

Middle Fork and Rampage Complexes

July – September 2003

Burned Area Emergency Stabilization And Rehabilitation Plan

*Glacier National Park,
Montana*



Prepared by:
NPS Intermountain Burned Area Emergency Response Team
August 29, 2003



INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT

BURNED AREA EMERGENCY STABILIZATION AND REHABILITATION PLAN
MIDDLE FORK & RAMPAGE COMPLEX FIRES, GLACIER NATIONAL PARK, MT

AGENCY/UNIT: NPS, Glacier National Park

LOCATION: Glacier National Park, West Glacier, Montana

DATE: 25 September 2003

PREPARED BY: NPS BURNED AREA EMERGENCY RESPONSE TEAM



Assessing Soil Burn Severity, Rampage Complex, 2003 Glacier National Park, MT

Submitted By: Richard G. Gatewood

Date: 25 September 2003

Richard G. Gatewood, BAER Team Leader

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

EXECUTIVE SUMMARY

This BAER (Burned Area Emergency Response) plan has been prepared in accordance with the Interagency Policy Guidance and Direction: *Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook (2001)*. This plan provides emergency fire stabilization and rehabilitation recommendations for Glacier National Park lands burned within the Middle Fork and Rampage Complexes. Primary objectives of the Middle Fork and Rampage BAER plan are to: 1) assess the impacts of the Middle Fork and Rampage Fire Complexes and estimate the effects to critical natural and cultural resources, trails and campgrounds, water quality and instream and downstream values at risk; and where appropriate, 2) prescribe post-fire mitigation measures to protect human life, property, and critical cultural and natural resources.

A team of National Park Service and contract specialists with contributions from a USFS Specialist evaluated the Middle Fork and Rampage Complexes for post fire rehabilitation needs. The BAER (Burned Area Emergency Response) team consisted of, wildlife biologists, ecologists, vegetation and ecology specialists, hydrologist, soil scientists, a cultural and a natural resource specialist, and a Wilderness coordinator who evaluated the potential erosion and flooding impacts on watersheds. Fieldwork was completed on September 21, 2003

The burned area evaluation process focuses on identifying fire related watershed emergency treatment needs beyond fire suppression rehabilitation. Much of the burned area includes a mosaic of low, moderate and high watershed response. Several high burn severity areas are upstream of values at risk, specifically bull trout and western cutthroat trout habitat in Coal Creek drainage, and trails and back country campgrounds in Coal Creek and Upper Park Creek drainages.

This document includes treatments, cost risk analysis, specification sheets, resource assessments and maps. A minimal number of treatments are planned, including hazard tree felling and clearing along trails, posting of warning signs, rehabilitating existing water bars and/or construction of new ones. Also planned is monitoring and treatment of exotic plant infestations into the burned area and planting of whitebark pine seedlings and monitoring of their recovery.

Preliminary findings indicate that most of the Middle Fork and Rampage burned areas will naturally revegetate to grasses and forbs in 2004. While significant impacts to streams and fisheries from increased erosion off the burned can be expected it was found that mitigating treatments would be excessively costly and would adversely impact wilderness values. No other values were identified as being at risk, therefore no treatments are being prescribed to mitigate the watershed response described in this plan.

This BAER plan is the initial funding report for Emergency Fire Rehabilitation funds. Additional interim reports will be submitted as further treatment needs are identified.

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PART A. FIRE LOCATION AND BACKGROUND INFORMATION

Fire Name	Middle Fork	Jurisdiction	Acres
Fire Number	P14462	Glacier National Park	10,469
Agency Unit	NP – Glacier National Park		
Region	NPS - Intermountain		
State	Montana		
County(s)	Flathead		
Ignition Date/Manner	08/19/03 / Lightning		
Zone			
Date Contained	Unknown		
Date Controlled		TOTAL ACRES	10,469

Fire Name	Rampage	Jurisdiction	Acres
Fire Number	P14478	Glacier National Park	21,363
Agency Unit	NP – Glacier National Park		
Region	NPS - Intermountain		
State	Montana		
County(s)	Flathead		
Ignition Date/Manner	08/19/03 / Lightning		
Zone			
Date Contained	Unknown		
Date Controlled		TOTAL ACRES	21,363

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PART B. NATURE OF PLAN**

I. Type of Plan (check one box below)

	Short-term Rehabilitation
	Long-term Rehabilitation
✓	Both Long and Short-term Rehabilitation

II. Type of Action (Check one box below)

✓	Initial Submission
	Updating Or Revising The Initial Submission
	Supplying Information For Accomplishment To Date On Work Underway
	Different Phase Of Project Plan
	Final Report (To Comply With The Closure Of The EFR Account

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PART C. EMERGENCY STABILIZATION and REHABILITATION ASSESSMENT

I. Emergency Stabilization Objectives:

- To prescribe cost effective post-fire stabilization measures necessary to protect human life, public health and safety, property, and critical cultural and natural resources while maintaining wilderness values.
- To promptly stabilize and prevent further degradation to affected resources on lands within the fire perimeter or areas affected directly by wind or water erosion from the burned areas.
- To repair damages caused by fire suppression operations.
- To implement emergency stabilization treatments in accordance with approved land management plans and policies, and all relevant federal, state, and local laws and regulations.
- To implement emergency stabilization treatments prior to the first damaging storms.

II. Rehabilitation Objectives

- To repair or improve lands damaged directly by the wildland fire which are unlikely to recover naturally from severe wildland fire damage by emulating historic or pre-fire ecosystem structure, function, diversity, and dynamics according to approved land management plans.
- To restore or establish healthy, stable ecosystems in the burned area, even if these ecosystems cannot fully emulate historic or pre-fire conditions as specified in approved land management plans.

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PART D. TEAM ORGANIZATION, TEAM MEMBERS, RESOURCE ADVISORS

I. BAER TEAM MEMBERS and CONTRIBUTORS

POSITION	TEAM MEMBER / AGENCY
Team Leader	Richard Gatewood, NPS, Big Bend NP
Administrative Support	Biddy Simet, NPS, Glacier NP
Archaeology	Lon Johnson, NPS, Glacier NP
Trails, Campsites and Cabins	Jack Potter, NPS, Glacier NP Lane Slover, NPS, Glacier NP
Fisheries	Bill Michaels, NPS, Glacier NP
Soil and Watershed	Michael Parenti , M. Parenti & Associates Suzanne Loadholt, M. Parenti & Associates Dean Sirucek, USFS, Flathead NF
Vegetation	Joyce Lapp, NPS, Glacier National Park
Weeds	Dawn LaFleur, NPS, Glacier National Park
Wildlife	Steve Gniadek, NPS, Glacier National Park John Waller, NPS, Glacier National Park
GIS	Dave Roemer, NPS, Carlsbad Caverns NP
Other Support	Several resource and administrative personnel from Glacier NP

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PART E. COST/RISK ANALYSIS**

Part 1. Treatment Costs

Treatments	Cost
T – 1 Install Hazard Warning Signs	\$2,843
T – 2 Hazard Tree Treatments– Trails	\$16,360
T – 3 Trail Assessment	\$2,942
T – 4 Install and Maintain Waterbars on Trails	\$6,634
T – 5 Assess Condition of Backcountry Campgrounds	\$1,339
M – 1 Noxious Weed Monitoring	\$10,547
M – 2 Monitor Whitebark Pine Treatment Effectiveness	\$1,703
M – 3 Monitor for Post-fire Soil Erosion	\$4,840
V – 1 Noxious Weed Control/Treatment	\$19,964
V – 2 Reforestation: Whitebark Pine	\$14,489
Total Cost	\$81,661

INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION**MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT****Part 2. Probability of Rehabilitation Treatments Successfully Meeting EFR Objectives**

Treatments	Units	%
T – 2 Hazard Tree – Trails	10	90
T – 3 Install Hazard Warning Signs	15	90
T – 4 Install and Maintain Waterbars on Trails	87	90
M – 1 Monitor for Noxious Weed	195	80
M – 2 Monitor Whitebark Pine Treatment Effectiveness	100	95
M – 3 Monitor for Post-fire Soil Erosion	2	80
V – 1 Noxious Weed Control/Treatment	66	75
V – 2 Reforestation: Whitebark Pine		

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Risk of Resource Value Loss or Damage

Identify the risk (high, medium, low, none or not applicable (NA) of unacceptable impacts or loss of resources.

No Action- Treatments Not Implemented (check one)

Resource Value	None	Low	Mid	High
Human Health & Safety				X
Park Infrastructure : Trails & Campgrounds				X
Plant communities at risk from weed infestations				X
Plant community structure function and composition				X
Aquatic community structure, function and composition				X
Watershed Integrity			X	
Heritage resources	X			
Threatened and Endangered Species (terrestrial)		X		
Threatened and Endangered Fish Species (fish)				X

Proposed Action – Treatments Successfully Implemented (check one)

Resource Value	None	Low	Mid	High
Human Health & Safety		X		
Park Infrastructure: Trails & Campgrounds		X		
Plant communities at risk from weed infestations		X		
Plant community structure function and composition		X		
Aquatic community structure, function and composition				X
Watershed Integrity			X	
Heritage resources	X			
Threatened and Endangered Species (terrestrial)		X		
Threatened and Endangered Fish Species (fish)				X

Part 3. SUMMARY

The costs of the project and probability of success of the proposed treatments are compared with the risks to resource values if: 1) no action is taken, and 2) the proposed action is successfully implemented. Alternatives may be included in this analysis to assist in the selection of the treatments that will cost effectively achieve the EFR objectives. Answer the following questions to determine which proposed EFR treatments should be selected and implemented.

1. Are the risks to natural and natural resources **acceptable** as a result of the fire if the following actions are taken?

Proposed Action Yes ☒ No ☐ Rationale for answer:

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Human Health and Safety: The threat of hazard trees and the increased probability of flash flooding is greatly increased in the back country following a wildland fire. The posting of warning signs at trailheads and junctures can greatly increase public awareness of these risks when entering the burned areas. Removal of hazard trees along trails will greatly reduce the risk of falling trees to an acceptable level to allow public access into the backcountry.

Invasive and Exotic weeds: Early detection and treatment of initial infestations is the most effective means of reducing the risk of exotic plant invasions.

Ecosystem Integrity: Taking advantage of burned areas to plant whitebark pine seedlings in suitable habitat will ensure that populations persist on the landscape to provide habitat and forage for a variety of wildlife species including the federally threatened Grizzly Bear.

Park Infrastructure Integrity (Trails and Campsites): The rehabilitation of waterbars and construction of new ones will reduce accelerated erosion and down cutting in the trail tread due to increased runoff from the burned slopes above the trails.

No Action Yes ☐ No ☒ Rationale for answer:

Human Health and Safety: The threat of hazard trees and the increased probability of flash floods is increased greatly in the back country following a wildland fire. Failure to place warning signs alerting the public of these risks could result in injury or death to individuals unaware and unprepared for these hazards. Failure to remove standing hazard trees along trails poses significant threats to those entering the back country. Failure to reduce the threat of falling trees or allowing the public into the backcountry unaware of the hazards is not acceptable.

Invasive and Exotic weeds: Failure to detect early and treat initial weed infestations would lead to expansion of exotic plants into intact native plant communities that could, in time be impaired and potentially displaced beyond recovery. This level of ecosystem impairment and loss of native biodiversity is not consistent with vegetation management goals of Glacier National Park.

Ecosystem Integrity: Failure to take advantage of burned areas to facilitate reestablish populations of whitebark pine could contribute to populations diminishing on the landscape and possibly. Placing these populations at risk and potential reducing native species diversity is not consistent with Park's vegetation management goals for these species.

Park Infrastructure Integrity (Trails and Campsites): By not taking mitigating measures to address the impacts of increased erosion and downcutting in trails due to increased runoff from burned areas above the trails a significant amount of damage could occur to the trail tread as well as coincidental resource damage adjacent to and downslope from the trails. The cost of repairing or relocating the trail could easily exceed the cost of the proposed treatment.

2. Is the probability of success of the proposed action, alternatives or no action acceptable given their costs?

Proposed Action Yes ☒ No ☐ Rationale for answer:

Human Health and Safety: The proposed treatments of hazard sign placement and hazard tree reduction has a high probability of success and can cost effectively reduce the risk to human health and safety. The cost of this treatment given the alternative of No Action is reasonable.

Noxious and Exotic weeds: Much greater success can be achieved at lower expense in treating small patches of noxious and exotic weeds, than allowing them to expand to larger areas. Treatment costs again are reasonable given the alternative of No Action.

Ecosystem Integrity: The park has had high success rates with planting whitebark pine, particularly in burned areas. Thus given the relatively inexpensive nature of this treatment it is very cost effective, especially considering the alternative in possibly diminishing whitebark pine populations if the No Action is pursued.

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Park Infrastructure Integrity (Trails and Campsites): The cost of repairing the trail damaged by increased erosion and down cutting would greatly exceed the mitigating measures proposed thus making the treatment very cost effective. Prevent trail damage could also contribute to reducing threats the human health and safety.

No Action Yes ☐ No ☒ Rationale for answer:

Human Health and Safety: While there is little initial cost to not reducing hazard trees or placing warning signs, there are costs, however, associated with injuries or death to individuals that would far exceed the cost of implementing the treatment. The proposed treatments of hazard sign placement and hazard tree reduction can effectively reduce the risk to human health and safety, given the cost of an accident resulting in injury or death.

Noxious and Exotic weeds: While the no treatment alternative has no initial cost, greater cost may be incurred in the future when attempting to treat extensive areas infested with weeds in the burned areas. Cost that may not be recoverable may be incurred if resource damage occurs particularly with respect to loss of native species diversity and impaired ecosystem function.

Much greater success can be achieved at lower expensive in treating small patches of noxious and exotic weeds, than much larger areas. Displacement and loss of ecosystem function and integrity would be a significant loss, losses that may never be recovered.

Ecosystem Integrity: The park has had high success rates with planting whitebark pine, particularly in burned areas. Thus given the relatively inexpensive nature of this treatment it is very cost effective, especially considering the alternative of possibly diminishing whitebark pine populations.

Park Infrastructure Integrity (Trails and Campsites): The cost of repairing the trail damaged by increased erosion and down cutting would greatly exceed the mitigating measures proposed thus making the treatment very cost effective. Damage to trails could also increase the risk to human health and safety, thus increasing to potential for increased costs due to accidents.

3. Which approach will most cost-effectively and successfully attain the EFR objectives and therefore is recommended for implementation from a Cost/Risk Analysis standpoint?

Proposed Action ☒, Alternative(s) ☐, or No Action ☐

Comments:

No large scale watershed treatments are being proposed for either the Middle Fork Fire or the Rampage Fires. Although there could be significant loss of Bull Trout habitat and significant fish kills due to changes in water quality from increased runoff and erosion, particularly in the Coal Creek drainage mitigating these effects would be expensive and would have significant adverse effects on wilderness values. No other resource values were identified in the resource assessments. In order to minimize impacts to wilderness values, Glacier National National Park is choosing not to mitigate the watershed response.

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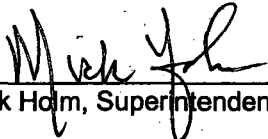
**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
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PART F. APPROVALS

I. EMERGENCY FIRE STABILIZATION & REHABILITATION APPROVAL

- ☒ **Approved**
☐ **Approved with Revision**
☐ **Disapproved**

Explanation for Revision or Disapproval:


Mick Holm, Superintendent, Glacier National Park

9/30/03
Date

II. EMERGENCY FIRE STABILIZATION & REHABILITATION CONCURRENCE

- ☐ **Approved**
☐ **Approved with Revision**
☐ **Disapproved**

Explanation for Revision or Disapproval:

Steve Martin, Regional Director, Intermountain Region Date

III. EMERGENCY FIRE STABILIZATION & REHABILITATION APPROVAL

- ☐ **Approved**
☐ **Approved with Revision**
☐ **Disapproved**

Explanation for Revision or Disapproval:

Stephen J. Botti, BAER Coordinator, Branch of Fire Management, NIFC

Date

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PART G. EMERGENCY STABILIZATION & REHABILITATION SPECIFICATIONS
(SEE FOLLOWING PAGES FOR INDIVIDUAL SPECIFICATIONS)**

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T-1: INSTALL HAZARD WARNING SIGNS SPECIFICATION

SPECIFICATION TITLE:	T-1: Install Hazard Warning Signs	JURISDICTIONS:	NPS-GNP
2500-S Part #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.4 Health & Safety	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

1. General Description: Hazard warning signs should be developed for immediate installation along trails within the burned area for protection of life and property. Interpretive panels at Walton Ranger Station will be replaced with fire history and safety messages. Signs are designed to notify the public of watersheds that are likely to sustain flash flood and/or mud/debris flows and falling rock and trees that may enter roadways or trails due to storm runoff and slope instability from fire effects to burned watersheds. 2. Location: <u>Trail hazard warning signs</u> (14) will be placed at trailheads that lead into the burned area and where trails cross the fire perimeter. <u>Interpretive panel</u> – a panel will be placed at the main Middle Fork Trailhead at Walton Ranger Station. 3. Design/Construction Specification(s): See attached sign lay-out and sign dimensions below for the trail hazard warning signs. The interpretive panel will be designed and constructed by GNP staff. 4. Purpose of Treatment Specification: To provide for public health and safety. These signs are necessary to inform the public of immediate danger posed by storm events and falling rocks and trees.
--

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here – see contract services below	COST/ITEM
WG-9 Sign Specialist @ \$20.98 per hour X 60 hours X 1 personnel	\$1259
WG – 5 Maintenance Worker WG-5 @13.62/hourx40 hours	\$545
GS-11 Interpretive Ranger @25.60/hour x 6 hours	\$154
TOTAL PERSONNEL SERVICE COST	\$1958

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here –see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
NPS-GNP: 14 anodized aluminum backcountry trail hazard signs @ \$20.00 each	\$280
NPS-GNP: 1 Interpretive panels @ \$100 each	\$100
NPS-GNP: 1 post assemblies with hardware for interpretive panels @ \$400	\$400
TOTAL MATERIALS AND SUPPLY COST	\$780

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM

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Pickup truck 75 miles/day/4 daysx.35	\$105
TOTAL TRAVEL COST	\$105
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost	COST/ITEM
TOTAL CONTRACT COST	

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
2004	Sign	\$140	15	\$2843	ESR	P
TOTAL	Signs	\$140	15	\$2843	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost.	P, M, T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan: BAESR HANDBOOK 6.3.4 ROAD, TRAIL AND SAFETY SIGNS.

