source of alternate or additional reviewers. The invitation letter asks invitees to suggest the names of additional individuals they might know who are qualified, if they are not available to complete the project themselves. These individuals may suggest a colleague, a recent retiree, a postdoctoral researcher, or Ph.D. candidate that they feel would meet the stated criteria for reviewers.
   - Ph.D. candidates must receive a strong recommendation from their advisor to participate in the process.

- If an invitee suggests new names, these individuals are added to the list of potential reviewers and checked for background information.

c. When a reviewer accepted, a confidential ID (e.g., A or B) was assigned to the reviewer, and the reviewer's name and e-mail address was added to the "Peer-Review Process Tracking Table" (see Appendix 8-A.2), which is updated as tasks are completed.

d. The "Scientific/Technical Peer-review Worksheet" (a Microsoft Word form) for pre-proposals and proposals (Appendices 8-A.3 and 8-A.4) were customized by project and reviewer ID.

e. Responded to questions peer-reviewers might have.

f. E-mailed instructions, the appropriate proposal, and the applicable "Scientific/Technical Peer-review Worksheet" to each reviewer.

g. Collected and reviewed the signed no-conflict-of interest certification form, which is part of the "Scientific/Technical Peer-review Worksheet."

h. Kept track of progress on the summary sheet.

i. Sent out e-mail reminders one week before the deadline to all reviewers who have not yet submitted their results.

j. Prepared reimbursement documents.

Tasks Pertaining to the Internal Management Review

The following tasks were planned and coordinated such that the interagency science and research team had approximately one month to review the proposals and at least a week to review the results of the external technical peer-reviews.

a. The review coordinator prepared "Management Review Worksheets," which are Word forms (see Appendix 8-A.5) customized by project and team member name; he/she then e-mailed the customized forms, along with the proposals, to each member of the team.

b. Team members reviewed each proposal, filled out the appropriate management review worksheets, and returned the completed worksheets to the review coordinator.

c. The review coordinator received the results of the scientific and management reviews and synthesized the results (see Appendix 8-A.6);

d. The review coordinator e-mailed the results of both the management and scientific/technical reviews and the original scientific/technical reviews to each member of the team.

7. The team held a special meeting to review the results of the external technical peer-review and to discuss individual results of the internal management review. Extensive notes were taken during this meeting, which were then assembled into a formal recommendations report to the SNAP Board.

8. The review coordinator assembled, copy-edited, and distributed the recommendation report to the team for review. A conference call was held to discuss finalization of the report, and any resulting team member additions and edits were incorporated into the report. Following final

approval of all team members, the Final Recommendations Report was submitted to the SNAP Board Executive Director via e-mail.

9. Based upon discussions during the special meeting, the review coordinator prepared summarized recommendations for each submitting author based upon the comments of the external peer-reviewers.

Appendix 8-A.1
Sample Letter of Invitation to Potential External Peer-Reviewers

Subject Heading: Seeking Reviewers / [Brief Description] Project Proposal

Dear Dr. [Name],

We are looking for a qualified reviewer for a [number of pages]-page proposal titled "**Proposal Title**" This proposal was submitted by [names of author(s)] from the [agency, local office name].

If you would be interested in reviewing this proposal, please let us know as soon as possible. We will provide $ [insert dollar amount] reimbursement for the peer-review. You will be provided with a worksheet to fill out electronically and we will request some additional personal contact information needed to process your reimbursement. If you are unavailable to participate in the review, we would very much appreciate your help identifying others (perhaps a colleague or recent retiree) who might be willing to complete the peer-review. In selecting a peer-reviewer, we need to identify individuals with the following qualifications:

1) expertise in [key project topic areas],
2) no current involvement in similar projects in southern Nevada,
3) no other conflict of interest,
4) ability to keep the proposal contents and your review confidential, and
5) willingness to provide a review by [deadline] (or sooner).

Background Information
The [cooperator] is assisting the federal land management agencies in southern Nevada by coordinating a peer-review process for science and research proposals that may be funded through the Southern Nevada Public Lands Management Act. The Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service have joined efforts in the Southern Nevada Agency Partnership (SNAP). With funding provided by the sale of public lands near Las Vegas, SNAP wishes to identify and recommend proposals that might best lead to improved management of federal lands. This process is fairly new and, by its nature, is not equivalent to that of the National Science Foundation (NSF) or other long-standing scientific funding mechanisms with which you are likely acquainted. However, it does endeavor to duplicate the integrity of such processes. Proposals must be submitted or sponsored, individually or jointly, by the above-mentioned agencies, but if funded, the work or some portion thereof will likely be contracted to a research organization that will further develop the study design. We ask that you bear this in mind if you elect to participate in the proposal review process.