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS- Glacier National Park	15	\$2843
TOTAL COST	15	\$2843

TRAIL HAZARD WARNING SIGN:

WARNING

**BURNED AREA PRONE TO
FALLING ROCK AND TREES**

**DRAINAGES PRONE TO
FLASH FLOODS AND MUD FLOWS**

OFF TRAIL TRAVEL NOT RECOMMENDED

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T-2: HAZARD TREE TREATMENT – TRAILS SPECIFICATION

SPECIFICATION TITLE:	T-2: Hazard Tree Treatment - Trails	JURISDICTIONS:	NPS-GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.4 Health & Safety	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

General Description: Cut and remove standing, leaning, and fallen hazard trees that were weakened as a result of the fires. Location (Suitable) Sites: <u>NPS-GNP</u> - 32 miles of all or part of trail numbers 67, 68, 69, 70, 73, 82, 85, 87 Design/Construction Specification(s): - Fallen logs should be removed to a four foot cleared width on either side of the trail tread. - All leaning trees within or presenting a hazard to the cleared trail right-of-way should be cleared. - Standing trees with major structural damage, either from the roots being burned out or most of the bole consumed, should first be pushed, and failing that, felled with stumps cut as flush to the ground as possible. Purpose of Treatment Specification: Clearing will permit reasonable safe passage for visitors on foot and horseback. Waiting until spring will allow seasonal winds and snow to bring down much of the imminent hazards and allow for a safer working environment as well as a more natural appearance.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
Trail Work Leader WL -5 \$15.12/hour x 192 hours	\$2903
Trails Laborer WG-3 @ 12.64/hour x 384 hours	\$4854
Animal Packer WG-8 @20.27/hourx100 hours	\$2027
Trail Maintenance worker WG- 5 @13.62/hour x192 hours	\$2615
TOTAL PERSONNEL SERVICE COST	\$12,399

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
Chainsaw, fuel, oil, chain, files and falling wedges \$20/day X 24 days	\$480
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	\$480

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
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**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

6 Passenger pickup 75 miles/dayx15 daysx.45/mile	\$506
Per diem -5 people 26 days @20/day	\$2600
Stock Truck 75 miles/dayx10daysx.50/mile	\$375
TOTAL TRAVEL COST	\$3481
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost	COST/ITEM
TOTAL CONTRACT COST	

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 04 GNP	Trails	\$1636	10 (32 miles)	\$16,360	ES	P
TOTAL	Trails	\$1636	10	\$16,360	ES	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OPI/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	T, M
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan:

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS- Glacier National Park	10	\$16,360
TOTAL COST	10	\$16,360

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

T-3: TRAIL ASSESSMENT SPECIFICATION

SPECIFICATION TITLE:	T-3: Trail Assessment	JURISDICTIONS:	NPS- GNP
2500-8 PART #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.4 Health and Safety	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

1. General Description:
Conduct trail safety inventory along trail systems within the fire area to identify areas that have been negatively impacted by fire and now pose a threat to public safety and/or watershed integrity. Trails will be inventoried and assessed prior to use by the public to insure the health and safety of visitors to public lands.
2. Location (Suitable) Sites:
NPS-Glacier National Park- Conduct inventories along approximately 32miles of trails including all or parts of trail numbers 67, 69, 68, 70, 73, 75, 82, 85, 86, 87
3. Design/Construction Specification(s):
- Identify safety hazards and high erosion potentials along major trail systems that threaten public safety and human health. - Locate, photo document, and map with GPS trail structures negatively impacted by the fire including drainage structures, and other trail structures, bank stabilization structures (log or rock), and loss of trail tread that will erode or requires stabilization treatment. Map erodable sites that will contribute to trail failure and watershed instability. - Determine stabilization and structural replacement needs. - Prepare and file supplemental funding request for stabilization treatments that pose threat to human health and safety and comply with National BAER guidelines.
4. Purpose of Treatment Specification: Provide for public safety on public lands through the prompt identification and treatment of short-term trail stabilization needs that pose a threat to human health and safety.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
(Monitoring) NPS- WS-7 Trails Supervisor @ \$32.66/Hour x 80 Hours	\$2612
TOTAL PERSONNEL SERVICE COST	\$2612

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
NPS- 8 rolls 35mm film and processing @ \$15/roll	\$120
	\$120

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
NPS-GNP: 75 miles/ day x 8 days x .35/ mile	\$210
TOTAL TRAVEL COST	\$210
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-04- NPS	Surveys	\$294	10	\$2,942	ESR	P
TOTAL	Surveys	\$294	10	\$2,942	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	M
4. Estimate based upon government wage rates and materials cost	P, T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan: Appendix A1: Soils and Watershed Resource Assessment

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS- Glacier National Park	10 Surveys	\$2,942
TOTAL COST	10 Surveys	\$2,942

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

T-4: INSTALL AND MAINTAIN WATERBARS ON TRAILS SPECIFICATION

SPECIFICATION TITLE:	T4: Install and Maintain Waterbars on Trails	JURISDICTIONS:	NPS - GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.9.2 Watershed & Property Protection	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

1. General Description: Install and maintain waterbars on trails to prevent erosion from the expected increase in runoff from burned areas along and above trails. 2. Location (Suitable) Sites: A. Trail 69 Harrison Lake Trail B. Trail 75 Coal Creek Trail C. Trail 86 Lake Isabel Trail 3. Design/Construction Specification(s): 1. Utilize native logs installed at 45-60degree angle on slopes of 7-10% to divert runoff. Logs should be a minimum of 8" diameter, 2/3 buried, extending 1 foot on the upward side of the trail and a minimum of 6" below the trail tread. The catch basin should be at least 18", and on side slopes greater than 15% a rock erosion guard should be installed. Excess soil should be distributed down the trail surface if free of large (over 1") rocks. 2. Clean out existing waterbars by removing accumulated rocks, soil and debris. This includes the catch basin and the diversion channel. 3. A. Construct 12 new waterbars, clean approximately 15; B. Construct 15 new waterbars and clean 10, C. Construct 20 new waterbars and clean 15. 4. Purpose of Treatment Specification: The waterbars are intended to prevent accelerated erosion by diverting, discharging, and dissipating runoff flowing down trail tread. This protects watersheds by lessening the force and concentration of water flowing downslope.
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II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
Animal Packer WG - 8 @\$20.27/hour x 60 hours	\$1216
Trails Maintenance Worker WG-5 @13.62/hour x 80 hours	\$1090
Trails Work Leader WL - 5 @ \$15.12/hour x 80 hours	\$1210
Trails laborer WG - 3 @ 12.64/hour hours x 160 hours	\$2022
TOTAL PERSONNEL SERVICE COST	\$5538

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

TOTAL MATERIALS AND SUPPLY COST	

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
6 passenger pickup 80 miles/day @ .45/mile x 6 days	\$216
Stock truck 80 miles/dayx .50/ mile 4 days	\$160
Per diem 4people x @\$20/day x 8 days	\$640
Per diem 1 person @ \$20/day x 4 days	\$80
TOTAL TRAVEL COST	\$1096
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
GNP - 2004	Construct/Clean Waterbars	\$76	87(47 new)	\$6634	ESR	P
TOTAL	Construct/Clean Waterbars	\$76	87	\$6634	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost.	P, T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

See Tails Maps for Middle Fork and Rampage Fires and Appendix I: Soils and Watershed Resource Assessment:

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS- Glacier National Park	87	\$6634
TOTAL COST	87	\$6634

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

T-5: ASSESS CONDITION OF BACKCOUNTRY CAMPGROUNDS SPECIFICATION

SPECIFICATION TITLE:	T5: Assess Condition of Backcountry Campgrounds	JURISDICTIONS:	NPS - GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.3.1 Minor Facilities	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

1. General Description: Conduct site inventory and evaluate condition of two backcountry campsites. 2. Location: Glacier National Park a. Lake Isabel b. Coal Creek Campground 3. Design/Construction Specification(s): a. Inventory site safety hazards (e.g. hazard trees, rolling rocks and flash flooding/erosion potential) which would threaten human health and safety. b. Locate and document burned condition of campsite structures such as toilets, hitchrails, food poles and site markers. c. Determine site safety, stabilization and structural replacement needs. d. Prepare and file supplemental funding requests that comply with National BAER guidelines for stabilization treatments and for hazards that pose threats to human health and safety and structural rehabilitation/replacement as needed if campsites are not retained in closure status and/or relocated outside the burned area. 4. Purpose of Treatment Specification: Provide for public safety through the prompt identification and treatment of hazards and short-term stabilization needs that pose a threat to human health and safety.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
Wilderness Manager GS-11 @ \$36.68/hour x 32 hours	\$1174
TOTAL PERSONNEL SERVICE COST	\$1174

EQUIPMENT PURCHASE, LEASE OR RENTAL (Item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
1 Roll of film and processing \$15.00	\$15

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

TOTAL MATERIALS AND SUPPLY COST	\$15
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TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
Pickup truck 50 miles/day x 4 days x \$.35/mile	\$70
Per Diem 1 person @20/day x 4 days	\$80
TOTAL MATERIALS AND SUPPLY COST	\$150
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
2003	Survey Campsites	\$669	2	\$1339	ESR	P
TOTAL	Surveys	\$669	2	\$1339	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost	P, M, T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan: See Vegetation Treatment Map
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VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS- Glacier National Park	2	\$1339
TOTAL COST	2	\$1339

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

M-1: NOXIOUS WEED MONITORING SPECIFICATION

SPECIFICATION TITLE:	M-1: Noxious Weed Monitoring	JURISDICTIONS:	NPS – GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004, 2005, 2006
ESR REFERENCE #:	6.3.5 Monitoring	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

General Description: Monitor known and high potential infestation sites for noxious weed species in the burned area, determine need and extent of control treatments required.

Location (Suitable) Sites:

Rampage Fire:

1. Administrative Sites/Facilities: Lake Isabel Backcountry Campground, Coal Creek Backcountry Campground, Lower Park Patrol Cabin, Upper Park Patrol Cabin, Lower Nyack Patrol Cabin, Upper Nyack Patrol Cabin, Coal Creek Cabin, and Scalplock Lookout,
2. Trailheads: Coal Creek Trail, Coal/Fielding Trail, and Park Creek Trail.
3. Fire Suppression Impact Areas: All handlines, wetlines, helispots, drop points, water drops, retardant drops, escape routes, and safety zones.

Middle Fork Complex Fires:

1. Administrative Sites/Facilities: Lincoln Patrol Cabin, Harrison Patrol Cabin, Loneman Lookout.
4. Trailheads: South Boundary Trail, Lincoln Creek Trail, Harrison Creek Trail, Loneman Lookout Trail, and Nyack Creek Trail.
5. River: Floodplains of the Middle Fork of the Flathead River that were burned over.
6. Fire Suppression Impact Areas: All handlines, wetlines, helispots, drop points, water drops, retardant drops, escape routes, and safety zones.

Design/ Construction Specification(s):

1. Conduct short-term monitoring (three years) of noxious weed infestation into the burn area.
2. Monitoring protocols will be established and implemented in accordance with current management plans. Monitoring should be designed to give a general estimate of weed density and cover.
3. All species identified as invasive according to the GNP Noxious Weed Management Plan should be surveyed for in the burn area.
4. Photo document and map weed infestations.
5. If monitoring reveals significant populations of noxious weeds that may pose threats to the ecological integrity of native plant communities, prepare supplemental funding requests in a timely manner to the Regional BAER Coordinator to facilitate the treatment of these areas. Prioritize treatments based on jurisdictional weed management plans.
6. If field surveys reveal additional populations of noxious weeds as a result of the fire in areas not identified in this spec, prepare supplemental funding requests in a timely manner to the Regional BAER Coordinator to monitor these populations and determine if control measures are necessary.
7. Prepare final reports of findings for submission to NIFC for inclusion in the fire effects database.

Purpose of Treatment Specifications: The objective of this specification is to identify the spread and potential threat of weed infestation in burned areas. Data gathered will be used to facilitate prompt treatment to control weed populations for the purpose of protecting native plant diversity and ecological integrity of the plant communities in the burned area.

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
NPS - GNP: 2 person crew @ 13.25/hr X 100 hrs X 2 people	\$ 2650
botanist @ 27.50/hr X 22 hrs	\$ 605
TOTAL PERSONNEL SERVICE COST	\$ 3255

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity X fiscal year = cost)	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
NPS - GNP: vehicle; 60 miles X 5 days X \$0.365/mile - Rampage Fire	\$ 110
NPS - GNP: vehicle: 30 miles X 6 days X \$0.365/mile - Middle Fork Complex Fires	\$ 66
TOTAL TRAVEL COST	\$ 176

CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-1-NPS	Acres	\$17.59	195	\$ 3,431	ESR	P
FY-2	Acres	\$18.25	195	\$ 3,558	ESR; OP	P
FY-3	Acres	\$18.25	195	\$ 3,558	ESR; OP	P
TOTAL			195	\$ 10,547	ESR;OP	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost	P; M; T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan: Appendix I- Vegetation Assessment, Appendix III- Watershed Treatment Map.

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS - GNP	195 acres	\$10,547
TOTAL COST (FY 2004,FY005,FY2006)	195 Acres	\$10,547

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

V-1: NOXIOUS WEED CONTROL/TREATMENT SPECIFICATION

SPECIFICATION TITLE:	V-1: Noxious Weed Control/Treatment	JURISDICTIONS:	NPS - GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004, 2005
ESR REFERENCE #:	6.3.2.1 Non-native Invasive Plant Control	SPECIFICATION TYPE:	ES

I. WORK TO BE DONE

General Description: Apply immediate herbicide and/or cultural and mechanical control treatments on known noxious weed infestations at identified campgrounds, administrative facilities, creek corridors, and trailheads. Identified sites have been ground-truthed and pose a threat for establishment, seed set, and spread into vulnerable areas. Identified sites were disturbed by fire suppression activities including structure protection and include slopes and drainages with high burn severity and/or high risk assessment for noxious weed invasion.

Location (Suitable) Sites:

A. Rampage Complex Fire:

Coal Creek Trail, Coal/Fielding Trail, and Park Creek Trail, Upper Park Creek campground and Patrol Cabin.

B. Middle Fork Complex Fire:

South Boundary Trail, Lincoln Creek Trail, Harrison Creek Trail, Loneman Lookout Trail, and Nyack Creek Trail

Design/ Construction Specification(s):

1. Treat all areas identified where noxious weeds are present and resprouting this fall.
2. All herbicide applications will be ground based.
3. All treatments in GNP will comply with the existing Noxious Weed Management Plan, and policies for Glacier National Park. Specifically, herbicide use will be spot treatment only of individual plants, and only licensed applicators and approved herbicides will be used. All herbicide label requirements will be followed. Where herbicide application is inappropriate, other strategies for noxious weed control will be implemented including mechanical and cultural methods of removal.
4. Following removal of weedy species in the vicinity of Upper Park Creek Campground and Patrol Cabin, re-seed the treated sites with a mix of site-specific native forb/grass species that will provide for long-term exclusion of non-native species in these areas of concentrated visitor use where the likelihood of weed spread is greatest. This seeding will reduce the need to retreat this area and provide a more rapid return to an ecologically stable plant community.

Purpose of Treatment Specifications: Prevent the establishment and spread of noxious weeds in burned areas, specifically where weed free ground has been disturbed by fire suppression activities. In addition, prevent the spread of noxious weeds to areas outside the burn, particularly uninfested areas. The objective of this specification is to allow natural regeneration of native plant communities affected by the burn, and to prevent loss of biological diversity and ecological stability on public lands as a result of weed infestations.

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
NPS - GNP: 2.5 person crew @ 13.25/hr X 100 hrs X 2 yrs	\$ 6,625
1 crew boss @ 23.50 /hr X 100 hrs X 2 yrs	\$ 4,700
TOTAL PERSONNEL SERVICE COST	\$ 11,325

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
Herbicide costs @ \$37/acre X 66 acres X 2 years	\$ 4884
Native seed mix (to be collect on site by GNP) @ \$ 20.00/lb X 20 lb/acre X 1 acre	\$ 400
TOTAL MATERIALS AND SUPPLY COST	\$ 5284

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
GNP: Crew vehicle: 60 miles X 3 days x \$0.365/mile X 2 yrs - Rampage Complex Fire	\$ 132
Crew boss vehicle: 30 miles X 7 days X \$0.365/mile X 2 yrs - Middle Fork Complex Fire	\$ 153
Herbicide Spray truck: \$200/day X 7 days X 2 yrs - Middle Fork Complex Fire	\$ 2800
TOTAL TRAVEL COST	\$ 3085

CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY - 2004	Acres	\$149	66	\$9,847	ESR	P
FY - 2005	Acres	\$149	66	\$9,847	ESR	P
TOTAL	Acres		66	\$19,694	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	P; M; T
4. Estimate based upon government wage rates and materials cost	
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

Please see Vegetation Assessment, Noxious Weed Treatment Map.

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS - GNP	66	\$19,694
TOTAL COST	66	\$19,694

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

V-2: REFORESTATION: WHITEBARK PINE PLANTING SPECIFICATION

SPECIFICATION TITLE:	V-2: Reforestation: Whitebark Pine Planting	JURISDICTIONS:	NPS - GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004, 2005
ESR REFERENCE #:	6.3.2.4 Forest Rehabilitation	SPECIFICATION TYPE:	R

I. WORK TO BE DONE

1. General Description: Restoration of whitebark pine by hand planting of 2000 whitebark pine seedlings where vegetation burned at moderate to high severity in the Middle Fork and Rampage Complex Fires at Glacier National Park. Seedlings are currently available to plant. Whitebark pine cones would be collected for seed to replace the seedlings planted in this project. 2. Location (Suitable) Sites: Rampage Complex: Lake Isabel Cirque - accessible by Trail Between Mt. Despair and Two Medicine Pass - accessible by Trail Middle Fork Complex: Loneman Mountain - accessible by Trail 3. Design/ Construction Specification(s): 1. Identify sites. 2. Use already available whitebark pine seedlings to hand plant across suitable areas. 3. Cage, collect and process cones to procure seed sufficient to result in 2000 seedlings (at least 140-160 cones) for replacement of seedlings planted in Middle Fork and Rampage Complex Fires. Estimates assume ave. 30 cones/tree, 30seeds/cone, and 60% of seeds resulting in seedlings (includes expected seed viability and seedling losses at nursery). 4. Monitor reforestation to assess growth and survival of tree seedlings in accordance agency policies and procedures 4. Purpose of Treatment Specifications: To aid in the restoration of whitebark pine - a species at risk due to exotic disease and other factors and an important ecological component of the forest, particularly for wildlife habitat/food source for many species, including grizzly bear. The fire has created an exceptional opportunity for the re-establishment of whitebark pine.
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II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
1 GS-11 to identify sites and serve as lead: 60 hrs x \$35/hr =	\$ 2100
2-GS 5/7 to cage and collect cones: 20 days x \$152/day	\$ 3040
2-GS 5/7 to plant trees: 20 days x \$152/day	\$ 3040
2-GS 5/7 to Monitor 16 days x \$152/day (8 days in 2004 / 8 days in 2005)	\$ 2432
TOTAL PERSONNEL SERVICE COST	\$10,612

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	N/A

MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
Nursery stock: 2000 seedlings @\$1.50	\$3000

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

TOTAL MATERIALS AND SUPPLY COST		\$3000
TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)		COST/ITEM
Cone collection - \$0.365/mile x 100 miles x 10 round trips		\$ 365
Planting - \$0.365/mile x 100 miles x 10 round trips		\$ 365
Monitoring - \$0.365/mile x 100 miles x 4 round trips		\$ 146
TOTAL TRAVEL COST		\$ 876
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)		COST/ITEM
TOTAL CONTRACT COST		N/A

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-2004	Hours	\$24.45	540	\$13,200	ESR-R	P
FY- 2005	Hours	\$16.11	80	\$ 1,289	ESR-R	P
TOTAL	Hours	\$23.40	620	\$14,489	ESR-R	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2 - 3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	P,M,T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

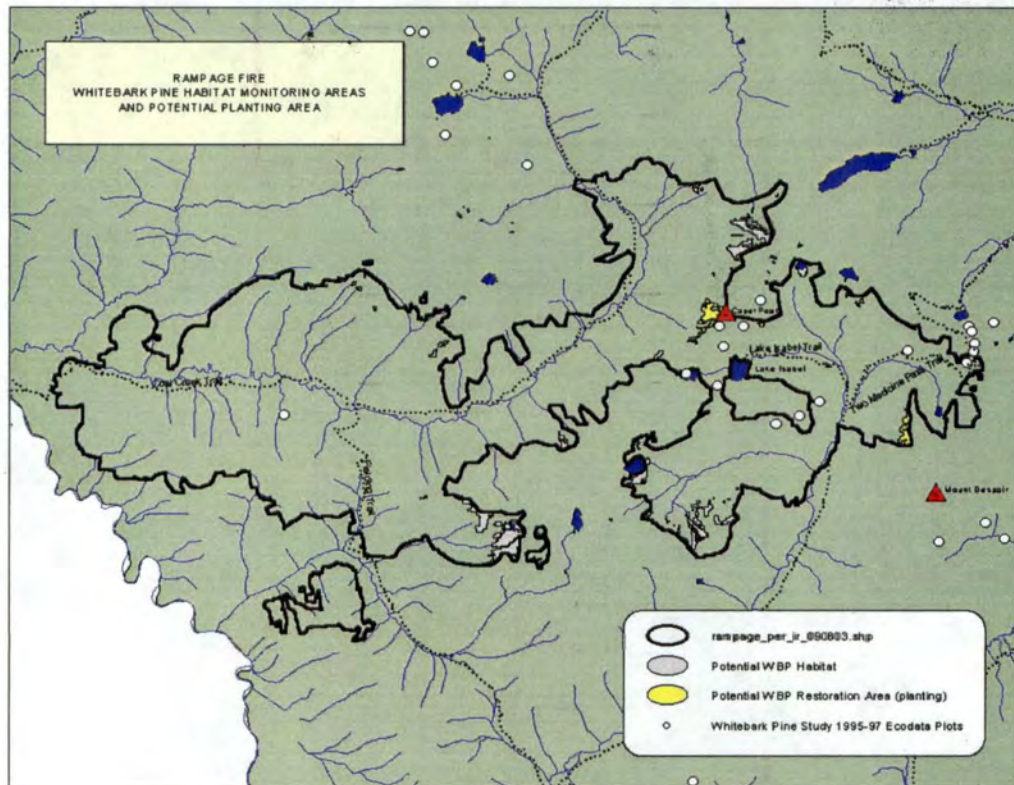
ESR Handbook 6.3.2.3 Revegetation; Vegetation Assessment and WBP Monitoring/Reforestation Map.

VI. UNITS AND COSTS BY JURISDICTION

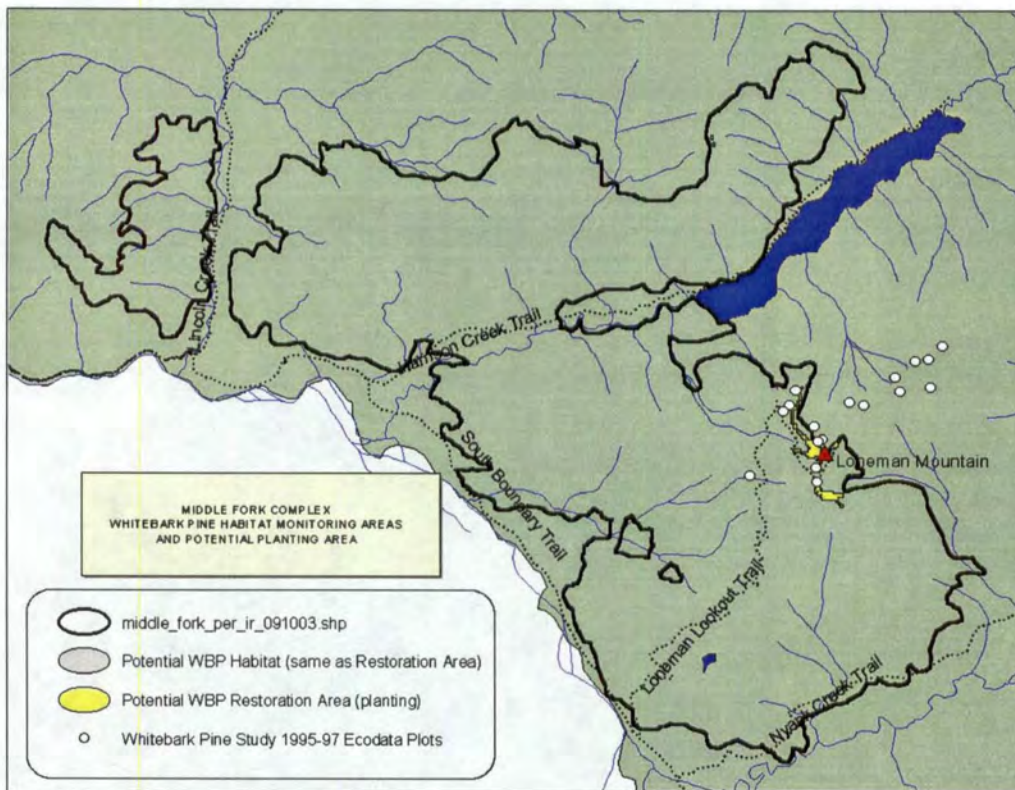
JURISDICTION	UNITS TREATED	COST
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**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

NPS - GNP	620	\$14,489
TOTAL COST	620	\$14,489



INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT



**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

M-2: MONITOR WHITEBARK PINE TREATMENT EFFECTIVENESS SPECIFICATION

SPECIFICATION TITLE:	M-2: Monitor Whitebark Pine Treatment Effectiveness	JURISDICTIONS:	NPS - GNP
2500-8 Part #:	n/a	FISCAL YEAR:	2004
ESR REFERENCE #:	6.3.4 Monitoring	SPECIFICATION TYPE:	R

I. WORK TO BE DONE

1. General Description: Monitor known and potential habitat within the MIDDLE FORK and RAMPAGE COMPLEX FIRES for whitebark pine survival, cone production, potential for regeneration, and effectiveness of treatments.

2. Location (Suitable) Sites:

Rampage Fire: Sites identified as potential and existing whitebark pine habitat within the fire perimeter include Lake Isabel Cirque, and the area between Mt. Despair and Two Medicine Pass.

Middle Fork Fire: Sites identified as potential and existing whitebark pine habitat within the fire perimeter include Loneman Mountain.

Approximately 500 acres of known and potential WBP habitat were affected by the Rampage and Middle Fork Complex fires. Many of those acres burned at high severity, particularly in the Rampage fire. This lethal burn severity is expected to result in greater than 80% mortality, leaving few mature live trees available for cone production. There is an urgent need to identify and focus monitoring on areas that burned at low to moderate severity to determine the potential for cone production and whitebark regeneration within the perimeters of both of these fires.

3. Design/ Construction Specification(s):

Conduct short-term monitoring of whitebark pine in the burn area.

Monitoring protocols will be established and implemented in accordance with current management plans. Monitoring should be designed to give a general estimate.

4. Purpose of Treatment Specifications: Whitebark pine trees are a critically important component of this forest, particularly for wildlife habitat and as a food source for grizzly bears. The objective of this specification is to monitor treatment effectiveness of re-established whitebark pine and survival of existing whitebark pine trees in burned areas. Data gathered will be used to determine the effectiveness of revegetation treatment as well as the need and potential for cone collection or planting of whitebark pine to protect native plant diversity and ecological integrity of the plant communities in the burned area.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
2 GS 5/7 @ \$152/day for 10 days total (five 10 hr. days with a two person crew)	\$1520
TOTAL PERSONNEL SERVICE COST	\$ 1520

EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	

MATERIALS AND SUPPLIES (item @ cost/each X quantity X fiscal year = cost)	COST/ITEM

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

TOTAL MATERIALS AND SUPPLY COST	N/A

TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
GNP Crew Vehicle: \$.0365 x 100 miles x 5 round trips	\$183
TOTAL TRAVEL COST	\$183
CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
TOTAL CONTRACT COST	N/A

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-2004	hours	\$17.03	100	\$1703	ESR	P
TOTAL	hours	\$17.03	100	\$1703	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimate based upon government wage rates and materials cost	P, T
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

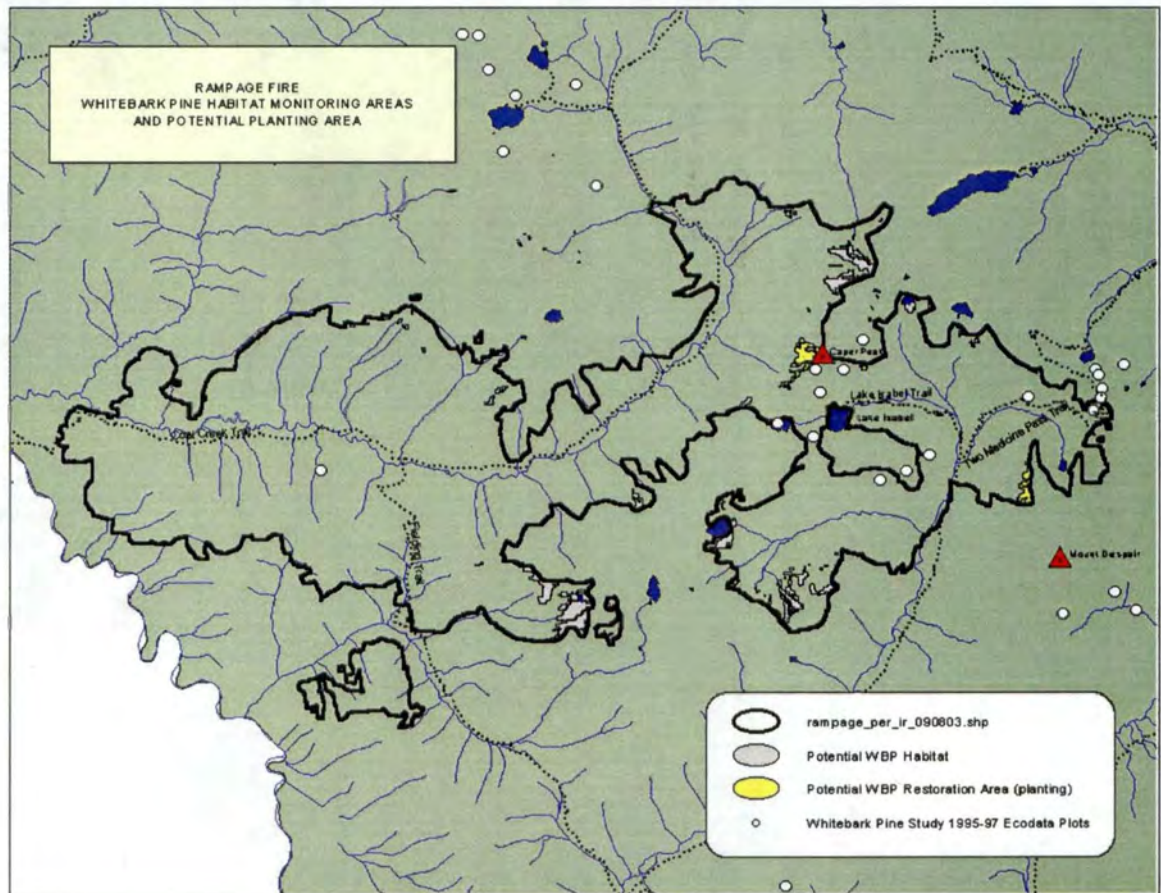
Appendix I : Vegetation Assessment; ESR Handbook 6.3.5
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VI. UNITS AND COSTS BY JURISDICTION

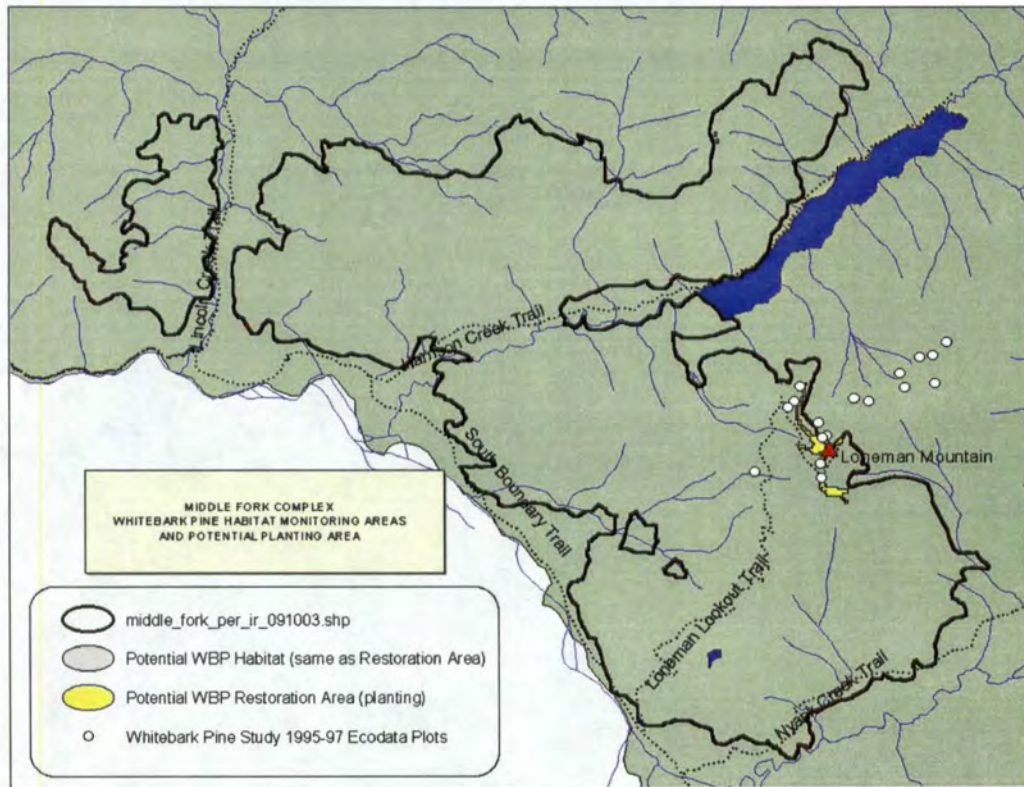
JURISDICTION	UNITS TREATED	COST
		\$ 1703

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

NPS - GNP	100	
TOTAL COST	100	\$ 1703



INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT



**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

M- 3 MONITOR FOR POST-FIRE SOIL EROSION SPECIFICATION

SPECIFICATION TITLE	M- 3 Monitor for Post-fire Soil Erosion	JURISDICTIONS	NPS - GNP
2501- PART	n/a	FISCAL YEAR	2004
ESR REFERENCE	6.3.5 Monitoring	SPECIFICATION TYPE	ES

I. WORK TO BE DONE

1. General Description:

Monitor to determine success of natural vegetation regeneration and measure any associated soil erosion on several (12-14) *high burn severity* units where grass seeding and/or slope stabilization was not prescribed on park lands. Because natural revegetation with little or no human intervention or manipulation is the standard prescription on the majority of park lands burned during a wildland fire event, monitoring of the native vegetation re-establishment, potential exotic plant invasion and the levels of soil erosion associated with those sites will provide critical data to support the premise that this is the most reasonable course of action given the recommended wilderness status of the affected lands. This monitoring will provide meaningful data to measure the level of degradation resulting from a high burn severity to the soil and seed bank resources. If monitoring results determine erosion levels are unacceptable, soil stabilization measures will be implemented or potential safety hazard zones will be closed to public access until the hazard level is reduced.

2. Location (Suitable) Sites:

Conduct a series of vegetation and soil erosion transects on *high burn severity* areas on the flanks of Lake Isabel Cirque above the Lake Isabel Campground and on the slopes directly above Coal Creek Campground.

3. Design/Construction Specification(s): Monitoring transect shall be established and methodologies designed to provide sufficient information to:

- Determine the amount of post-fire plant ground cover on non-seeded high burn severity sites, using point-intersect transects.
- Determine the depth and aerial extent of surface soil erosion occurring on non-seeded high burn severity sites. Determine the risk of eroded soil material entering Coal Creek and Lake Isabel and creating a flooding event or debris flow that would pose a threat to the safety of visitors utilizing either of these campsites.
- Sampling methodologies will be determined by local agency Ecologist/Biologist. Representative samples across high burn severity sites representing different plant communities, soil, and topographic situations. Photos should accompany data records documenting findings.
- A report shall be published that documents sampling methodologies, areas sampled, and summary of findings.
- Place 5 rain gages throughout the fire perimeter within areas identified for soil erosion potential monitoring. Place the rain gages at various elevational zones to record the rainfall events throughout the monitoring area.

4. Purpose of Treatment Specification: Fire is a natural process and as such, treatments are not generally prescribed for soil erosion and water shed protection on park lands, especially where no facilities are at risk. The Coal Creek drainage and the Upper Park Creek drainage burned extremely hot during the Rampage Fire resulting in high burn severity ratings. This monitoring will evaluate soil erosion and vegetation establishment/recovery after a lethal fire event, when no stabilization or revegetation treatment was applied. If monitoring results indicate that soil erosion is extensive and placing downstream resources in jeopardy, or presents a hazard to public safety, remedial stabilization and/or area closures will be implemented. This information will provide excellent data to support our hands-off strategies for fire in natural lands management, particularly in recommended wilderness areas, in contrast with adjacent land management agencies that take a more proactive approach to fire rehabilitation.