Thanks for your help,

[signed, review coordinator]

Appendix 8-A.2
Peer-Review Process Tracking Table

Round_____

Project	Reviewer A	Reviewer B
Proposal 1 Title	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed
Proposal 2 Title	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed
Proposal 3 Title	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed
Proposal 4 Title	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed	**Name of Reviewer** e-mail ☐ Proposal & Worksheet sent ☐ Pre-Cert. Form received ☐ Contact info received ☐ Reimbursement Form sent ☐ Review Received ☐ Reimbursement Forms received ☐ Payment processed

Modify and print additional sheets as necessary

Appendix 8-A.3
External Technical Peer-Review Scoring Guidelines

Dear Reviewer,

Thank you for agreeing to participate in the peer-review process for science and research projects submitted for nomination for Southern Nevada Public Lands Management Act funding. Your professional comments are valued.

Please confirm that your review of this project does not present a conflict of interest (see attached certification form). Please note that nominations contain private, confidential, and proprietary information that must be protected at all times. Critiques and scores are equally confidential. Reviewers and others with access should fully protect the information contained within the proposal and review. Your comments will be shared with a review committee and with proposal authors without your name being revealed.

Overall Scoring Rubric
You will rank the proposals on five criteria and then total the score. The resulting score should be reflective of the definitions provided below. We additionally ask that you fill out the "brief narrative" response section of the worksheet.

SCORE	DEFINITION
21-25	All aspects of the proposal are clear and well described. All technical review criteria are affirmatively met and there is a high probability of success. No substantive flaws are noted, although some minor errors or omissions may be noted.
16-20	All aspects of the proposal are clear and well described. A majority of the technical review criteria are affirmatively met, although there may be some minor questions related to some aspects of the proposal. Reviewers may identify one substantive flaw, but there is a clear resolution to that flaw. Some minor errors or omissions also may be noted.
11-15	The proposal is sound overall, but some deficiencies are noted. Reviewers may identify up to two substantive critical flaws, and at least half of the technical review criteria are affirmatively met.
6-10	The proposal presents a cogent description of the project, but serious deficiencies are noted. Reviewers may identify three or more substantive critical flaws, and less than half of the technical review criteria are affirmatively met.
0-5	The proposal does not present a cogent description of the project and serious deficiencies are noted. Reviewers may identify three or more substantive critical flaws, and less than half of the technical review criteria are affirmatively met.

Reviewer [ID: A or B]
[Proposal Title]

Appendix 8-A.4
External Technical Peer-Review Worksheet for Pre-Proposals

Note that the actual worksheet used is a Word form

SNAP Science and Research Proposal Review
Scientific and Technical Merit

Worksheet

DATE: [Insert date]

PROPOSAL ID: [Insert abbreviated proposal title]

1. Technical Merit

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are the problems, goals, objectives, and hypotheses clearly stated, well defined, and sound? Are key management issues and corresponding science needs adequately framed by the proposal?

b. Is the project plan well thought out and achievable according to its planning schedule? Is the timeframe reasonable?

c. Is there a well defined data-collection methodology? How will the collected data be handled? Are the most current data-collection/storage/retrieval technology and standards being used?

2. Cost Effectiveness

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Is the value of the project/project results worth the cost? Is the study justified relative to existing knowledge?

b. Does the project propose to utilize the most cost-effective methods available?

c. Does the team have access to the necessary laboratory, computer equipment, and other necessary infrastructure capacity to complete the project—or will project funds be allocated to capital outlays?

3. Qualifications

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are the Principal Investigator(s) and team members appropriately qualified relative to the proposed project? Have they provided indications of past success (i.e., evidence of successful past grant management, publications generated from grants, implementation of management practices, supporting students)?

b. Are the Principal Investigator(s) regional subject-matter experts; are they experienced with southern Nevada ecosystems?

c. Is a satisfactory letter of commitment by the Principal Investigator(s) included? Are satisfactory scopes of work provided for all proposed contract work?

4. Creativity

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Is the proposal creative and does it display original thought (i.e., is it re-inventing the wheel or does it push the boundaries of science) in its advancement of management knowledge and objectives?

b. Does the proposal employ an adequate literature review that reflects current scientific understanding of the issue?

c. Are current or new methodologies, approaches, and/or partnerships proposed?

5. Interpretable/Interpretive Products

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are provisions for sharing data and results described, and are these methods appropriate and sufficient? Will the resulting information be useful to resource and land managers?

b. Are reports, publications, and technology transfer planned and budgeted?

c. Are methods described for creating interpretive products/public outreach materials from the study results? Are these methods appropriate and sufficient? Will the resulting materials be connected to improved resource management in a meaningful way?

TOTAL POINTS	/25

Please tally your points in the gray box above.

SNAP Science and Research Proposal Review: [Insert Reviewer ID]

Appendix 8-A.5
External Technical Peer-Review Worksheet for Proposals

Note that the actual worksheet used is a Word form

SNAP Science and Research Proposal Review
Scientific and Technical Merit

Worksheet

DATE: [Insert due date]
PROPOSAL ID: [Insert proposal title]

1. Technical Merit

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are the problem, goals, objectives, and hypotheses clearly stated, well defined, and sound? Are key management issues and corresponding science needs adequately framed by the proposal?

b. Is the project plan well thought out and achievable according to its planning schedule? Is the timeframe reasonable?

c. Is there a well-defined data-collection methodology? How will the collected data be handled? Are the most current data-collection/storage/retrieval technology and standards being used?

2. Cost Effectiveness

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Is the value of the project/project results worth the cost? Is the study justified relative to existing knowledge?

b. Does the project propose to utilize the most cost-effective methods available?

c. Does the team have access to the necessary laboratory, computer equipment, and other necessary infrastructure capacity to complete the project—or will project funds be allocated to capital outlays?

3. Qualifications

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are the Principal Investigator(s) and team members appropriately qualified relative to the proposed project? Have they provided indications of past success (i.e., evidence of successful past grant management, publications generated from grants, implementation of management practices, supporting students)?

b. Are the Principal Investigator(s) regional subject-matter experts; are they experienced with southern Nevada ecosystems?

c. Is a satisfactory letter of commitment by the Principal Investigator(s) included? Are satisfactory scopes of work provided for all proposed contract work?

4. Creativity

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Is the proposal creative and does it display original thought (i.e., is it re-inventing the wheel or does it push the boundaries of science) in its advancement of management knowledge and objectives?

b. Does the proposal employ an adequate literature review that reflects current scientific understanding of the issue?

c. Are current or new methodologies, approaches, and/or partnerships proposed?

5. Interpretable/Interpretive Products

☐1 ☐2 ☐3 ☐4 ☐5
Inferior ⟷ Superior
Please choose one.

a. Are provisions for sharing data and results described, and are these methods appropriate and sufficient? Will the resulting information be useful to resource and land managers?

b. Are reports, publications, and technology transfer planned and budgeted?

c. Are methods described for creating interpretive products/public outreach materials from the study results? Are these methods appropriate and sufficient? Will the resulting materials be connected to improved resource management in a meaningful way?

TOTAL POINTS	/25

SNAP Science and Research Proposal Review: A

2

Appendix 8-A.5 (Continued)
External Technical Peer-Review Worksheet

This page is interchangeable for Pre-Proposals and Proposals

Brief narrative summarizing reviewer's overall opinion of the proposal:

Please provide a brief written summary of your review findings for **each** criterion. Consider the strengths and weaknesses of this proposal concerning both its technical merit and its scientific impact/outreach potential. Please comment upon the relevance of the research to improved management.

Please begin typing your review in the gray box below:

In regard to "[Project Title]"

RECOMMENDATION FOR FUNDING:

YES ☐
NO ☐

Appendix 8-A.6
Management Review Worksheet for Proposals (Page 1)

Note that the actual worksheet used is a Word form

SNAP Science and Research Proposal Review
Management Review

Worksheet

DATE: [Insert due date]
PROPOSAL ID: [Insert proposal title]

1. Significance of Results /10

a. Does the proposal answer inter-jurisdictional questions relative to southern Nevada ecosystem productivity and sustainability?
b. Does the proposal address any key vital sign of a healthy ecosystem; how can the results be applied to management practices; and, how would the southern Nevada ecosystem be better because of the research?

Enter your score in the grey box, and press TAB so total will calculate at the bottom.

2. Management Enhancement / 5

a. Does the proposal address the SNAP Science and Research Team charter for sustained and enhanced management of federal lands?
b. Will the project result in improved management of partner agency lands or result in the improved conservation of key resources?

Press TAB after entering or changing a score.

3. Technology Transfer / 1

a. Are the results/methodologies exportable or applicable to all SNAP partners?
b. Are the results/methodologies exportable or applicable to other areas (geographic or technical)?

Press TAB after entering or changing a score.

4. Relevance / 3

a. Is the proposal relevant within the southern Nevada ecosystem to one or more of the partner agencies?

Press TAB after entering or changing a score.

5. Collaboration / 3

a. Are there multiple research partners with well-defined roles?
Award 1 point for each partner identified to a **maximum** of 3 points.

Press TAB after entering or changing a score.

6. Urgency / 8

a. Does the proposal address current threats to a resource?
b. Does the timing for implementation of this proposal affect the implementation of another project?
c. Does this proposal complement other funded initiatives?

Press TAB after entering or changing a score.

7. Cost effectiveness / 5

a. Is the proposal cost effective and is a planning schedule included?

Press TAB after entering or changing a score.

Native Fish and Aquatic Species Refuge Restoration Investigation TOTAL POINTS **0 /35**

Appendix 8-A.6 (continued)
Management Review Worksheet for Proposals (Page 2)

Note that the actual worksheet used is a Word form

SNAP Science and Research Proposal Review
Management Review

Worksheet

DATE: [Insert due date]
PROPOSAL ID: [Insert proposal title]

Brief narrative / overall opinion of the proposal:

Regarding "Native Fish and Aquatic Species Refuge Restoration Investigation and Habitat Improvement – Improving a Public Resource…" begin typing in the grey box below…

RECOMMENDATION FOR FUNDING: YES ☐ NO ☐

SNAP Science and Research Proposal Management Review PAGE 2

Appendix 8-A.7
Conflict of Interest, Confidentiality, and Non Disclosure Rules and Information for Reviewers

Documents in this appendix follow forms and guidelines used by the National Institutes of Health, Office of Extramural Research.