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour x hours = cost) Do not include contract personnel costs not on contract schedule	
GNP Restoration Biologist GS-11 @ \$35/hour x 40 hours	\$1400
GNP Ecologist GS - 11 @ \$35/hour X 40 hrs	\$1400
GNP Backcountry Ranger GS -5 @ \$13.50/hour x 40 hours	\$540
TOTAL PERSONNEL SERVICE COST	\$3340

EQUIPMENT PURCHASE, LEASE OR RENTAL (Item @ cost/hour or day x hours or days = cost) Do not include contract personnel costs not on contract schedule	
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	\$0

MATERIALS AND SUPPLIES (Item @ cost per unit x quantity = cost)	
Data recording rain gages @ \$160.00/gage X 8 gages =	\$1280.00
TOTAL MATERIALS AND SUPPLY COST	\$1280.00

TRAVEL (Personnel @ rate x number of days = cost)	
FOR Vehicle Mileage @ 100 miles/day x 6 days x \$.365/mile	\$220
TOTAL TRAVEL COST	\$220

CONTRACT COST (Labor, equipment, and travel @ cost/hour or day x hours or days = cost)	
TOTAL CONTRACT COST	\$0

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	NO OF UNITS	COST	FUNDING SOURCE	ATTENTION
FY-1	Surveys	2420	2	\$4,840	ESR	P
TOTAL	Surveys	2420	2	\$4,840	ESR	P

FUNDING SOURCES:

F = Fire Suppression Account

ESR = Emergency Stabilization & Rehabilitation

OP/O = Agency Operating or Other Account

EWP = Emergency Watershed Protection (NRCS)

SPECIFICATION TYPE

ES = Emergency Stabilization

R = Rehabilitation

FS = Fire Suppression

METHODS FOR COMPLETION:

P = Agency Personnel Services

C = Contract

EFC = Emergency Fire Contract

FC = Crew Labor Assigned to Fire

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

IV. SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources	
2. Documented cost figures from similar project work obtained from local agency resources	
3. Estimate supported by cost guides from independent sources or other federal agencies	P, T
4. Estimate based upon government wage rates and materials cost	
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services

M = Materials/Supplies

T = Travel

C = Contract

F = Fire Suppression

V. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN REPORT

List relevant documentation and cross-references within ESR Plan: Please refer to Vegetation and Watershed Assessment, and Watershed Treatment Map.

VI. UNITS AND COSTS BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
NPS - Glacier National Park		\$4,840
TOTAL COST		\$4,840

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT
APPENDIX I. RESOURCE ASSESSMENTS**

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

SOIL AND WATERSHED RESOURCE ASSESSMENT

**INTERAGENCY BURNED AREA EMERGENCY STABILIZATION & REHABILITATION
MIDDLE FORK AND RAMPAGE COMPLEXES, GLACIER NATIONAL PARK, MT**

SOIL AND WATERSHED RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess overall watershed changes caused by the fire, particularly those that pose substantial threats to human life and property, and critical ecosystems and cultural resources. This includes evaluating changes to soil conditions, hydrologic function, and watershed response to precipitation events.
- Identify the most critical soil and watershed areas and issues based on increased flood potential and loss of soil resources, and prescribe treatments, if necessary, to mitigate impacts and risks.
- Develop maps of watershed response and prescribed watershed treatments.
- Estimate the increased post-fire peak flows in several of the critical watersheds.
- Identify assessment and monitoring needs.

II. ISSUES

- Potential threats to campgrounds, cabins, and trails from potential increases in peak flows, debris torrents, and surface erosion. These include the Coal Creek Patrol Cabin, Coal Creek Campground, Lake Isabel Campground, and Upper Park Creek Campground and Patrol Cabin.
- Changes in water quality due to increased suspended sediment and ash, and increased soil erosion in the fire area.
- Impacts to aquatic species habitat including bull trout and native westslope cutthroat trout.

III. OBSERVATIONS

A. Background

1. Geology/Physiography, Vegetation and Climate

The burned areas are comprised of several landforms dominated by glacial processes. The lower elevation landforms include alluvial and glacial outwash deposits. Mid-elevations include moderately sloping glacial till hillslopes to glacial troughwalls and mountain slopes, with the highest elevations comprised of glacial cirques, basins, and alpine ridges. Geology of the Middle Fork Complex and Rampage Fires mainly includes Appekunny and Prichard Formations – undivided, till, and colluvium, with other formations comprising minor (<8%) portions of the fire area. The lowest elevation of the burned areas occurs at the Middle Fork of the Flathead River, (3,300 feet), with the highest elevations occurring on surrounding mountain peaks, including Mount Saint Nicholas at 9,376 feet in elevation.

Vegetation patterns follow elevation. The riparian areas in the low to mid-elevations include deciduous trees and shrubs. The majority of the burned area is covered by dense/mesic conifer forest, with the second most prevalent vegetation type being classified as open/dry conifer forest. Some mesic and dry herbaceous vegetation occurs within riparian areas, meadows, and alpine tundra.

Normal annual precipitation within Glacier National Park ranges from about 23 inches to 100 inches, varying mostly due to topography and elevation. December and January normally have the heaviest monthly precipitation with a secondary peak occurring in June. A large decrease typically follows in July, the driest month within Glacier, with a slight increase again in August. Between years, July - August totals at West Glacier have varied from 0.28 inch to 8.29 inches. Thunderstorms occur on an average of 5 to 7 days per month during June, July and August.

2. Soils

The information on soils was obtained from Soils of Glacier National Park (Land & Water Consulting 2000). A total of 15 soil map units occur within the Middle Fork Complex, but only 4 soil map units comprise at least 5 percent of the fire area each (Table 1). The Rampage Fire includes a total of 16 soil map units, with only 6 of those comprising at least 5 percent of the fire area each (Table 2). Soils that comprise less than 5 percent of the fire area are not described.

Table 1. Soil map units occurring within the Middle Fork Complex

Middle Fork Complex Soils			
MAP SYMBOL	Soil Name - Landform	Slope %	% of Burn
LC3/LC5	Deep and Moderately Deep Colluvial Forest Soils on Limestone – Cirque Basins and Lower Mountain Slopes	20-50	6
C3/C5	Deep and Moderately Deep Colluvial Forest Soils – Cirque Basins and Lower Mountain Slopes	20-50	9
G3/C3	Mixed Glacial and Colluvial Soils – Narrow Glaciated Valleys	15-45	14
G2	Silty Clay Loam Glacial Soils – Wide Glaciated Valley Bottoms	5-25	60

Table 2. Soil map units occurring within the Rampage Fire

Rampage Fire Soils			
MAP SYMBOL	Soil Name - Landform	Slope %	% of Burn
C5/C4	Moderately Deep and Shallow Colluvial Soils – Scoured Mountain Slopes and Trough Walls	25-60	6
C1/C4	Quartzite/Argillite Rock Outcrop and Shallow Soils – Mountain Tops, Cirques, Ridges	10-70	6
LC3	Deep Colluvial Forest Soils on Limestone – Lower Mountain Slopes	25-60	8
C3/C5	Deep and Moderately Deep Colluvial Forest Soils – Cirque Basins and Lower Mountain Slopes	20-50	12
G3/C3	Mixed Glacial and Colluvial Soils – Narrow Glaciated Valleys	15-45	23
C3	Deep Colluvial Forest Soils – Lower Mountain Slopes	25-60	36

The parent materials in valley bottoms include glacial till, glacial outwash, and glacial lacustrine deposits. The soils are typically moderately deep to shallow on the mountain sides, and deep on toe slopes and valley bottoms. Most soils have a volcanic ash surface layer with a silt loam texture, with coarse fragments ranging from 5 to 15 percent pebbles or gravels. Pre-fire, organic duff layers on forested soils were typically 1 to 3 inches on mountain slopes and ridgetops, and 5 to 8 inches thick on northern aspects at lower elevations. Surface soils contain many fine and very fine plant roots.

3. Hydrology, Stream Channel Morphology and Water Quality

The Middle Fork Complex and Rampage Fires are located within the Middle Fork of the Flathead River watershed. The Middle Fork of the Flathead River is a component of the National Wild and Scenic River System and has been designated as a "recreational" beneficial use along Glacier National Park (Glacier NP).

Three lakes and several major streams occur within the burned areas and include: Lake Isabel, Harrison Lake, Halfmoon Lake, Harrison Creek, Park Creek, Muir Creek, Coal Creek, Nyack Creek, and Lincoln Creek. Peak flows in the Middle Fork of the Flathead River and streams within the burned area generally occur in May and June in response to snowmelt runoff and springtime precipitation. A return to baseflows occurs in August, with a continuing decline to the lowest levels in the winter. The peak of record is associated with a June 7-8, 1964 storm and flooding. A peak flow of approximately 140,000 ft³/sec occurred on the Middle Fork of the Flathead River near West Glacier.

Fisheries and stream channel surveys were conducted on Coal Creek (Coal Creek Drainage Fisheries Report on file at Glacier NP) in 1981. The Reach 1 of Coal Creek (junction with the Middle Fork of the Flathead River to approximately 4.8 km upstream) is dominated by a boulder

substrate, a stream gradient of approximately 2.4% and an average valley width of 100 meters. Reach 2 of Coal Creek (between 4.8 km and 18.7 km from the confluence with the Middle Fork of the Flathead River) is dominated by a cobble substrate. The substrate composition of Reach 2 was noted as having "excellent spawning habitat for the species present, and spawning by adfluvial bull trout and resident brook trout has been documented". Many large pools were present in Reach 2 and pools contained 90% fines and gravels. Average valley width was measured at 100 meters in Reach 2. Reach 3 of Coal Creek (between 18.7 km and 25.7 km from the confluence with the Middle Fork of the Flathead River) is dominated by a cobble substrate. Several migration barriers were present above stream km 20 that formed partial migration barriers. A higher gradient section containing several chute falls that formed a complete migration barrier was noted at km 25.5.

Aerial and ground reconnaissance of the streams within the burned area revealed a relatively high frequency of slope failures caused by lateral migration of stream channels and the presence of mid-channel bars. The mid-channel bars indicate that the stream power is not sufficient to carry the bedload. The most likely recent source of the bedload imbalance is the 1964 flood event.

Water quality in the lakes and streams within and downstream of the burned area is excellent. However, the lakes within and downstream of the burned area are very sensitive to changes in nutrient inputs. Eutrophication can occur in these lakes with small changes in nutrient inputs (Ellis et al 1992). The soluble forms of N and P are very important because they generally control plant growth in lakes. The relative trophic state of any lake is usually expressed in terms of its total N and P concentrations; lakes with N:P greater than 18:1 are generally referred to as phosphorus limited. Ellis et al (1992) found that lakes in Glacier NP in general contained very little P relative to N thus any abnormal input of P could cause an immediate stimulus of autotrophic productivity.

4. Aquatics

Two of the lakes within the Middle Fork Complex and Rampage Fire contain bull trout: Harrison Lake and Lake Isabel. All streams within the burned areas contain bull trout. In addition, the above mentioned lakes and streams contain native westslope cutthroat trout, a state listed "species of special concern".

B. Reconnaissance Methodology

Emergency watershed conditions include both hydrologic and soil factors; typically the potential for increased flooding and sedimentation and deterioration of soil condition, particularly loss of soil cover, leading to erosion and a decline in soil productivity.

Burned area evaluations included:

- Fire-caused changes in soil properties and hydrologic function;
- Verifying the Burned Area Reflectance Classification map;
- Conditions of sediment source areas and erosion potential; and
- Threats to life, property, and natural resources.

A Burned Area Reflectance Classification (BARC) is a satellite derived map of post-fire condition. The BARC has four classes: high, moderate, low, and unburned. The BARC map was compared to maps produced by helicopter reconnaissance (aerially mapped by Dean Sirucek, Flathead National Forest) and verified by field visits to produce the final Watershed Response Map. This map, along with soil burn severity findings, becomes a basis to predict the hydrologic response of the watersheds and rates of erosion.

Six points identifying soil burn severity and watershed response conditions were recorded in the field using a Trimble GPS – these points coincide with Composite Burn Index plots established by Glacier NP already in place before the fires so pre-fire data was available to compare to post-fire conditions. Digital photos were taken at each point. An Arcview GIS shapefile with the GPS

points and corresponding digital photos has been saved to a CD-ROM. Field determination of soil burn severity and watershed response at each point was compared with the BARC map to produce a final Watershed Response Map.

1. Soil Burn Severity

Soil burn severity is not the same concept as fire intensity and fire severity as recognized by fire behavior specialists. Fire intensity and fire severity relate to fire behavior and fire effects on overstory and understory vegetation, respectively; while soil burn severity relates specifically to effects of the fire on soil conditions and hydrologic function (e.g., amount of surface litter and duff, erodibility, changes to soil structure, infiltration rate, runoff response). Although soil burn severity is not primarily a reflection of fire effects on vegetation, vegetative conditions and pre-fire vegetation density are among the indicators used to assess soil burn severity.

In some cases there may be complete consumption of vegetation by fire, with little effect on soil and watershed function. In general, the denser the pre-fire vegetation and the longer the residence time, the more severe the effects of the fire are on soil hydrologic function. For example, deep ash after a fire usually indicates a deeper litter layer prior to the fire, which generally supports longer residence times. Increased residence time often promotes the formation of water repellent layers at or near the soil surface, and loss of soil structural stability. The results are increased runoff and soil particle detachment by water and transport off-site.

Soil burn severity parameters include changes in litter and duff (vegetative ground cover), loss of soil structure, destruction of fine and very fine roots in the surface horizon, and development of hydrophobic (water repellent) soil surfaces. Changes in vegetative and litter/duff ground cover as affected by the fire were noted and compared to pre-fire conditions. Water repellency was evaluated by observing the depth and thickness of a water repellent horizon in surface soils using an infiltrometer.

2. Soil Erosion

Erosion potential was calculated in annual tons/acre/year using the Revised Universal Soil Loss Equation (RUSLE) in a spatially-based ArcView model. The Glacier National Park GIS soils and vegetation layers were used in conjunction with information from the Soils of Glacier National Park (Land & Water Consulting 2000) for soil data.

$$\text{The RUSLE equation: } A = R * K * LS * C$$

A is the on-site soil loss expected in tons/acre/year, R is the rainfall factor, K is the soil erodibility value, LS is the slope factor accounting for slope length and step effect, and C is the cover factor. An ArcView spatial model (30 meter grid cell size) was run to model erosion potential within the fire. The model runs a user-specified precipitation event to predict erosion for one hour storm durations based on NRCS storm distribution types (NRCS 1986) – for the Middle Fork Complex and Rampage Fires, the precipitation event used was a 2 year 1 hour storm (0.44 inches). The other RUSLE inputs are incorporated spatially using a 30 meter Digital Elevation Model (DEM) for the LS factor and by calculating C factors for each different vegetation type in conjunction with soil burn severity (i.e., a polygon of conifer forest classified as moderate severity is attributed with a different cover factor than a polygon of conifer forest in high severity).

3. Watershed Response

The major determining factor influencing runoff and erosion from burned hillslopes is the amount of disturbance to the forest floor that protects the underlying mineral soil (Robichaud 2000). The unburned forest floor consists of a litter layer (leaves, needles, fine twigs, bark flakes, matted dead grass, mosses and lichens, O1 soil horizon) and a duff layer (partially decomposed remnants of the material in the litter layer, O2 soil horizon) (Martin and Moody 2001). These layers absorb most of the rainfall, provide storage of water and obstruct the flow of water on hillslopes. The combustion process converts the forest floor into ash and charcoal. Ash and small soil particles seal soil pores (Morin and Banyamini 1977, Neary et al. 1999), decreasing the infiltration rate (Fuller et al. 1995, Barfield et al. 1981) and increasing potential runoff and erosion.

When the charcoal and ash are removed from the hillslope by post-fire runoff or wind, the soil is left bare and susceptible to rain splash and overland flow.

Overland flow occurs as a result of rainfall in excess of soil infiltration capacity and the storage capacity of depressions. On the unburned forest floor, overland flow follows a myriad of interlinking flow paths that constantly change as organic material (litter and duff layers) and inorganic material (rock) are encountered (Huggins and Burney 1982). Consumption of the forest floor by fire alters the path of overland flow resulting in a reduction in the overall length of the flow path resulting in a concentration of flow into a shorter flow path. This concentration of overland flow increases the hydraulic energy of the flow and can result in rill erosion. At the watershed scale the reduction of hillslope flow path lengths and the formation of rills that have a high water conveyance capacity reduces times of concentration or the amount of time for overland flow to reach a defined point within the watershed.

Overland flow is also influenced by fire induced water repellency of soils. The reduction of infiltration due to water repellency can increase overland flow (DeBano et al. 1967). Infiltration curves for water repellent soils reflect increasing wettability over time once the soil is placed in contact with water. Infiltration increases with time because the hydrophobic substances responsible for water repellency are slightly water soluble and slowly dissolve, thereby increasing wettability. In general, water repellency is broken up or is sufficiently washed away within one to two years after a fire (Robichaud, 2000).

Raindrops striking exposed mineral soil with sufficient force can dislodge soil particles and small aggregates. Vegetation and the forest floor generally protect the soil from raindrop splash erosion. Once soil particles are detached by splash erosion they are more easily transported in overland flow. Surface erosion is defined as the movement of individual soil particles by a force, and is initiated by the planar removal of material from the soil surface (sheet erosion) or by concentrated removal of material in a downslope direction (rill erosion). Surface erosion is a function of four factors: 1) susceptibility of the soil to detachment, 2) magnitude of external forces (raindrop impact or overland flow), 3) the amount of protection available by material that reduces the magnitude of the external force, and 4) the management of the soil that makes it less susceptible to erosion (Foster 1982, Megahan 1986).

The Watershed Response Map includes three classifications - low, moderate, and high. The watershed response classes are based upon the primary factor driving watershed response - the condition of the forest floor and the condition of the canopy. The classes are as follows:

Low watershed response	<30% mineral soil, ash and rock >1 inch and >70% canopy intact
Moderate watershed response	30%-70% mineral soil, ash and rock >1 inch 30%-70% canopy intact
High watershed response	>70% mineral soil, ash and rock >1 inch <30% canopy intact

4. Pre and Post-fire Flow and Sediment Delivery Modeling

Flow Modeling

Previous BAER assessments for fires within the Flathead National Forest (Flathead NF) and Glacier NP (Robert Fire and Wedge Canyon Fire) utilized a snowmelt runoff model and a peak flow model based on average annual precipitation. Although recorded peak flows in the analysis watersheds are generally in response to snowmelt, most post-fire peak flow increases that have the potential to damage life and property or adversely affect aquatic species and their habitats are the result of short duration, high intensity thunderstorms. For streams within and downstream of the burned area, late spring to early summer thunderstorms or long duration frontal events that occur during the latter stages of snowmelt or soon after snowmelt has ended have the highest probability of producing damaging peak flows. The reasons for this are twofold: (1) recovery of the vegetation is in the initial stage and little if any ground cover is provided by grasses and forbs

that are expected to recover, and (2) soils will most likely be at or near field capacity due to snowmelt infiltration and any additional precipitation will runoff as overland flow. Peak flows and debris flows that occurred on the Bitterroot National Forest after the fires of 2000 and on Overwhich Creek on the Bitterroot National Forest in 1992 were in response to late spring-early summer short duration, high intensity precipitation events.