As reviewers themselves are most familiar with their own situations, it is their personal responsibility to: (1) alert the review coordinator on behalf of the interagency science and research team to any possible conflict of interest situation, whether real or apparent, that may impact the review, and (2) identify and certify on the pre-meeting and post-meeting Conflict of Interest Certification Forms associated with this information sheet, (a) any application where they have a conflict of interest, and (b) that they will not be, and have not been, involved in the review of any application where their participation constitutes a conflict of interest. Reviewers must also certify that they will maintain the confidentiality of the proceedings and associated materials, and that they will not disclose to another individual any matter or information related to the review proceedings. In addition, the interagency science and research team may determine that a particular situation involves a conflict of interest and require that the potential reviewer not be involved in the review of the application(s) or proposal(s) in question. All reviewers are covered by this information sheet and associated Certification Forms.

There are several bases for a conflict of interest: employment, financial benefit, personal relationships, professional relationships or other interests. If applicable, any one condition may serve to disqualify a reviewer from participating in the review of an application or proposal. A **conflict of interest may be real or apparent.**

The following guidance and definitions, derived from federal regulations governing the Scientific Peer-Review of Research Grant Applications, and Research and Development Contract Projects (42 CFR Part 52h), will assist you in determining whether you are faced with a real or apparent conflict of interest. The guidance is not all-inclusive, due to the variety of possible conflicts of interest. Therefore, it is important that you consult with your contact within this process when there is any question about your participation in a review.

Guidance and Definitions

A **Conflict of Interest** in scientific peer-review exists when a reviewer has an interest in a proposal that is likely to bias his or her evaluation of it. A reviewer who has a real conflict of interest with a proposal may not participate in its review.

Real Conflict of Interest means that a reviewer or a close relative or professional associate of the reviewer has a financial or other interest in a proposal that is known to the reviewer, and is likely to bias the reviewer's evaluation of that proposal as follows:

A reviewer shall have a real conflict of interest if he/she or a close relative or professional associate of the reviewer: (1) has received or could receive a direct financial benefit of any amount deriving from funding a proposal under review; (2) has received or could receive a financial benefit from the applicant institution, offeror or Principal Investigator that in the aggregate exceeds $10,000 per year; this amount includes honoraria, fees, stock or other financial benefit, and additionally includes the current value of the reviewer's already existing stock holdings, apart from any direct financial benefit deriving from an

application or proposal under review; or (3) has any other interest in the proposal that is likely to bias the reviewer's evaluation of that application or proposal.

Regardless of the level of financial involvement or other interest, if the reviewer feels unable to provide objective advice, he/she must recuse him/herself from the review of the application or proposal at issue. The peer-review system relies on the professionalism and integrity of each reviewer to identify to his/her review coordinator any real or apparent conflicts of interest that are likely to bias the reviewer's evaluation of an application or proposal.

Appearance of a Conflict of Interest means that a reviewer or close relative or professional associate of the reviewer has a financial or other interest in an application or proposal that is known to the reviewer or the review coordinator and would cause a reasonable person to question the reviewer's impartiality if he or she were to participate in the review. The review coordinator will evaluate the appearance of a conflict of interest and determine, in cooperation with the interagency science and research team, whether or not the interest would likely bias the reviewer's evaluation of the proposal. Where there is an appearance of conflict of interest, but not sufficient grounds for disqualifying the reviewer, the review coordinator will document: (1) that there is no real conflict of interest; and (2) that, at the time of the review, no practical alternative exists for obtaining the necessary scientific advice from the reviewer with the apparent conflict.

Employment: A reviewer who is a salaried employee, whether full-time or part-time, of the applicant institution, offeror, or Principal Investigator, or is negotiating for employment, shall be considered to have a real conflict of interest with regard to an application/proposal from that organization or Principal Investigator. The review coordinator may determine there is no real conflict of interest or an appearance of a conflict of interest where the components of a large or multi-component organization are sufficiently independent to constitute, in effect, separate organizations, provided that the reviewer has no responsibilities at the institution that would significantly affect the other component.

Financial Benefit: See definition of Real Conflict of Interest above.

Personal Relationships (Relatives): A close relative means a parent, spouse, sibling, son or daughter, or domestic partner. A conflict of interest exists if a close relative of a reviewer submits an application or proposal, receives or could receive financial benefits from, or provides financial benefits to an applicant or offeror. In such case, it will be treated as the reviewer's financial benefit.

Professional Associates: Professional associate means any colleague, scientific mentor, or student with whom the peer-reviewer is currently conducting research or other significant professional activities or with whom the member has conducted such activities within three years of the date of the review.

Standing Review Group Membership: When a scientific review group meets regularly, a relationship among the individual members exists; therefore, the group as a whole may not be objective about evaluating the work of one of its members. In such a case, a member's application or proposal will be reviewed by another qualified review group to insure that a competent and objective review is obtained.