Pre and post-fire flows were modeled using a modified Rational Equation run in the ArcView software environment. The model has been used to calculate peak flows for fires ranging in size from 2,500 acres to 100,000 acres. The modified Rational Formula was originally intended to accurately calculate peak flows for watersheds up to 640 acres in size. The primary reasons for the size limitation of the modified Rational Formula are the assumption that rainfall is distributed equally over the entire watershed and the lack of a flow routing component. This model has accurately predicted post-fire flows for watersheds up to 5,000 acres in size. Absolute peak flow values for watershed greater than 5,000 acres should be used with caution, however the increase in post-fire peak flows relative to pre-fire peak flows for watersheds greater than 5,000 acres can be used to evaluate post-fire flow conditions.

The peak flow rate is calculated using the following equation:

$$Q = C' I A$$

Q = peak flow rate (cubic feet per second)

I = rainfall intensity (inches per hour)

C' = runoff coefficient calculated as described below (dimensionless)

A = drainage area (acres)

Rainfall Intensity

Input as a grid of rainfall intensity for the desired return interval and duration. For the Rampage Fire and Middle Fork Complex analyses, the 2yr 1 hour (0.44 inches), 10 yr 1 hour (0.65 inches), 25yr 1 hour (0.75 inches), 2yr 6hr (1.0 inches) and the 2yr 24 hour (2.0 inches) storm events were modeled. The storm event precipitation values were calculated using procedures described in the NOAA Rainfall Frequency Atlas 2, Volume I, Montana.

Time of Concentration

$$T_c = 0.60 \times T_L$$

where:

T_c = the time of concentration (hours)

T_L = the lag time (hours)

Lag time is calculated using the following method developed by the Natural Resources Conservation Service:

$$T_L = (L^{0.8} (S_c + 1)^{0.7}) / (1900 \times S^{0.5})$$

where:

T_L = lag time (hours)

L = greatest flow length in watershed (feet)

S_c = Storage coefficient = 1000/CN - 10 (inches)

CN = Curve number

S = Average watershed slope (percent)

Flow length and average watershed slope are calculated from the DEM and grids derived from the DEM. Curve number is input as a grid.

Runoff Coefficient

$$C' = C + C_s + C_i$$

$$C_s = ((0.8 - C) [\ln(S - 1)] S^{0.5}) / 56$$

$$C_i = \frac{1}{e^i} [0.80 - (C + C_s) \times [1 - 1 + \ln(i + 1)]]$$

where:

C' = runoff coefficient

C = base runoff coefficient

C_s = slope adjustment factor

C_i = rainfall intensity adjustment factor

S = average ground slope of the incremental drainage (percent)

i = rainfall intensity (inches/hour)

The slope adjustment factor accounts for the fact that steeper slopes generate higher flows than shallow slopes. The intensity factor accounts for more intense storms producing more runoff.

The pre-fire and post-fire CN were selected from a CN table based on vegetation types within the Rampage and Middle Fork Complex Fires (Appendix III - Curve Numbers). Unburned runoff coefficients in Table 3 are based upon the unburned runoff coefficient (0.1) in Table 4. The unburned coefficient was derived from a conifer vegetation type and all other runoff coefficients are relative to the unburned conifer condition.

The post-fire runoff coefficients (Table 4) used in the model were determined from research conducted at experimental plots in the Bitterroot National Forest (Robichaud 2000). Hydraulic conductivity rates in mm/hr were measured from simulated rainfall events applied several days after a prescribed burn. The simulator rained at a rate of 94 mm/hr on randomly located one meter square plots on natural (unburned), low severity, high severity, and high severity plus strongly hydrophobic soil plots, with three replications. Hydraulic conductivity rates (K) were reported as a range of values but the lowest number in each range for varying burn severity type was used to calculate the runoff coefficient. K values were subtracted from the total simulated rainfall to determine the amount of runoff and then divided by the rainfall rate to calculate percent runoff. Moderately burned areas were extrapolated from the low and high severity values. The post-fire flow factor is a ratio of each severity type runoff rate (mm/hr) to the runoff rate of the unburned condition.

Table 3. Unburned Runoff Coefficients

Veg Name	Coefficient
Barren – rock/soil	0.7
Conifer forest – dense mesic, Conifer forest - open/dry	0.10
Deciduous tree/shrub	0.12
Dry herbaceous	0.18
Mesic herbaceous	0.15

Table 4. Post-fire Runoff Coefficients

Plot	K (mm/hr)	Runoff rate (mm/hr)	% Runoff / Runoff coefficient
Natural (unburned)	85	9	10/0.10
Low severity	60	34	36/0.36
Moderate severity	43	52	55/0.55
High severity with strong hydrophobicity	25	69	73/0.73

Flows were bulked to account for sediment and debris that could be entrained in the post-fire peak flows. Although other BAER assessments completed for fires on the Flathead NF and Glacier NP assumed that flows would not be bulked (Robert Fire and Wedge Canyon Fire), several avalanche chutes within the Middle Fork Complex and Rampage Fire are within areas of high watershed response. Most of the vegetation that was present in inactive avalanche chutes has been removed and the chutes are loaded with large woody debris and boulders that could be entrained in snowmelt or runoff in response to short duration, high intensity precipitation events. Post-fire peak flows were increased 70% for areas of high watershed response. Moderate watershed response area flows were increased 50% and low watershed response areas were increased 20%. The bulking equation is as follows:

Post-fire peak flow (cfs) + (Post-fire peak flow (cfs) x % of high watershed response area x 0.7) + (Post-fire peak flow (cfs) x % of high watershed response area x 0.5) + (Post-fire peak flow (cfs) x % of high watershed response area x 0.2)

Pre and post-fire flows were modeled for four watersheds in the Middle Fork Complex and three watersheds in the Rampage Fire (Analysis Watersheds Map).

Sediment Delivery Modeling

Sediment delivery was calculated for watersheds by creating a stream layer using a 30 meter DEM and buffering each stream segment with four 50 meter buffers. The buffers were then intersected with the watershed boundaries to determine the total buffer area in acres for each watershed. The erosion potential grid created by the RUSLE spatial model was analyzed to determine the sum of erosion potential in tons/acre/year for each buffer class within a watershed. The following delivery coefficients were then applied to each erosion potential sum within each buffer class in a watershed:

Buffer Distance	Delivery Coefficient
0 to 50 meters	0.80
50 to 100 meters	0.25
100 to 150 meters	0.15
150 to 200 meters	0.05

C. Findings

1. Soil Burn Severity and Watershed Response

All watersheds burned in a mosaic of fire intensity and severity that are reflected on the Watershed Response Map as classes of low, moderate, and high watershed response. Photos showing low, moderate and high watershed response and soil burn severity within the Rampage Fire and Middle Fork Complex are included at the end of the Watershed Assessment.

Watershed response and soil burn severity were combined into one map: Based on discussions with local soil scientist Dean Sirucek of the Flathead NF, knowledge of the soils within the fires, and field visits, the soil burn severity throughout the fires was determined to be mostly moderate and low. In areas interpreted as high watershed response, the soil burn severity was observed to be within the limits of the moderate soil burn severity class. Areas mapped as moderate watershed response typically have a moderate to low soil burn severity. Therefore, while above ground effects to the vegetation and removal of litter/duff may have been high as indicated on the Watershed Response Map, the soils in these areas typically were not heated enough to destroy the soil structure, seedbank, or roots, and remain relatively similar to their pre-fire condition from an ecological perspective. Infiltration rates ranged between 0 and 10 ml in a three minute period in areas of low and moderate soil burn severity. These rates were not significantly different than natural infiltration rates measured on unburned soils adjacent to the burned area, indicating that little to no water repellency occurred a result of the fire. In areas of low soil burn severity, the soil

structure was not altered and roots remain alive. Vegetation communities are expected to recover rapidly in areas of low and moderate soil burn severity.

Table 5 displays a summary of watershed response acres by class for the Rampage Fire and Middle Fork Complex. For spatial distribution of watershed response classes please refer to the Watershed Response Map. Table 6 displays a summary of watershed response classes by watershed – see the Analysis Watersheds Map for locations of the watersheds.

Table 5. Watershed Response

Middle Fork Complex		
Watershed Response	Acres	Percent
Unburned	2	<1
Low	8,746	84
Moderate	1,047	10
High	674	6
TOTAL	10,469	100

Rampage Fire		
Watershed Response	Acres	Percent
Unburned	243	1
Low	9,611	45
Moderate	5,884	28
High	5,623	26
TOTAL	21,361	100

Table 6. Watershed Response by Watershed

Watershed	Acres	High Watershed Response	Moderate Watershed Response	Low Watershed Response	Burned	Unburned
Unnamed Middle Fork Tributary	1,723	8%	6%	83%	97%	3%
Muir Creek	8,700	5%	5%	18%	28%	72%
Harrison Creek	17,316	1%	2%	18%	21%	79%
Lincoln Creek	22,716	0%	1%	6%	7%	93%
Nyack Creek	23,062	1%	1%	7%	9%	91%
Park Creek	25,210	6%	8%	9%	23%	77%
Coal Creek	36,014	10%	9%	14%	33%	67%

2. Erosion Potential

Rill, gully and sheet erosion are expected to occur at increased rates due to the fire. Pre-fire vegetation and duff/litter layers played an important role in infiltration, both factors in reducing pre-fire overland flow and erosion. Soils mapped as high watershed response and moderate soil burn severity have an increased potential for raindrop splash erosion due to the consumption of protective groundcover by the fire. Sediment generated from moderate and high watershed

response slopes has the potential to be delivered to stream channels within and downstream of the burned areas. The probability of a storm event (intense short duration thunderstorm) that would cause detrimental soil loss is relatively low. Although past fires in the Flathead NF and Glacier NP have not resulted in detrimental soil loss (Moose Fire 2001 and Red Bench Fire 1988) these fires occurred in areas with relatively gentle terrain. Little surface erosion was observed following the Red Bench Fire (Spencer et al, in press) due in part to reduced winter snowpack and a lack of heavy rains, and as a result burned areas revegetated quickly.

Ash, fine sediment and organic matter will be mobilized during rain events and carried off-site and will result in a net loss of nutrients to the soils. However, ash that remains on the soil will replace some of the nutrients lost by consumption of organic matter and removal of topsoil by erosion. A short term increase in soil pH is likely where ash is incorporated into soils.

The results of the RUSLE model are presented on the Erosion Potential Map. The majority of the fire area before the burn experienced erosion rates of less than 1 ton per acre annually, with maximum erosion rates of 1.8 tons/acre/year (Table 7). Post-fire maximum erosion rates were greatest in areas mapped as high watershed response occurring on steep slopes (Erosion Potential Map), and have the potential to be as high as 40 tons/acre/year in those areas. Although litter/duff and canopy were consumed in areas of high watershed response, these areas can be expected to begin revegetating in the next growing season, spring 2004, which will provide groundcover that will reduce the potential for erosion. The amount of revegetation is dependent on variables such as climate, but the fact that most areas within both the Middle Fork Complex and Rampage Fire experienced only moderate soil burn severity is a good indication that the seed bank and the soil's ability to support vegetation remains viable. Erosion potential was also modeled assuming 30% groundcover on areas mapped as high and moderate watershed response (Table 7). A 30% groundcover is predicted one year after the fire based on vegetative recovery of past fires on the Flathead NF and Glacier NP.

Table 7. Erosion Potential by Watershed

Watershed Name	Erosion in tons/acre/year					
	Pre Fire Maximum*	Pre Fire Average	Post Fire Maximum*	Post Fire Average	1 yr after fire Maximum*	1 yr after fire Average
Lincoln Creek	1.81	0.04	23.19	0.07	7.35	0.06
Harrison Creek	1.30	0.06	31.70	0.29	10.05	0.15
Unnamed Middle Fork Tributary	0.91	0.02	26.38	1.24	8.36	0.47
Nyack Creek	1.61	0.06	32.22	0.20	10.24	0.12
Muir Creek	1.17	0.05	29.55	0.48	9.37	0.21
Coal Creek	1.73	0.06	39.07	0.96	12.59	0.37
Park Creek	1.51	0.06	38.74	0.65	12.28	0.27

Note 1: 1 year after fire assumes a 30% groundcover established over areas mapped as moderate and high watershed response.

Note 2: Please refer to Analysis Watersheds Map for watershed locations and the Erosion Potential Map for spatial distribution of erosion.

* "Maximum" is the greatest rate of erosion on any 1-acre area within a watershed.

3. Flow and Sediment Delivery Modeling Results

Pre-fire and post-fire watershed parameters that influence peak runoff are shown in Table 8 - Watershed Parameters. An analysis comparing pre-fire and post-fire peak flows is shown in Table 9a-9e and the results of the sediment delivery modeling are shown in Table 11. These tables illustrate predicted fire changes in peak runoff and sediment delivery that could result from burned hillslopes. Peak flow increases will decrease as hillslopes revegetate, increasing percent ground cover and providing organic matter to the forest floor that will gradually increase soil infiltration capacity and hillslope roughness. Initial grass and forb recovery will provide increased

ground cover in mid to late summer of 2004. Formation of duff and litter layers and canopy conditions similar to the pre-fire forest environment will take several decades. Table 10 shows the probability that a rainfall event of a specific return interval will occur within the next three years.

The results of the flow and sediment delivery modeling and field observations indicate that peak flow, sediment delivery and deposition and water quality effects include: 1) an initial flush of ash producing localized and downstream changes in water quality and localized fish kills with snowmelt runoff and late spring to early summer 2004 precipitation; 2) fine sediment deposition in pools and spawning gravels, 3) increases in peak flows resulting in increased mass wasting of inner gorge areas and stream banks, and 4) increases in the scouring of avalanche chutes and the origination of debris torrents in avalanche chutes. Measurable increases in peak flows and sediment delivery and deposition due to post-fire vegetation and forest floor conditions are expected to occur for several years after the fire.

Sediment, ash and debris delivered to the intermittent and ephemeral stream channels within the fire area could be transported to Middle Fork of the Flathead River resulting in temporary increases in suspended and dissolved solid concentrations in the Middle Fork of the Flathead River. Nutrients adsorbed to the fine sediments, such as P, could contribute an increase in P concentrations Harrison, Halfmoon and Isabel Lakes.

Table 8. Watershed Parameters

Watershed	Acres	Pre-Fire Time of Concentration (hrs)	Post-Fire Time of Concentration (hrs)	Average Slope %	Pre-Fire Average Curve Number	Post-Fire Average Curve Number	Pre-Fire Average Runoff Coefficient	Post-Fire Average Runoff Coefficient
Unnamed Middle Fork Tributary	1,723	1.3	1.1	29	68	76	0.10	0.39
Muir Creek	8,700	2.9	2.7	47	57	61	0.15	0.24
Harrison Creek	17,316	3.9	3.7	57	56	58	0.16	0.22
Lincoln Creek	22,716	3.9	3.8	42	62	63	0.14	0.16
Nyack Creek	23,062	4.5	4.4	48	56	57	0.14	0.17
Park Creek	25,210	4.1	3.7	56	60	64	0.21	0.29
Coal Creek	36,014	5.0	4.2	57	57	64	0.19	0.32

Table 9a. Peak Flow Analysis

Watershed	Acres	Pre-Fire 2yr1hr Discharge (cfs)	Post-Fire 2yr1hr Discharge (cfs)	2yr1hr Bulk Flow (cfs)	Increase in 2yr 1hr Discharge	Increase in 2yr 1hr Bulk Flow
Unnamed Middle Fork Tributary	1,723	249	397	496	60%	100%
Muir Creek	8,700	1,751	1,939	2,122	11%	21%
Harrison Creek	17,316	3,895	4,104	4,324	5%	11%
Lincoln Creek	22,716	4,275	4,384	4,457	3%	4%
Nyack Creek	23,062	4,639	4,792	4,922	3%	6%
Park Creek	25,210	5,877	6,298	6,932	7%	18%
Coal Creek	36,014	8,296	9,235	10,557	11%	27%

Table 9b. Peak Flow Analysis

Watershed	Acres	Pre-Fire 10yr1hr Discharge (cfs)	Post-Fire 10yr1hr Discharge (cfs)	10yr1hr Bulked Flow (cfs)	Increase in 10 yr 1hr Discharge	Increase in 10 yr 1hr Bulked Flow
Unnamed Middle Fork Tributary	1,723	375	591	739	58%	97%
Muir Creek	8,700	2,614	2,887	3,160	10%	21%
Harrison Creek	17,316	5,799	6,104	6,431	5%	11%
Lincoln Creek	22,716	6,392	6,550	6,659	2%	4%
Nyack Creek	23,062	6,924	7,147	7,341	3%	6%
Park Creek	25,210	8,743	9,357	10,299	7%	18%
Coal Creek	36,014	12,346	13,712	15,676	11%	27%

Table 9c. Peak Flow Analysis

Watershed	Acres	Pre-Fire 25yr1hr Discharge (cfs)	Post-Fire 25yr1hr Discharge (cfs)	25yr1hr Bulked Flow (cfs)	Increase in 25yr 1hr Discharge	Increase in 25yr 1hr Bulked Flow
Unnamed Middle Fork Tributary	1,723	438	685	856	56%	96%
Muir Creek	8,700	3,035	3,348	3,664	10%	21%
Harrison Creek	17,316	6,724	7,073	7,452	5%	11%
Lincoln Creek	22,716	7,431	7,612	7,738	2%	4%
Nyack Creek	23,062	8,041	8,296	8,522	3%	6%
Park Creek	25,210	10,132	10,834	11,926	7%	18%
Coal Creek	36,014	14,310	15,873	18,146	11%	27%

Table 9d. Peak Flow Analysis

Watershed	Acres	Pre-Fire 2yr6hr Discharge (cfs)	Post-Fire 2yr6hr Discharge (cfs)	2yr6hr Bulked Flow (cfs)	Increase in 2yr6hr Discharge	Increase in 2yr6hr Bulked Flow
Unnamed Middle Fork Tributary	1,723	93	150	187	61%	101%
Muir Creek	8,700	659	731	800	11%	21%
Harrison Creek	17,316	1,469	1,549	1,632	5%	11%
Lincoln Creek	22,716	1,608	1,650	1,677	3%	4%
Nyack Creek	23,062	1,747	1,805	1,854	3%	6%
Park Creek	25,210	2,217	2,378	2,617	7%	18%
Coal Creek	36,014	3,129	3,488	3,987	11%	27%

Table 9e. Peak Flow Analysis

Watershed	Acres	Pre-Fire 2yr24hr Discharge (cfs)	Post-Fire 2yr24hr Discharge (cfs)	2yr24hr Bulked Flow (cfs)	Increase in 2yr24hr Discharge	Increase in 2yr24hr Bulked Flow
Unnamed Middle Fork Tributary	1,723	47	75	94	61%	101%
Muir Creek	8,700	330	365	400	11%	21%
Harrison Creek	17,316	734	774	816	5%	11%
Lincoln Creek	22,716	804	824	838	3%	4%
Nyack Creek	23,062	873	902	927	3%	6%
Park Creek	25,210	1,108	1,189	1,308	7%	18%
Coal Creek	36,014	1,564	1,743	1,993	11%	27%

Table 10. Three Year Storm Event Probabilities

2 Year Return Interval	5 Year Return Interval	10 Year Return Interval	25 Year Return Interval	50 Year Return Interval	100 Year Return Interval
88%	49%	27%	12%	6%	3%

Table 11. Sediment Delivery

Watershed Name	Sediment Delivery in cubic yards		
	Pre-fire	Post-fire	1 yr after fire
Coal Creek	490	25724	8774
Harrison Creek	218	1907	926
Lincoln Creek	47	244	179
Muir Creek	47	2140	813
Nyack Creek	163	1493	683
Park Creek	244	9852	3467
Unnamed Middle Fork Tributary	23	846	366

Note 1: 1 year after fire assumes a 30% groundcover established over areas mapped as moderate and high watershed response.