Longstanding Disagreements: A conflict of interest may exist where a potential reviewer has had longstanding scientific or personal differences with an applicant.

Multi-Site or Multi-Component Project: An individual serving as either the Principal Investigator or key personnel on one component of a multi-site or multi-component project has a conflict of interest with all of the applications or proposals from all investigators or key personnel associated with the project. The individual should be considered a professional associate when evaluating applications or proposals

submitted by the other participants in the project.

Request For Applications (RFA) or Request For Proposals (RFP): Persons serving as the Principal Investigator or key personnel on an application submitted in response to an RFA or on a proposal in response to an RFP are generally considered to have a conflict of interest with all of the applications or proposals submitted in response to the RFA or RFP. However, if no other reviewer is available with the expertise necessary to ensure a competent and fair review, a waiver may be granted by the review coordinator that will permit an individual to review only those applications or proposals with which he/she has no conflict of interest that is likely to affect the integrity of the advice to be provided by the reviewer.

Waivers If no other reviewer is available with the expertise necessary to ensure a competent review, a waiver may be granted by the review coordinator to allow participation in the review.

Confidentiality and Non-disclosure of Proceedings

The applications and proposals and associated materials made available to reviewers, as well as the discussions that take place during review meetings (or other communications) are strictly confidential and must not be disclosed to, or discussed with, anyone who has not been officially designated to participate in the review process. In addition, disclosure of procurement information prior to the award of a contract is prohibited by the Procurement Integrity Act (41 U.S.C. §423, implemented at FAR 3.104). Review results will be shared with the interagency science and research team and individuals designated to participate in the SNPLMA funding process. Portions of the review will be shared with proposal authors; however, reviewer identity will be kept confidential.

Certification

All reviewers must certify that they have read the "Conflict of Interest, Confidentiality, and Non-Disclosure Rules." The reviewer must certify that, to the best of his/her knowledge, he/she has disclosed all conflicts of interest that he/she may have with the proposal or its authors and he/she fully understands the confidential nature of the review process and agrees: (1) to destroy or return all materials related to it; (2) not to disclose or discuss the materials associated with the review, their evaluation, or the review meeting with any other individual except as authorized; (3) not to disclose procurement information prior to the award of a contract; and (4) to refer all inquiries concerning the review to the review coordinator.

Appendix 8-A.7 (continued)
Pre-Review Certification Form

Legal Name (First Name / Middle Initial / Last Name):

Non-University or Agency Address:

Title of Proposal Reviewed:

Date(s) of review:

Check only one (and provide any comments or explanations on reverse side):

☐ I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers" and hereby certify that, based on the information provided to me, **I do not have a conflict of interest in the proposal listed above or the proposal authors.**

OR

☐ I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers" and hereby certify that based on the information provided, **I have a conflict of interest in the specific proposal or proposal authors listed above** and hereby recuse myself from the review of this proposal.

Certification

I certify that I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers." I certify that to the best of my knowledge I have disclosed all conflicts of interest that I may have with the proposal or proposal authors, and I fully understand the confidential nature of the review process, and agree: (1) to destroy or return all materials related to it; (2) not to disclose or discuss the materials associated with the review, my evaluation, or the review meeting with any other individual except as authorized by the review coordinator on behalf of the interagency science and research team; (3) not to disclose procurement information prior to the award of a contract; and (4) to refer all inquiries concerning the review to the review coordinator.

Signature: **X** _____ Date: _____

PLEASE FAX SIGNED COPY OF THE PRE-CERTIFICATION FORM TO:

Review Coordinator
Address
Phone number

OR SCAN AND E-MAIL TO:
Review Coordinator e-mail address

Appendix 8-A.8
Review Results Summary Table

"[Insert Proposal Title]" Nominating Organization(s): [Insert nominating agencies]

Management Review	1	2	3	4	range	average	
(1) Significance of Results							/10
(2) Management Enhancement							/5
(3) Technology Transfer							/1
(4) Relevance							/3
(5) Collaboration							/3
(6) Urgency							/8
(7) Cost Effectiveness							/5
Fund?							
TOTAL							/35

External Review	A	B	average	
(1) Technical Merit				/5
(2) Cost Effectiveness				/5
(3) Qualifications				/5
(4) Creativity				/5
(5) Interpretable/Interpretive Products				/5
Fund?				
TOTAL				/25

Management Comments:

Appendix 10-A
SNPLMA Conservation Initiatives Relevant to SNAP Science and Research Strategy Goals and Sub-goals

GOAL 1 SOUTHERN NEVADA ECOSYSTEMS

Sub-goal 1.1 Wildland Fire

- Round 5: Research and Planning to Restore Fire within the Spring Mountains National Recreation Area (NRA) Ecosystem ($741,665)
- Round 6: Implementation of Fuel Reduction in the Spring Mountains NRA ($7,043,200)
- Round 8: Fire History, Fire Effects, and Postfire Seeding in Southern Nevada: Compilation of Fire Histories and Evaluation of Past and Future Fires and Seeding ($1,115,409)

Sub-goal 1.2 Invasive Species

- Round 4: Invasive Weed Removal and Habitat Restoration ($5,295,000)
- Round 4: Meeting the Challenge of Water 2025 Initiative: Balancing Water Quality, Community Needs & Water-Based Recreation for Lake Mead and Lake Mohave / Exotic Vegetation Control Component ($2,306,000; see also 1.3 , 1.4 , and 2.2)
- Round 5: Interagency Restoration - Weed Management, Phase II ($4,673,334; see also 1.4)
- Round 5: Meeting the Challenge of "Water 2025": Phase II - Completing Comprehensive Aquatic Baselines for Lakes Mead and Mohave ($3,078,490; see also 1.3 and 1.4)
- Round 6: Meeting the Challenge of "Water 2025": Phase III - Assessment of Limnological and Aquatic Resources ($5,049,000; see also 1.3 and 1.4)

Sub-goal 1.3 Watersheds and Landscapes

- Round 4: Meeting the Challenge of "Water 2025" Initiative: Balancing Water Quality, Community Needs & Water-Based Recreation for Lake Mead and Lake Mohave (see also 1.2 and 1.4)
- Round 5: Ground Water Hydrologic Model for Northeast Clark County ($1,821,985)
- Round 5: Ground Water Hydrologic Analysis along the West Slopes of the Spring Mountains ($688,915)
- Round 5: Meeting the Challenge of "Water 2025": Phase II - Completing Comprehensive Aquatic Baselines for Lakes Mead and Mohave (see also 1.2 and 1.4)
- Round 6: Rehabilitation of Public Lands Through Reclamation of Trash Dumps and Orphan Mine Sites ($2,000,000; note: has implications or tie-ins to protecting recreation, species, and cultural resources)
- Round 6: Characterizing Local Climate and Soils within Ecological Zones of the Spring and Sheep Mountains ($1,400,000)
- Round 6: Meeting the Challenge of "Water 2025": Phase III - Assessment of Limnological and Aquatic Resources (see also 1.2 and 1.4)
- Round 6: Habitat Restoration - Program Sustainability (see also 1.4)
- Round 6: Monitoring, Assessment, and Data Management for Water Resources in Clark County ($5,400,000)
- Round 6: Clark County Geologic Mapping ($1,045,020)
- Round 6: Soil Survey of Portions of the Desert National Wildlife Refuge within Clark County (see also 2.4)

- Round 6: A Pilot Program for Comprehensive Interagencies Wild Horse and Burro Management for Sustainable Ecosystems (see also 1.2)
- Round 7: Meeting the Challenge of "Water 2025 Initiative": Phase IV, Assessment of Limnological and Aquatic Resources ($275,000; see also 1.4)

Sub-goal 1.4 Biotic Communities and Biodiversity

- Round 4: Meeting the Challenge of "Water 2025" Initiative: Balancing Water Quality, Community Needs & Water-Based Recreation for Lake Mead and Lake Mohave (see also 1.2 and 1.3)
- Round 4: Wild Horse and Burro Management ($510,000)
- Round 5: Westside Spring Mountains NRA Recreation Strategic / components: inventories of sensitive plant and wildlife species and habitats; biological assessment of federally listed species ($511,675)
- Round 5: Interagency Restoration - Weed Management, Phase II (see also 1.2)
- Round 5: Meeting the Challenge of "Water 2025": Phase II - Completing Comprehensive Aquatic Baselines for Lakes Mead and Mohave (see also 1.2 and 1.3)
- Round 6: Meeting the Challenge of "Water 2025": Phase III - Assessment of Limnological and Aquatic Resources (see also 1.2 and 1.3)
- Round 6: Development of a Habitat Management Plan to Maintain Viability of the Desert Bighorn Sheep Population in the River Mountains, Nevada, Phase I (see also 2.4)
- Round 6: Habitat Restoration - Program Sustainability (see also 1.3)
- Round 6: A Pilot Program for Comprehensive Interagency Wild Horse and Burro Management for Sustainable Ecosystems ($1,500,000)
- Round 7: Meeting the Challenge of "Water 2025 Initiative": Phase IV, Assessment of Limnological and Aquatic Resources (see also 1.3)
- Round 7: Growth and Survival of Moapa Dace in the Muddy River System: Response to Variable Temperatures, Flows, and Habitat Changes ($297,000)
- Round 8: Growth and Survival of Moapa Dace in the Muddy River System: Response to Variable Temperatures, Flows, and Habitat Changes, Phase II ($655,028)
- Round 8: Spring Mountains Butterfly Life History and Autecology Studies ($440,000)
- Round 9: Spring Mountains Butterfly Life History and Autecology Studies, Phase II ($440,000)

GOAL 2 HERITAGE RESOURCES AND HUMAN INTERACTION

Sub-goal 2.1 Cultural Resources

- Round 4: Cooperative Conservation: Increasing Capacity through Community Partnership / Cultural Site Stewardship Component (see also 2.3, 2.4, and 2.5)
- Round 5: Westside Spring Mountains NRA Recreation Strategic / Cultural assessment component (see also 1.4)
- Round 5: Improving Visitor Safety and Conserving Biological and Cultural Resources at Abandoned Mine Sites (see also 2.4)
- Round 6: Cultural Site Stewardship Program (see also 2.5)
- Round 6: Lower Colorado Dams Office Museum Property Protection and Preservation ($695,000)