Note 2: Please refer to Analysis Watersheds Map for watershed locations.

4. Values at Risk

A. Threats to Life and Property

1. Coal Creek Patrol Cabin and Campground, Upper Park Creek Campground and Patrol Cabin, Lake Isabel Campground

Risk Process: Flooding, mud flows, debris torrents

Situation: Campgrounds and patrol cabins are located near the floodplains of Coal Creek and Park Creek and below burned hillslopes. Aerial and ground reconnaissance of these facilities and the results of the erosion and flow modeling indicate that these facilities will most likely not be damaged by flooding, mud flows or debris flows nor will campers be at risk by these processes if they occupy the campgrounds.

Recommendation: None

2. Lincoln Creek, Harrison Creek, South Boundary, Longman Lookout, Nyack Creek, Coal Creek, Fielding, Park Creek, Lake Isabel and Two Medicine Pass Trails

Risk Process: Surface erosion of trails, fluvial erosion of trail stream crossings

Situation: Increased overland flow above trails will result in increased erosion of trail surfaces and breaching of existing drainage structures (waterbars).

Recommendation: See Specification T-4 Install and Maintain Waterbars on Trails.

B. Threats to Natural Resources

1. Water Quality

Risk Process: Ash wash, increased suspended sediment/turbidity, increased nutrient loads

Situation: Ash wash, suspended sediment and turbidity will result in adverse changes in the water quality in the streams within and downstream of the burned area. These effects will be most pronounced in Coal Creek because sediment delivery due to surface erosion is expected to increase from a pre-fire level of 490 yd³ to 25,724 yd³. Sediment delivery due to debris torrents that originate in existing avalanche chutes and sediment created by fluvial erosion of avalanche chutes and streambanks was not estimated, however, predicted increases in peak flows will increase the frequency of mass wasting due to lateral migration of stream channels. Suspended sediment concentrations may reach lethal levels for aquatic species and result in fish kills in Coal Creek. Phosphorous adsorbed to suspended sediments will most likely result in temporary increases in soluble P and total P. Spencer et al (in press) found elevated levels of soluble reactive P in Bowman Creek and Quartz Creek after the Red Bench Fire of 1988. Increased P concentrations may result in localized increases in autotrophic productivity in Harrison and Halfmoon Lakes and Lake Isabel.

Recommendation: Most of the areas of moderate and high watershed response are on hillslopes that are inaccessible and are too steep for cost effective emergency stabilization measures (>60% slope) and changes in water quality will be temporary in nature.

2. Aquatic Habitat

Risk Process: Ash wash, increased sediment deposition, increased suspended sediment/turbidity

Situation: Ash wash, suspended sediment and turbidity will result in a reduction of water quality in the streams within and downstream of the burned area. These effects will be most pronounced in Coal Creek. Sediment delivery due to debris torrents that originate in existing avalanche chutes and sediment created by fluvial erosion of avalanche chutes and streambanks was not estimated, however, predicted increases in peak flows will increase the frequency of mass wasting due to lateral migration of stream channels. Sediment delivered to channels will decrease pool volumes and increase fine sediments in spawning gravels. Suspended sediment concentrations may reach lethal levels and result in fish kills in Coal Creek.

Recommendation: Although aquatic habitat will be degraded and fish kills may occur, fish populations should be able to find suitable refugia to maintain their viability.

3. Erosion and Loss of Soil Productivity

Risk Process: Raindrop splash, sheetwash, rill and gully erosion during precipitation events until effective groundcover is established in areas mapped as high and moderate watershed response.

Situation: Natural vegetation recovery (amount of plant cover, and time to reestablish) for these areas has not been highly impacted by damage to seed banks, soil structure, and nutrient redistribution. However, removal of groundcover and subsequent erosion will result in a loss of soil productivity that will take decades to return to pre-fire conditions. Factors affecting revegetation include: the loss of groundcover that can unfavorably alter the microclimate at the soil surface and leave soils bare and susceptible to erosion processes, loss of above ground seed sources, loss of nutrient input into soils due to consumption of organic matter (litter/duff), and potential for non-native and/or noxious weeds to outcompete native species.

Recommendation: Most of the areas of moderate and high watershed response are on hillslopes that are inaccessible and are too steep for cost effective emergency stabilization

measures (>60% slope) and recovery of natural vegetation is expected to begin stabilizing soils as well as cost-effective treatments could be expected to perform.

CONSULTATIONS

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Middle Fork and Rampage Complexes Watershed Photos



Mapping watershed response on the Rampage Fire – high watershed response in foreground due to changes in groundcover (removal of canopy and duff/litter layer).



Moderate watershed response and soil burn severity. Needle cast shown here provides some immediate post-fire cover.



Mosaic burn pattern around Lincoln Creek viewed from Middle Fork of Flathead River looking north.



High intensity burn indicating high watershed response in upper Coal Creek watershed.



View of high watershed response surrounding Lake Isabel (center of photo) and mosaic burn in foreground on east slopes of Vigil Peak.



Mosaic burn in Coal Creek watershed near Coal Creek Campground

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VEGETATION RESOURCE ASSESSMENT

I. OBJECTIVES

- Evaluate and assess fire impacts to vegetation resources, including threatened, endangered and sensitive plant species, and identify values at risk associated with vegetative changes and losses.
- Determine rehabilitation and monitoring needs supported by specifications to aid in vegetative recovery and soil stabilization efforts.
- Provide management recommendations to assist in vegetative recovery, prevent noxious weed spread, and protect or restore species of concern.

II. ISSUES

- Short and long-term fire impacts to plant communities and vegetative resources within the Middle Fork Complex and Rampage Fires on Glacier National Park lands.
- Impacts of vegetation loss to other resource values, including site productivity, wildlife habitat/forage (including Threatened and Endangered species), and watershed stability.
- Noxious weed encroachment and spread into the fire area through suppression efforts, ground disturbance, and fire effects.
- Loss of whitebark pine seed source and impacts to the ecological integrity of this high elevation forest plant community and keystone species.

III. OBSERVATIONS

A. Introduction

This report identifies and addresses known and potential impacts to vegetative resources within the Middle Fork Complex and Rampage Fires on Glacier National Park (GNP) lands. Findings and recommendations contained within this assessment are based upon information obtained from personal interviews with agency representatives and staff from the National Park Service, literature research, and field reviews of the fire area. Reconnaissance of impacted areas was conducted utilizing aerial and ground survey methods. This assessment will attempt to capture the concerns expressed by line officers, staff, and the general public for the future management of these lands; will detail the known damage to vegetative resources; will discuss revegetation needs and monitoring criteria; and will outline management considerations for recovery of the vegetative resources.

The Middle Fork Complex Fire perimeter has been reported at 11,851 acres and the Rampage Fire perimeter at 24,488 acres as of 9/17/03. Both fires are currently listed as 40% contained and in a monitoring status. An aerial reconnaissance on 9/21 revealed no current fire activity. Recent rains and cool weather have likely ended this fire event. Both fires are entirely within the boundaries of Glacier National Park. All lands affected by these fires lie within recommended wilderness zones of the Park and are managed as designated wilderness. These are road-less areas, however numerous trails, campgrounds, patrol cabins and one fire lookout are located within the fire perimeters. The Rampage fire lies within the Coal Creek drainage, the upper portion of the Park Creek drainage and includes the Lake Isabel Cirque and a portion of Two Medicine Pass trail up to the Continental Divide. The Middle Fork complex includes the Harrison Creek drainage, the eastern side of the Lincoln Creek drainage and a portion of the western edge of the Nyack Creek drainage. Both fires are bordered on the southwestern boundary by the South Boundary trail, the Middle Fork of the Flathead River and Montana Highway 2 East.

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B. General Vegetation Description of the Burn Areas

The Middle Fork Complex fire is separated from the Rampage fire by the Nyack and Pinchot Creek drainages. A distance of only 3.8 miles separate these two fires. Vegetation communities are very similar in both burns and consist almost exclusively of coniferous forest-dominated plant communities, with only minor areas of grass, forb or shrub species, rock or barren areas and occasional wet meadows along riparian corridors. The area is densely forested with fire-initiated, even-aged stands of lodgepole pine and western larch covering most of the area. The potential climax species are Engelmann spruce and subalpine fir, but frequent fires have limited the distribution of these species to scattered individuals and understory regeneration. Pockets of western red cedar/western hemlock habitat types persist in cool, moist sites along tributaries of the Middle Fork between Lincoln Creek and Nyack Creek. Douglas fir, black cottonwood, and paper birch are also scattered throughout the area. Understory vegetation in these lower montane forests include huckleberry, false huckleberry, buffaloberry, queencup beadlily, Oregon grape, pinegrass, arnica, beargrass, twinflower, and elk sedge.

With increased elevation, the vegetation becomes a cooler coniferous forest with an overstory comprised of subalpine fir, Engelmann spruce, lodgepole pine, and occasional Douglas fir and whitebark pine. There are isolated populations of subalpine larch on the upper slopes of Mt. St. Nicholas and Battelman Mountain. Vegetative resources throughout the burned area provided forage, cover and habitat for a wide variety of wildlife species including the Threatened and Endangered Species Bull Trout and Grizzly bear, as well as watershed protection, recreational and aesthetic values.

Table 1: Middle Fork Complex and Rampage Cover and pre-fire Vegetation structure class

Vegetation Structure Class	GNP acres
Water	96
Rock/barren	1,769
Nonforest/grass/shrub	1,454
Forest seedling/sapling (<40 years)	3,513
Intermediate Tree (< 150 years)	6,735
Mature forest (>150 – 200 yrs)	11,329
Older mature forest (>200 years)	9,844
TOTAL	36,339

Source of GNP data is "stand_se" GIS layer from GNP, based on Steve Barrett's Fire History analysis of GNP, 1990.

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Species at risk:

Whitebark pine (*Pinus albicaulis*) is considered a keystone species because it plays an important role in the structure of the ecosystem it inhabits. The cones are important food for the Federally Threatened grizzly bear and the mature trees influence vegetation patterns across the landscape by pioneering dry, cold, exposed sites, where they accumulate and retain snow, thus lengthening the snow melt period. The trees are also major components of areas of cultural and spiritual importance in the park (Carolin, 2000). Whitebark pine is recognized as a community/species at high risk to loss due primarily to the effects of white pine blister rust (*Cronartium ribicola*), an exotic disease. Native populations of this species have been decimated in recent decades, and programs to restore whitebark pine back into the high elevation ecosystems are being actively pursued by the National Park Service. Over 500 acres of potential whitebark pine habitat occur in the upper elevations of the Middle Fork Complex and Rampage fires. The fires burned at low to high severity across these areas, creating ideal conditions for natural regeneration, primarily via seed caching by the Clark's nutcracker. It is important to monitor the condition of any remaining whitebark for cone production and to reintroduce seedling whitebark to replace lost whitebark regeneration capabilities.

A second unique conifer species is found within the fire perimeter. Subalpine larch (*Larix lyallii*) occurs in isolated bands on the western flanks of Mt. St. Nicholas and Battlement Mountain. There is little recorded information about population distribution of this species or the effects of fire related to its resistance to various burn intensities or its cone production in response to fire. This fire will provide an excellent opportunity to observe this species under moderate and high burn severity conditions.

Fire Regimes

Fire History:	Rampage Fire	Middle Fork Complex Fire
	1720 – 4942 acres burned	1780 – 2673 acres burned
	1813 – 739 acres	1801 – 56 acres burned
	1910 – 3273 acres burned	1929 – 7171 acres burned
	1958 – 176 acres burned	2003 – 10,470 acres burned
	1984 – 361 acres burned	
	2003 - 21,363 acres burned	

The vast majority of the lands within the Middle Fork Complex and Rampage Fire area (70 - 80%) are in a lethal and mixed severity/infrequent fire regime (75-150+ year fire return interval). A lethal fire kills most (>80%) of the trees. Mixed severity fires are less severe, with higher proportions of tree survival and generally a more mosaic forest condition resulting after the fire. These types of fire regimes are associated with the dense forest types that develop on the mid and upper elevation habitats in this area. Cool/moist subalpine fir habitat types dominate (Pfister 1977), with larch, Douglas-fir and lodgepole pine as common seral species. Fires may not occur very frequently, but when they do they tend to be large and cause high amount of tree mortality. It is in years such as this (2003), with several years of drought and excessively dry soil and fuel conditions, that fires are most likely to occur in these moist forest types, given an ignition event (i.e. lightning) and favorable weather conditions.

C. General Vegetation Impacts and Expected Recovery

Vegetation burn severity was determined to be very similar to the Watershed Response mapping. Because of limited aerial reconnaissance and ground survey opportunity a separate map was not generated. Vegetation burn severity will be assumed to mimic Watershed Response categories. (see Watershed response map). Also refer to the soils and watershed response section of this BAER report for more information.

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Low vegetation burn severities exhibit relatively low tree mortality, as determined by the presence of blackened or brown scorched trees. Up to an estimated 30% of the trees are killed and there are often patches of unburned forest. However mortality may actually be higher due to the presence of less fire resistant tree species including subalpine fir and spruce, which may be easily girdled and killed by a relatively low intensity ground fire though their crowns may appear green for several months following the fire. In low burn severity areas, the degree to which shrubs and herbaceous vegetation under the forest canopy are affected varies considerably, but overall these sites experienced low degrees of soil heating, low to moderate duff reduction, and little to no mortality of root crowns and below ground parts. These forests may experience some change in species composition and structure, but not significant enough to change their successional status. A total of approximately 18,357 acres are rated as low within the recorded perimeters of these fires.

Moderate vegetation burn severities are highly variable. They are a complex mosaic of underburned areas, some with scorched trees and some pockets of crown fire. Underburned areas may have many green crowned trees, but unless they are larch or Douglas-fir they are very probably girdled and dead. It is estimated that 40-60% tree mortality has occurred in this mapping unit (however, the range can vary from 0 – 100%). They are defined as having 20-80% tree mortality (again, as determined by presence of blackened vegetation) in an irregular pattern across the area. Impact on ground vegetation is variable, but most of the understory vegetation has experienced some burning, though has not been completely consumed. Soil burn severity is low to moderate, with significant duff reduction in some areas. These forests will experience some change in species composition and structure, with much of the area reverting back to an early successional stage. An estimated 6930 acres are rated in this category.

High vegetation burn severity sites have experienced a stand replacing fire as typified by >80% tree mortality (usually 100%), often with total consumption of the tree crowns. The ground vegetation is completely burned as well, with moderate to high soil burn severity. These forests will completely revert to the earliest successional stage of development. Approximately 6,300 acres burned at this severity.

Table 3: Rampage Fire Vegetation Burn Severity (based on Watershed Shed Response Ratings)

Vegetation Burn Severity Class	Acres	Percent
Unburned	242	1%
Low burn severity: Burn Mosaic with <30% blackened	9,611	45%
Moderate burn severity: Burn Mosaic with 20-80% blackened	5,885	28%
High burn severity: >80% blackened	5,625	26%
TOTAL	21,363	100%

Table 4: Middle Fork Complex Fire Vegetation Burn Severity (based on Watershed Shed Response Ratings)

Vegetation Burn Severity Class	Acres	Percent
Unburned	2.2	.02%
Low burn severity: Burn Mosaic with <30% blackened	8,746	84%
Moderate burn severity: Burn Mosaic with 20-80% blackened	1,047	10%
High burn severity: >80% blackened	674	6%
TOTAL	10,469	100%

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Middle Fork Complex and Rampage Fires

Both of these fires burned at an intensity and pattern that represent no observable departure from natural, expected fire behavior in the affected forest types across this landscape. The fires were at both lethal and mixed severity, creating a highly variable mosaic pattern of tree mortality ranging from 100% killed trees to extensive unburned patches and individuals (refer to Watershed Response Map). Major fires burned smaller portions of the Middle Fork Complex and Rampage Fire areas in 1910, and 1929, which is within the expected fire return interval for these fire regimes. The 1958 Coal Creek fire and the Crystal Creek Fire of 1984 mostly burned over forests that had burned in 1929, and now have burned again in 2003. Some very mature forests appear to have been lost in the Rampage fire (235-255 yrs. age class). Burn severity on the soil appears to be primarily low to moderate, with a lesser percent (~ 20%) experiencing severe heating of the soil profile. The soils are excessively dry due to several years of drought. Deprived of some of the insulating effect of soil moisture, this has increased the severity of the burn into the soil profile over what might have occurred in a more "normal" year.

Coniferous species in the fire area vary in their response to fire, with some species more resistant to heat damage and crown scorch than others. In order for any tree to survive, some of the roots, cambium on the main trunk, and buds or foliage of a tree must survive the fire. In the fire areas, larch and Douglas-fir are the most fire-resistant trees. Larger islands, smaller patches and individual trees of these species have survived the fire and are scattered throughout the area. They will be an ongoing source of seed for reforestation of much of the area. Other trees that were severely scorched and killed by the fire still have viable cones that were not completely consumed. These include such fire sensitive species as spruce and subalpine fir, as well as scorched Douglas-fir and larch. Seedfall from these cones will contribute to reforestation of the area. Where lodgepole pine was present prior to the fire, regeneration of lodgepole is expected to be abundant with seed from serotinous cones opened by the heat of the fire.

The seeds of many shrubs and forbs can persist in the soil for years. A fire can open up an area to sunlight and warmth, stimulating germination of some of these seeds. Hard seeds with thick seed coats are ruptured by fire, allowing the seed to absorb water and germinate. Many plants are rhizomatous and regenerate readily from these roots after a fire. Other plants have root crowns just beneath the soil surface that are insulated from the heat of the fire and are able to re-establish from sprouts.

Due to severe drought conditions this year and over the past few years, surface and subsurface soil moisture levels have been depleted in this region. This has not only limited the moisture available for plant growth, but in some areas it has resulted in deeper heat penetration into the soil from the fire, resulting in higher mortality of the fine plant roots in the upper soil layers (refer also to Soils report). However, resprouting of shrubs and rhizomatous plants has already been observed in many areas within the fire, in spite of the severe drought, and it is expected that moisture levels will be adequate for natural recovery to proceed at an acceptable level in most of the fire affected area, especially by the second year after the fire. Evidence of this rapid vegetative response can be seen in the Moose Fire area, just to the north and west of these fires, that burned over in 2001.

An area of concern regarding regrowth exists on those areas burned at high severity for soils. Duff has been completely consumed; there are no above ground parts of plants left, and heating into the upper layers of soil has killed some of the small surface roots, root crowns, and undoubtedly some of the seed that may have been within the duff or upper soil layers. Though seeding from off-site plants will occur (such as fireweed), the ability of on-site vegetation to regrow has been severely impacted on these sites. The rate and amount of vegetative recovery is dependent on survival of existing plants and the amount of seeding from adjacent areas that may occur. In the short term, vegetation is expected to be slow to establish and spatially discontinuous, which is of most concern in the steeper slopes where erosion and sedimentation of streams is an issue. Over the long term, these areas are expected to develop a good vegetative cover.

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D. Noxious Weeds

Noxious weeds and invasive plant species pose a serious threat to the composition, structure, and function of native plant communities (Sheley and Petroff, 1999). Depending on burn severity and site potential, fire as a disturbance process has the potential to greatly exacerbate infestations of certain noxious weed species (FEIS, 2001). Soil disturbances resulting from all levels of burn severities in a wildfire incident and fire suppression related activities (hand lines, structure protection, drop spots, etc.) that cause vegetation and soil alteration provide the optimum conditions for noxious weed invasion. Dry site vegetation types and trail corridors are also extremely vulnerable.

The potential for accelerated invasion of noxious weed species throughout the Middle Fork Complex and Rampage fire perimeters is significant. Abundant pre-existing weed populations were likely impacted during fire suppression activities and some weed populations will be exacerbated by the effects of burn severity on native and exotic plant communities. Glacier National Park has had an active weed management program in place for the last thirteen years. Current infestations and treatments are carefully mapped each year. Weed populations greatly expanded during a similar fire event on park lands in the Moose fire of 2001. Aggressive noxious weed treatment and monitoring have been implemented to control those fire-related exotic plant populations. Data generated from that work certainly confirms the fact that fire and related impacts favor weed invasion and population expansion, and provides an excellent model to predict the effect this fire will have on existing weed populations with various burn severity ratings and different levels of ground disturbance.

Weed Species of Concern

The Middle Fork Complex and Rampage Fire perimeter is entirely within Flathead County. In accordance with the County Noxious Weed Control Act, Flathead County has designated a county noxious weed list, in addition to the State of Montana noxious weed list. A recent weed risk assessment project in the Northern Region of the U.S.F.S. (Mantas and Jones, 2001) has identified additional species that pose a threat to native plant communities. After assessing those species recognized by Flathead County, the State of Montana and information provided by Glacier National Park that includes location and treatment maps of known exotic plant species within the fire perimeter, a list was compiled of species of greatest concern with regards to impacts on ecosystem integrity for these fire areas (Table 1).

Table 1. Exotic plant species that pose the greatest threat and that can cause significant impacts to ecosystem integrity in the Middle Fork Complex and Rampage Fires. (Species in bold are those that were already known and established in the vicinity before the fire. The remaining species are not yet known from the area, but would be considered highly threatening if found.)

Scientific Name ¹	Common Name
Arctium minus	burdock
Bromus tectorum	cheatgrass
Centaurea biebersteinii (C. maculosa)	spotted knapweed
<i>Centaurea solstitialis</i>	yellow starthistle
<i>Chondrilla juncea</i>	rush skeletonweed
Cirsium arvense	Canada thistle
Cynoglossum officinale	hound's-tongue
Elymus repens	quackgrass
Hieracium aurantiacum	orange hawkweed
Hieracium cespitosum	meadow hawkweed complex

¹ Nomenclature follows the USDA Plants Database: USDA, NRCS 1999. The PLANTS database (<http://plants.usda.gov/plants>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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Scientific Name	Common Name
<i>Hypericum perforatum</i>	common St. John's-wort
<i>Leucanthemum vulgare</i>	ox-eye daisy
<i>Linaria dalmatica</i>	Dalmatian toadflax
<i>Linaria vulgaris</i>	yellow toadflax
<i>Melilotus officinalis</i>	yellow sweetclover
<i>Myriophyllum sibiricum</i>	Eurasian water milfoil
<i>Phalaris arundinacea</i>	reed canarygrass
<i>Potentilla recta</i>	sulphur cinquefoil
<i>Sonchus</i> spp.	perennial sowthistle
<i>Tanacetum vulgare</i>	common tansy
<i>Veronica officinalis</i>	common speedwell

Pre-burn Noxious Weed Condition

Glacier National Park has been conducting noxious weed inventories and treatment throughout the park for a number of years and maintains a detailed location and treatment database. Most of the exotic plant infestations within and adjacent to the fire perimeters occur along trail corridors, at most trailheads and stock loading ramps, in or adjacent to several campgrounds and adjacent to riparian corridors. The most abundant and widely distributed noxious weed species include spotted knapweed, St. John's-wort or goatweed, orange and meadow hawkweed, ox-eye daisy, and isolated patches of Canada thistle. Dalmatian toadflax is found along the flood plain and gravel bars of the Middle Fork of the Flathead River.

Response of Noxious Weeds to Fire

Vegetation response to fire is dependent on many factors. Each species must be assessed individually due to the great degree of variation in life history, morphology, phenology, ecology, and reproductive biology among species. Another key factor in assessing the response to fire is the severity of the burn, or heat transfer into the soil, which influences the degree of root mortality of pre-existing plants, and germination substrate for seeds. Following are some summarized notes on response to fire for the key species in the burned area taken from the U.S.D.A. Forest Service's Fire Effects Database and from the Nature Conservancy's Stewardship abstracts database. (Mantas, 2001)

Spotted knapweed – Often dense stands of knapweed have little surrounding vegetation, possibly due to allelopathy. Litter from the previous year's stems often decays or scatters during the current season, but it may accumulate in very dense stands and create more favorable burning conditions. Spotted knapweed probably resists low-severity fire because of its stout taproot. Spotted knapweed probably colonizes after fire from seeds buried in soil or from off-site sources. What we observed in the Moose Fire was that knapweed often grew in disturbed areas where there was a high bare soil component and little fuels. This being the case, plants were often not consumed by the fire.

Canada thistle - Response to fire varies from positive to negative, depending on season of burn, soil moisture, and location. Dormant season burning stimulates growth of native herbaceous species which compete with Canada thistle. Growing season fire damages native species as well as Canada thistle. After top-kill, plants resume growth from perennating buds located on the roots.

Leafy spurge – Top growth occurs and established plants quickly resprout after fire.

Yellow toadflax - The large, deep, root systems protect yellow toadflax from burning. In fact, areas that have been recently disturbed by fire are susceptible to increased toadflax infestation.

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Sulphur cinquefoil - Perennating buds may survive fire if they are beneath the soil surface, but the available literature does not specify the location of perennating buds in relation to soil surface nor their susceptibility to fire. Buried seed is probably undamaged by most fires.

These references indicate that for at least a few of the more common noxious weed species in the burn perimeter, fire can, and often will, stimulate growth and reproduction of pre-existing plants under certain conditions. This is even more so in lower severity burns because there is less root mortality. In more severely burned areas, plants may be killed, but germination substrate may become more favorable. Approximately 75% of the Watershed Response ratings (which correlates to burn severity) in the Rampage fire are listed as low to moderate, 93% for the Middle Fork Complex fires. This moderate burn severity coupled with the severely dry soil condition found throughout the fire perimeter indicates that these fires will likely stimulate the response of the more common weed species. Low to moderate watershed ratings were recorded on a total of 15,495 acres in the Rampage fire and 9,793 acres on the Middle Fork Complex. Where the forest canopy has been consumed by high burn intensity (26% on the Rampage and 6% on the Middle Fork Complex), conditions may favor the invasion of weed species requiring high light conditions, in part because the native seed and propagule bank may have been destroyed. 5625 acres received a rating of high on the Rampage and 674 acres on the Middle Fork Complex.

Areas at Risk

For most noxious weed species identified in the Middle Fork Complex and Rampage fire perimeters, disturbed sites and dry potential vegetation types are the most at risk from invasion and spread.

Disturbed areas would be trail heads, trail corridors, campgrounds, patrol cabins where structure protection was initiated, helispots, safety zones, and drop points). These sites are especially vulnerable to weed invasion. Severely burned sites can have altered soil structure and reduced organic matter content creating more a favorable germination substrate for weed seeds. Finally, undisturbed areas in drier vegetation types are also at risk. This is because many of our noxious weed species have evolved in dry Mediterranean climates and are highly competitive under these similar site conditions.

Research by Rice and Toney (1997) and a weed risk assessment project currently being conducted in the Northern Region of the USFS (Mantas and Jones 2001) have identified potential vegetation types most at risk from invasion by a number of invasive exotics. The following potential vegetation types in the burn perimeter have been determined to be vulnerable to the listed weed species when there is site disturbance, such as moderate to severe fire.

Species	Vulnerable Vegetation Types Within the Burn Perimeter
burdock	any severely disturbed site
cheatgrass	any severely disturbed site
spotted knapweed	graminoid parks, dry Douglas-fir, riparian forests
yellow starthistle	graminoid parks, drier riparian forests
rush skeletonweed	graminoid parks, ponderosa pine
Canada thistle	riparian shrublands and meadows
hound's-tongue	any severely disturbed site
quackgrass	any riparian area
orange hawkweed	all mesic forest types (subalpine fir, spruce)
meadow hawkweed complex	all mesic forest types (subalpine fir, spruce)
common St. John's-wort	graminoid parks, ponderosa pine
ox-eye daisy	any severely disturbed site
Dalmatian toadflax	graminoid parks, ponderosa pine
yellow toadflax	graminoid parks, ponderosa pine
yellow sweetclover	any severely disturbed site
Eurasian water milfoil	lakes
reed canarygrass	any riparian area

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Species	Vulnerable Vegetation Types Within the Burn Perimeter
sulphur cinquefoil	graminoid parks, ponderosa pine
tall buttercup	riparian shrublands and meadows
tansy ragwort	subalpine fir
perennial sowthistle	any severely disturbed site
common tansy	any riparian area
common speedwell	subalpine fir and hemlock forests

Table taken from BAER report, Moose fire, 2001

Based on this information, particular areas where there is a serious threat to ecosystem integrity of native plant communities include:

Rampage Fire:

1. Administrative Sites/Facilities: Coal Creek Campground, Upper Upper Park Creek Campground, Lake Isabel Campground, Upper Park Creek Patrol Cabin, Coal Creek Patrol Cabin
2. Trailheads and Trails: Coal Creek Trail, Fielding Trail, Lake Isabel Trail, Park Creek Trail, Two Medicine Pass Trail
3. River and Riparian Areas: Floodplain of the Middle Fork of the Flathead River, Coal Creek and Upper Park Creek stream banks and edges of wetlands within the fire perimeter
4. Fire Suppression Impact Areas: All sites where structure protection occurred, helispots, and drop points.

Middle Fork Complex Fires:

1. Administrative Sites/Facilities: Loneman Lookout
2. Trailheads and Trails: South Boundary Trail, Lincoln Creek Trail, Harison Creek Trail, Loneman Lookout Trail, and Nyack Creek Trail
3. River and Riparian Areas: Floopplain of the Middle Fork of the Flathead River, Harrison Creek and Nyack Creek streambanks, shore of Harrison and Half Moon Lakes affected by fire.
4. Fire Suppression Impact Areas: helispots, and drop points.

Monitoring Strategy

BAER team vegetation experts assessed areas at risk from invasion and potential seed sources into these areas. These areas are identified (see monitoring specifications) to determine where treatment will be needed to protect vulnerable vegetation resources.

Local agency botanists and weed managers should determine monitoring design. However, a cursory walk through survey is suggested at first, in order to gather general inventory information on weed occurrences by species. Documentation (GPS, GIS and photomonitoring) of weed locations, by species, and other observations regarding density and spread should be recorded. If local experts determine more rigorous monitoring is then needed to track particular infestations through time, a new design can be implemented in appropriate areas. Areas to be monitored are identified in detail on the specification form.

Immediate Control Treatments

A funding request for immediate control measures has been included in this report for areas where known weed infestations may quickly flourish after the fire and create a large source of weed seeds. These areas are high use public and administrative sites where people and stock would serve as vectors of spread. It is critical that these areas be treated as soon as fall rosettes are visible to prevent weed seed spread into newly burned and vulnerable areas. These sites are identified in detail on the specification form.

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Supplemental Funding Strategy

The areas identified in this report have been surveyed for the presence of weed populations by vegetation technical experts on the BAER team. In areas of severe burn, it is impossible to identify existing plant populations. Because these fires are both in recommended wilderness areas and are currently very difficult to access except by helicopter, it is impossible to provide an accurate assessment of weed proliferation as a result of the current fire situation. Other areas may pose greater threats to ecosystem integrity once access is available to review the full extent of the fire. Therefore, it is fully expected that supplemental funding requests will be submitted to the Regional BAER team coordinator if additional areas are detected in out-year monitoring that require survey and treatment. This is particularly the case for fire suppression related activities where ground disturbance has occurred.

Regulatory Requirements

The National Park Service has sole jurisdiction for the lands affected by these fires. There are adjacent railroad and highway right-of-ways, but it appears that these fires did not encroach on these lands. Protocols for monitoring and noxious weed control treatments vary among these agencies. It is important that the BAER implementation team consult with the appropriate agency/owner to assure regulations are followed and actions are in accordance with existing NEPA decisions and management plans.

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IV. RECOMMENDATIONS

A. Management

1. Noxious Weed Control (Specification V-1: Noxious Weed Control/Treatment)

Apply immediate herbicide, cultural or mechanical control treatments on known noxious weed infestations at identified trail heads, trail corridors, campgrounds, parking areas, and administrative facilities (patrol cabins). Treat as soon as possible after rosettes are identifiable, either fall, 2003 or spring, 2004 and fall 2004/spring 2005. Identified sites have been mapped and pose a threat for establishment, seed set, and spread into vulnerable areas.

Seed one acre of treated weed infestations within the Upper Park Creek drainage to facilitate the establishment of native plant populations and reduce the need for retreatment. This area is in a area of concentrated visitor use and will benefit by supplemental seeding to provide ground cover once exotics have been removed.

2. Restoration of whitebark pine (Specification V-2: Whitebark Pine Planting)

Collection of whitebark pine cones and planting of 2000 whitebark seedlings within the fire area. There is a low probability for natural regeneration due to lack of seed source (pre-fire blister rust mortality and fire mortality). The fire has created excellent sites for planting of whitebark pine seedlings.

3. Cutting of Hazard Trees along Trail and placement of Warning Signs: (Specifications T-1: Install Hazard Warning Signs & T-2: Hazard Tree Treatment – Trails)

Due to high tree mortality in the burned areas there is a greater risk of falling trees that could injury or kill visitors in the backcountry. This hazard is greatest along the trail and backcountry camp grounds. Placing warning signs at trail heads and trail junctures would warn those who may pass through the burned areas. Felling hazard trees along trails would significantly reduce the threat of hazard trees.

4. Assessments of the safety of backcountry campgrounds (Specification T-5: Assess Condition of Backcountry Campgrounds)

Hazard trees would be a significant risk at campgrounds that were burned over, specifically the Coal Creek, Upper Park Creek and Lake Isabel campgrounds. An assessment must be carried at to determine the level of hazard tree risk. If hazard tree risk is high closure of affected backcountry campgrounds may be necessary until the hazards posed by falling trees is reduced to acceptable levels. Felling hazard trees to safe levels in the effected campgrounds would be a significant intrusion into the wilderness that is unacceptable.

B. Monitoring – Specification related

1. Whitebark pine (Specification M-1: Monitor Whitebark Pine Treatment Effectiveness)

Monitor whitebark pine habitat within the fire perimeters to determine tree survival, cone production and potential for natural regeneration. This species is an important ecosystem component and wildlife food source whose populations have been severely depleted due to blister rust. In conjunction with this monitoring, populations of the unique conifer species, subalpine larch will be observed for burn damage and potential recovery.

2. Noxious Weed Monitoring (Specification M-1: Noxious Weed Monitoring)

Monitor and map (GPS, GIS, and photo) known and high potential infestation sites for noxious weed species in the burned area. Conduct walk-over surveys of selected high and moderate burn severity areas, suppression impact areas, campgrounds, parking areas, drop points, staging areas etc. A complete list of monitoring sites are included within the Weed Monitoring Specification.

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**3. Soil Erosion/ Revegetation Monitoring above Coal Creek and Upper Park Creek Campgrounds:
(M-3: Monitor For Post-Fire Soil Erosion)**

Monitor rainfall, soil erosion/movement and native plant establishment on the slopes above Coal Creek and Upper Park Creek campgrounds where burn severity rating was high. Monitoring will be used to determine safety of campgrounds for visitor use. If monitoring indicates that there is a safety hazard, sites will be temporarily closed or other treatments will be implemented.

C. Management Recommendations (non-specification related)

- Coordinate rehabilitation treatments to ensure proper application and success (i.e. seeding)
- Educate natural resource staff on potential weed species that may have been introduced into the fire area. Aggressively look for, map and control new noxious weed infestations as discovered. Implement coordinated weed treatment actions on State, County, and Federal lands within the fire area to ensure complete coverage in control and monitoring actions.