Sub-goal 2.2 Historic Context

- Round 4: Meeting the Challenge of "Water 2025" Initiative: Balancing Water Quality, Community Needs & Water-Based Recreation for Lake Mead and Lake Mohave / Component: Mapping significant cultural resource sites along shorelines (see also 1.2 , 1.3, and 1.4)
- Round 5: Preserve America – A Southern Nevada Interagency Culture Resource Program ($6,330,000)
- Round 5: Ethnographic Study of the Paiute/Chemehuevi Tribes ($795,470)

Sub-goal 2.3 Recreation and Responsible Visitor Use

- Round 4: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program ($3,628,900; see also 2.4 and 2.5)
- Round 4: Logandale Trail Gateway ($745,000)
- Round 4: Off-Highway Vehicle Strategy ($2,000,000)
- Round 4: Backcountry Access (see also 2.5)
- Round 4: Intra/Inter-agency Recreation Plan ($2,068,000)
- Round 4: Cooperative Conservation: Increasing Capacity through Community Partnerships (see also 2.1, 2.4, and 2.5)
- Round 5: Westside Spring Mountains NRA Recreation Strategic / Cultural assessment component (see also 1.4 and 2.1)
- Round 5: Take Pride in America – Eliminating Litter and Desert Dumping through Community Education ($4,033,155; see also 2.4 and 2.5)
- Round 6: BLM Recreation Area Management Plans (RAMPs) ($1,856,000; see also 2.4)
- Round 6: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase III ($1,220,360; see also 2.4 and 2.5)
- Round 6: Clark County Abandoned Mine Inventory ($421,850)
- Round 7: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase IV ($1,063,700; see also 2.4 and 2.5)
- Round 7: Interagency Wilderness Stewardship ($969,592; see also 2.5)

Sub-goal 2.4 Land Use

- Round 4: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program (see also 2.3 and 2.5)
- Round 4: Resource Protection ($6,454,000)
- Round 4: Cooperative Conservation: Increasing Capacity through Community Partnerships (see also 2.1, 2.3, and 2.5)
- Round 5: Implementation of Dust Mitigation Plans for USDA FS and BLM in Southern Nevada ($2,228,582)
- Round 5: Interagency Restoration - Weed Management, Phase II (see also 1.2 and 1.4)
- Round 5: High-resolution Satellite-imagery Technology to Advance Natural Resource Management ($2,777,815; note: images will be checked for archaeological resources, thus these represent potential benefits for sub-goal 2.1)
- Round 5: Interagency Backcountry Planning ($1,959,135)
- Round 5: Improving Visitor Safety and Conserving Biological and Cultural Resources at Abandoned Mine Sites (see also 2.1)
- Round 5: Interdisciplinary Management Plan for Gold Butte, an Area of Special Designation Experiencing Increasingly Extensive Recreational Use ($3,165,000; note: takes into account natural and cultural resource protection, habitat restoration,

threatened and endangered species management, education and interpretation, recreation and travel)

- Round 5: Ecological Health Assessment in Southern Nevada ($253,200)
- Round 5: Meeting the Challenge of "Water 2025": Phase II - Completing Comprehensive Aquatic Baselines for Lakes Mead and Mohave (see also 1.2 , 1.3 , and 1.4)
- Round 5: Take Pride in America – Eliminating Litter and Desert Dumping through Community Education (see also 2.3 and 2.5)
- Round 5: Interagency Volunteer Program - Helping Hands Across Public Lands, Phase II (see also 2.5)
- Round 6: BLM Recreation Area Management Plans (RAMPs) (see also 2.3)
- Round 6: Soil Survey of Portions of the Desert National Wildlife Refuge within Clark County (see also 1.3)
- Round 6: Development of a Habitat Management Plan to Maintain Viability of the Desert Bighorn Sheep Population in the River Mountains, Nevada, Phase I (see also 1.4)
- Round 6: Interagency Law Enforcement Resource Protection, Phase II ($9,776,450)
- Round 6: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase III (see also 2.3 and 2.5)
- Round 6: Sunrise Management Area Interdisciplinary Management Plan ($1,730,500)
- Round 6: Listed Species Consultation and Recovery Information Tracking System ($1,205,600)
- Round 7: Communications Upgrade and Round 5 Refunding for Law Enforcement (Clark County) and Resource Protection Law Enforcement (Lincoln County) ($4,076,484)
- Round 7: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase IV (see also 2.3 and 2.5)

Sub-goal 2.5 Public Outreach

- Round 4: Education in the Environment: Hands-on Student Research & Outdoor Learning Experiences ($916,825)
- Round 4: Backcountry Access / Education Component (see also 2.3)
- Round 4: Resource Protection / Education Component (see also 2.4)
- Round 4: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program / Messaging Component (see also 2.3 and 2.4)
- Round 4: Off-Highway Vehicle Strategy / Promotion of outdoor ethics component (see also 2.3)
- Round 4: Cooperative Conservation: Increasing Capacity through Community Partnerships (see also 2.1, 2.3, and 2.4)
- Round 5: Interagency Restoration - Weed Management, Phase II / Public education component (see also 1.4)
- Round 5: Preserve America – A Southern Nevada Interagency Culture Resource Program / Education and Outreach Component (see also 2.2)
- Round 5: Take Pride in America – Eliminating Litter and Desert Dumping through Community Education (see also 2.3 and 2.4)
- Round 5: Take Pride in America – Increasing Community Understanding of our Public Lands and Providing Place-based Learning Opportunities for Improved Student Achievement ($46,330,000)
- Round 5: Interagency Volunteer Program - Helping Hands Across Public Lands, Phase II (see also 2.4)
- Round 5: Interagency Website Development in Southern Nevada ($244,591)

- Round 5: Multidisciplinary Science and Learning Opportunities for Underprivileged Children at Oliver Ranch ($2,479,250)
- Round 6: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase III (see also 2.3 and 2.4)
- Round 6: Cultural Site Stewardship Program (see also 2.1)
- Round 6: Education in the Environment - A Strategy for Continued Interagency Outdoor Education Programming ($1,665,600)
- Round 6: Mobile, Place-based, Multi-media Education Center ($120,000)
- Round 7: "Take Pride in America" in Southern Nevada - A Local Litter and Desert Dumping Clean-up Program, Phase IV (see also 2.3 and 2.4)
- Round 7: Interagency Wilderness Stewardship ($969,592; see also 2.5)

GOAL 3 STRATEGY MANAGEMENT ACTIVITIES

Sub-goal 3.1 Interdisciplinary Analysis and Assessment

- Round 4: Intra-/Inter-Agency Science and Research Strategy ($462,000)
- Round 5: GIS-based Environmental Impacts Analysis and Decision Support System ($2,348,272)
- Round 6: Listed Species Consultation and Recovery Information Tracking System ($1,205,600)
- Round 9: Interagency Science and Research Strategy Implementation ($634,840)

Sub-goal 3.2 Effective Linkages and Data Sharing

- Round 5: GIS and Data Management: A Model for Large-scale, Multidisciplinary Data Integration, Preservation, and Access ($3,136,970)
- Round 6: Implementing "Service First" in Southern Nevada ($750,000)

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Glossary

BIODIVERSITY
The variety and variability of life on earth; an abbreviation for biological diversity.

COLLECTIBLE HERITAGE ASSETS
Heritage assets (see below) that can be collected, such as archaeology collections; objects gathered and maintained for exhibition; museum collections; and archival collections.

CONFLICT OF INTEREST
A set of conditions in which professional judgment concerning a primary interest, such as the validity of research, tends to be unduly influenced by a secondary interest (such as financial gain).

CORRIDOR
Strips of land, the resources contained therein, and associated airspace that connect patches of wild habitat often isolated in seas of human developments and make it possible for species to migrate amongst them.

ECOSYSTEM
A system that includes all living organisms (biotic factors) in an area as well as its physical environment (abiotic factors) functioning and interacting together as a unit.

EXOTIC SPECIES
Plant or animal species introduced into an area where they do not occur naturally, non-native species.

GEODATABASE
An object-relational geographic data container; an abbreviation for geographic database.

HERITAGE ASSETS
Property, plant and equipment that are unique for one or more of the following reasons: historical or natural significance; cultural, educational, or artistic (e.g., aesthetic) importance; or significant architectural characteristics. Heritage assets are generally expected to be preserved indefinitely. Other terms often used include: cultural resources; historic properties; and archaeological sites.

INHOLDING
A privately owned parcel of land within the boundaries of a federal public land area.

INVASIVE SPECIES
Non-native species that disrupt and replace native species.

LINEAR DISTURBANCE
A throughway (e.g., roads, railroads, powerlines, trails, etc.) disrupting an ecosystem's structure and function.

META-ANALYSIS
A quantitative statistical analysis of several separate but similar experiments or studies in order to test the pooled data for statistical significance.

METADATA
Data about data. Metadata describe how and when and by whom a particular set of data was collected, and how the data are formatted. Metadata are essential for understanding information stored in data warehouses.

NON-COLLECTIBLE HERITAGE ASSETS
Heritage assets that cannot be collected, such as historic buildings, archaeology sites, landscapes, memorials, and monuments.

RECLAMATION
The process by which seriously disturbed land surfaces are stabilized against the hazards of water and wind erosion.

RESTORATION
Activities that initiate or accelerate the recovery of an ecosystem with respect to its health, integrity, and sustainability.

SUSTAINABILITY
The ability of ecosystems maintain their essential functions and processes, and retain their biodiversity in full measure over the long-term; use of resources by humans at a rate at which they can be replenished.

WATERSHED
All land and water areas that drain toward a river or lake; also called "drainage basin."