V. CONSULTATIONS

Jack Potter, Assistant Chief, Natural Resources, NPS- Glacier National Park
Tara Caroline, Ecologist, NPS – Glacier National Park
Dawn LaFleur, Noxious Weed Program Manager, Glacier National Park
Stephen Willis, Backcountry Supervisor (west side)

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RARE PLANT SPECIES ASSESSMENT

I. OBJECTIVES

Identify all threatened and endangered plant species and all Montana Natural Heritage Program Species of Special Concern within the fire perimeter. In addition, determine the impacts of fire and fire suppression related activities to these species within Glacier National Park.

II. ISSUES

Fire or fire suppression related activities might have impacted rare plant species and/or habitat.

III. OBSERVATIONS

A. Background

Refer to Vegetation Assessment.

Consultation with U.S. Fish and Wildlife Service

Emergency consultation was held with the U.S. Fish and Wildlife Service (USFWS) on threatened, endangered, or proposed species for all fires burning in the Flathead Forest and Glacier National Park during August, 2003 and a current species list was obtained. Two threatened species, water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*), were identified as species that could potentially occur on fire impacted lands. One State T&E candidate species, linear-leaved moonwort (*Botrychium lineare*) occurs within Glacier National Park but not within any of the fire perimeters.

B. Reconnaissance Methodology and Results

Databases maintained by the Flathead National Forest, Glacier National Park, and the Montana Natural Heritage Program (MNHP) were researched to determine if any threatened, endangered, or proposed species were known to occur within the fire perimeter, and to determine if any MNHP species of special concern were known from Glacier National Park.

T&E - Database searches revealed that no listed threatened, endangered, or proposed species were known to occur within the fire perimeter. Water howellia grows in shallow vernal pothole ponds that average $\frac{3}{4}$ acre in size. The nearest known population of this species is over 100 air miles to the south in the Swan Valley. Spalding's catchfly is only known to occur in rough fescue dominated grasslands. The nearest known population of this species is nearly 20 air miles to the northwest in the Tobacco Valley. Very few potential habitats for these species exist. Some rare plant surveys were conducted in the burn area prior to the fire, revealing no habitat or plants for either species.

Consultation with local staff, database reviews, available literature and species lists, and evaluations of the burned areas within the fire perimeter revealed no expected direct impacts to threatened, endangered, or proposed species from the fire or suppression related activities.

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MNHP Species of Special Concern- There are seven known species of MNHP species of special concern located in the Middle Fork Valley of Glacier National Park, including:

- Western moonwort (*Botrychium hesperium*)
- Slender cotton-grass (*Eriophorum gracile*)
- Great sundew (*Drosera anglica*)
- Buckler fern (*Dryopteris cristata*)
- Bractless hedge-hyssop (*Gratiola ebracteata*)
- Short-flowered monkey-flower (*Mimulus breviplorus*)
- Austin's knotweed (*Polygonum austinae*)

Initially, it appears that no mapped populations of MNHP species of special concern occurred in the burn area within the park. Table 1 lists additional MNHP species by associated vegetation types that possibly burned in the Rampage and Middle Fork Complex Fires. Although many surveys have been conducted in the past, it is unknown if any of these species occurred in the vegetation types that burned. It is also unknown what impacts to the populations or species would be if they did burn. It is known that there are no impacts to these species as a result of fire suppression activities, because no suppression related disturbances occurred within the park.

If there are populations of any of these rare species or species of special concern, it is unlikely that the fire negatively impacted these populations. Fire suppression activities did not affect any plant populations within the burn perimeters as no fire suppression activities occurred other than structure protection.

IV. RECOMMENDATIONS

No recommendations are made with regards to actions that should be taken to mitigate any potential fire impacts to rare plants. A field visit to known rare/sensitive plant sites within GNP adjacent to the burn perimeter would be desirable to validate that they were not involved in the fire.

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Table 1: Potential MNHP Species of Special Concern:

AQUATIC <i>Bidens beckii</i> <i>Brasenia schreberi</i> <i>Heteranthera dubia</i> <i>Potamogeton obtusifolius</i> <i>Scirpus subterminalis</i> <i>Utricularia intermedia</i> FENS & FEN MARGINS* <i>Amerorchis rotundifolia</i> <i>Carex livida</i> <i>Carex paupercula</i> <i>Carex rostrata</i> <i>Collema curtisporum</i> (lichen) <i>Cypripedium parviflorum</i> <i>Cypripedium passerinum</i> <i>Drosera anglica</i> <i>Drosera linearis</i> <i>Dryopteris cristata</i> <i>Eleocharis rostellata</i> <i>Epipactis gigantea</i> <i>Eriophorum gracile</i> <i>Kalmia polifolia</i> <i>Liparis loeselii</i> <i>Lycopodiella inundata</i> <i>Meesia triquetra</i> (moss) <i>Scirpus cespitosus</i> <i>Scorpidium scorpioides</i> (moss) <i>Viola renifolia</i> OTHER WETLANDS (marshes/wet meadows) <i>Botrychium crenulatum</i> <i>Carex chordorrhiza</i> <i>Ophioglossum pusillum</i> <i>Scheuchzeria palustris</i> RIPARIAN (adjacent to flowing or stagnant surface water) <i>Amerorchis rotundifolia</i> <i>Botrychium ascendens</i> <i>Botrychium crenulatum</i> <i>Botrychium hesperium</i> <i>Carex paupercula</i> <i>Collema curtisporum</i> (lichen) <i>Cypripedium parviflorum</i> <i>Cypripedium passerinum</i> <i>Dryopteris cristata</i>	MOIST CLIFFS, SEEPS & TALUS SLOPES <i>Grimmia brittoniae</i> (moss) <i>Idahoia scapigera</i> <i>Mimulus patulus</i> <i>Phegopteris connectilis</i> WET CONIFEROUS FOREST* (not associated with surface water) <i>Amerorchis rotundifolia</i> <i>Botrychium crenulatum</i> <i>Botrychium montanum</i> <i>Carex paupercula</i> <i>Collema curtisporum</i> (lichen) <i>Cypripedium parviflorum</i> <i>Cypripedium passerinum</i> <i>Dryopteris cristata</i> <i>Epipactis gigantea</i> <i>Petasites frigidus</i> var. <i>nivalis</i> <i>Viola renifolia</i> UPLAND CONIFEROUS FOREST <i>Botrychium crenulatum</i> <i>Botrychium hesperium</i> <i>Botrychium montanum</i> <i>Cetraria subalpina</i> (lichen) <i>Corydalis sempervirens</i> <i>Cypripedium fasciculatum</i> <i>Diphasiastrum sitchense</i> <i>Lathyrus bijugatus</i> <i>Lycopodium dendroideum</i> <i>Polygonum douglasii</i> ssp. <i>austinae</i> GRASSLANDS & FOREST OPENINGS (non-wetland) <i>Botrychium ascendens</i> <i>Botrychium crenulatum</i> <i>Botrychium hesperium</i> <i>Botrychium paradoxum</i> <i>Corydalis sempervirens</i> <i>Grindelia howellii</i> <i>Lathyrus bijugatus</i> <i>Polygonum douglasii</i> ssp. <i>austinae</i> ALPINE & SUBALPINE <i>Astragalus lackschewitzii</i> <i>Botrychium</i> spp. <i>Cetraria subalpina</i> (lichen) <i>Diphasiastrum sitchense</i>
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<i>Epipactis gigantea</i> <i>Mimulus patulus</i> <i>Oxytropis campestris</i> var. <i>columbiana</i> <i>Petasites frigidus</i> var. <i>nivalis</i> <i>Phegopteris connectilis</i> <i>Salix barrattiana</i> <i>Viola renifolia</i>	<i>Erigeron lackschewitzii</i> <i>Oxytropis podocarpa</i> <i>Potentilla quinquefolia</i> <i>Salix barrattiana</i>
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WILDLIFE RESOURCE ASSESSMENT

I. OBJECTIVES

1. Assess effects of fire and suppression actions to federally listed Threatened, Endangered, and other significant or locally rare species and their habitats.
2. Initiate Section 7 Emergency Consultation with the U.S. Fish and Wildlife Service.
3. Determine effects of fire and suppression action to habitat improvements.
4. Prescribe emergency rehabilitation measures and/or monitoring.
5. Assess effects of proposed rehabilitation actions to listed species and habitats.

II. ISSUES

1. Five federally listed species, and critical habitat, occur within the fire area.
2. Several locally rare species occur within the fire area.
3. Potential impacts to these species from the fire, post fire effects, suppression actions, and proposed emergency rehabilitation proposals.

III. OBSERVATIONS

A. Background

The purpose of this Burned Area Emergency Rehabilitation (BAER) Wildlife Assessment is to document the effects of the fire, suppression actions, proposed emergency rehabilitation work, and potential post fire flooding, to all federally listed mammals, birds, fish and their habitats which may occur within or downstream from the fire area. Species occurrence discussed in this assessment is based on formal surveys, habitat inventories and knowledge of the area by local biologists conducted pre and post fire. Documents, inventory data, sighting records, vegetation maps and other species specific information referenced in this report are on file at Glacier National Park offices.

The Rampage Fire started on August 19th, 2003 and burned approximately 24,488 acres between August 19th and September 14th. The Middle Fork Fires started August 19th and burned approximately 11,851 acres between August 19th and September 14th. Both fires were started by lightning. Fire activity was driven by high temperatures, high winds, low relative humidity and low fuel moisture. The watersheds of the Rampage and Middle Fork Complex Fires drain into the Middle Fork of the Flathead River. Many ephemeral drainages occur throughout the fire areas. Only lands administered by Glacier National Park were affected by the fires. Both fires are currently in monitoring status.

Fire suppression actions were minimal compared to other fires in the region, but included numerous helicopter water drops, several retardant drops, and construction of a small amount of hand line in the Belton Hills, around patrol cabins, and possibly elsewhere. No bulldozers or other motorized equipment were used in suppression efforts. We are unaware of any safety zones that were cleared or drop points improved by trimming back overgrown vegetation. Water was dipped out of the Middle Fork River and Harrison Lake and possibly other water bodies, but the exact locations and frequency of dipping is unknown.

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B. Reconnaissance Methodology

Information used in this assessment is based on a review of relevant literature, agency management planning documents, agency wildlife sighting and habitat inventory data, communication with FWS, personal communication with agency biologists (listed at end of report), and ground reconnaissance of the fire areas on September 19th, 2003. Reconnaissance included a helicopter flight over the fire areas. Soil burn severity and watershed response was mapped by the BAER vegetation and soils teams.

C. Findings

The purpose of this assessment is to discuss the potential effects of the fire, suppression actions and proposed emergency rehabilitation activities to federally listed species that occur within the fire areas. Effects to general wildlife species are not discussed. This assessment is not intended to definitively answer the many questions of effects to specific species that are inevitably raised during an incident such as the Rampage and Middle Fork Complex Fires. The focus of this assessment is to determine the potential for immediate, emergency actions that may be necessary to prevent further effects to these species. Because the species discussed in this assessment have ranges or territories which extend beyond the fire area, it may be important to include information at a larger scale, across land ownership boundaries, for species which may require assessment for long term rehabilitation or restoration needs.

BIOLOGICAL EVALUATION

Direct effects as described in this report refer to mortality or disturbance that results in flushing, displacement, harassment or mortality of the animal. Indirect effects refer to modification of habitat and/or effects to prey species.

Bald Eagle

There are 12 known bald eagle nests in or adjacent to Glacier National Park, including 8 nests west of the Continental Divide where fires burned during 2003. The Middle Fork Complex Fires burned to within about 100 meters of the Nyack bald eagle nest, but no other nests have been affected by the Rampage and Middle Fork Complex Fires. Bald eagle population numbers vary by season and include breeding, migration and wintering populations. The breeding season begins in late February or March, with juveniles fledging between mid-July and early September and migrating from the nest area between late August and late September. Annual nest monitoring surveys are conducted irregularly during the breeding season, with anecdotal observations documented during other seasons. Bald eagles in this area feed primarily on various fish species during most of the year, and make significant use of natural mortality (winter-killed and predator-killed animals) during the autumn and winter. Migration generally peaks during March-April in the spring, and October-November in the autumn, with some birds moving earlier or later.

All fires treated by this assessment are within areas included in the Recovery Plan for the Pacific Bald Eagle (U.S. Fish and Wildlife Service 1986), and the Montana Bald Eagle Management Plan (Montana Bald Eagle Working Group 1994). No critical habitat has been designated for bald eagles.

DIRECT AFFECTS: The southwest perimeter of the Middle Fork Complex Fires came within about 100 meters of the Nyack bald eagle nest, though the nest tree and nearby perch trees were unaffected by the fire. One eaglet was observed in the nest in mid-July and probably fledged from the nest in early August. A firefighter reported observing a bald eagle, presumably an adult, fly from the nest in early September. Fledglings typically remain on the territory, often near the nest, for a month or more though usually migrate from natal areas in Glacier National Park by mid-September (McClelland et al. 1996). Since the young had

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probably left the nest by the time the fire approached it, the bird was less vulnerable to direct effects of the fire. In addition, fire burned near the nest so late in the season, during late August, that the juvenile may have already left the area. However, due to lack of flight and foraging experience, if the juvenile remained in the area, it would still have been susceptible to injury or death; it could have blundered into the fire; periods of dense smoke may have temporarily reduced foraging efficiency; or fish may have been less vulnerable to capture if they moved to deeper levels in water bodies as a result of warmer water temperatures. Carcasses of any animals killed by the fire may have provided a temporary forage resource.

Bald eagles may have been temporarily displaced due to the fire and suppression actions, especially the use of helicopters if water-dipping were done in proximity to a foraging area. Water-dipping was relatively limited on these fires, and there was apparently no suppression activity near the nest or along lower Nyack Creek. Adults from the Nyack nest probably forage along the Middle Fork and at Harrison Lake, where they may have been temporarily displaced by water-dipping activities. The construction of very limited hand line likely had no effect on bald eagles, since it was distant from eagle use areas.

Rehabilitation efforts will be minimal and will largely occur next summer as part of normal trail maintenance, with replacement of water bars and turnpike. These efforts are unlikely to cause more than temporary displacement of eagles if they occur near the nest or foraging areas. Limitations on the use of chainsaws and/or timing restrictions may be necessary, depending on proximity to eagle use areas.

INDIRECT AFFECTS: Although limited information is available on bald eagle use on the Nyack Territory, trees used for perching, feeding, and roosting sites within the vicinity of the fires, and areas affected by aerial suppression actions, occur primarily along Nyack Creek, the Middle Fork of the Flathead River, and Harrison Lake. The fire probably killed some perch trees and potential nest trees, but will likely have little long-term impact on nesting or foraging sites. The dead trees will remain standing for varying lengths of time, depending on the tree species and severity of fire effects. In general, the larger the tree, the longer it will stand, and the larger trees that remain may continue to be used as perch sites; others may be lost through attrition if they were rendered unstable due to the fires. The fire affected a relatively small proportion of suitable bald eagle nesting and foraging habitat found in the Middle Fork of the Flathead River drainage.

POST-FIRE OBSERVATIONS: The Rampage and Middle Fork Complex Fires and associated suppression actions appear to have had minimal impact on the Nyack resident bald eagles. Future monitoring is encouraged to determine any short or long-term post-fire effects.

Gray Wolf

One wolf pack is believed to reside near areas impacted by the Rampage and Middle Fork Fires. The origins of this pack are unknown but may be derived from, or even composed of individuals from the Apgar pack. Status of the Apgar pack is unknown because there are no radio-collared wolves in this pack. There have been wolf sightings and track observations in the Apgars as well as in the Middle Fork. There were 2 observations in the burn area during 2002 and 3 through June 2003. White-tailed deer make up the greatest proportion of the wolf diet, followed by elk and moose (Kunkel 1997); mule deer and smaller mammals or birds may be preyed upon opportunistically throughout the year.

The first documented wolf den in Glacier National Park in 50 years was found in the North Fork in 1986 (Ream et al. 1989). In response to an abundant prey base, wolf numbers increased until the mid-1990s. During the winter of 1996-7 a combination of severe weather, hunter harvest, and predation by wolves, mountain lions and other predators accelerated a decline in deer and elk numbers by significantly reducing the ungulate prey base (T. Their, pers. comm.). The three North Fork wolf packs were reduced to one. Subsequent gradual increases in whitetailed deer and elk numbers has resulted in a slow increase in wolf

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numbers, though disease and human-related mortality have slowed this recovery. GIS maps of ungulate winter ranges important to wolves show that the Rampage fire encompassed 15,839 ac of ungulate winter range (73% of the fire area), and the Middle Fork fire encompassed 7,203 ac of ungulate winter range (70% of the fire area).

The Rampage and Middle Fork Fires lay within the Rocky Mountain Gray Wolf Recovery Area. No critical habitat has been designated for wolves.

DIRECT AFFECTS: Track and sighting records during the previous year documented at least occasional presence of the Apgar Pack within the current Rampage and Middle Fork Fire perimeters. The increase of human activity in the fire area may have displaced wolves for brief periods of time, but no wolves have been sighted in the Fire area since June 2003. Therefore, displacement in that area was probably insignificant. Since many deer and other prey species were probably displaced from the fire area, foraging wolves may not have been displaced by increased human activity. However, if wolves remained in the fire area in search of prey that persisted there, some displacement may have occurred.

INDIRECT AFFECTS: Rampage and Middle Fork Fire intensity varied from unburned to intensively burned. Keay and Peek (1980) reported that large burned areas tend to be avoided by whitetailed deer in Idaho, though generally, fire affects that return the vegetation to early seral stages are beneficial to wolves because of the positive effects of increasing habitat for prey species. Following fire, seral successional stages of forest vegetation often provide preferred forage for whitetailed deer (Peek 1984), elk (Lyon and Ward 1982), and moose (Peek 1997). However, since woody browse is a major component in the year-long diet of deer in the Middle Fork of Glacier NP (Singer 1979), and probably on adjacent FNF lands, loss of the shrub layer to fire will reduce the availability of forage during at least the first winter. Loss of tree canopy on winter range will affect snow-intercept and thermal cover, resulting in greater snow depths and greater heat loss among wintering ungulates. During severe winters, whitetailed deer often prefer dense, mature stands of spruce and other areas where overstory was dense (Singer 1979). Depending on the extent of mortality of overstory vegetation on winter ranges, weather severity, especially during the first winter, will be a major determinant of whitetailed deer survival, and to a lesser extent, elk and moose. If the winter is relatively mild, some deer may remain on traditional winter ranges while others shift to adjacent areas with winter range attributes (canopy closure, adequate forage, south aspect). Moose prefer openings and will benefit more immediately from the fire. Elk, especially cow-calf groups, also prefer more open conditions. White-tailed deer are more dependent on hiding cover and will be slower to respond to the increase in forage resulting from the fire.

Increased sight distance and reduction of cover resulting from the fire may make ungulates, especially whitetailed deer, more vulnerable to wolves, other predators, hunters outside the park, or other recreational users during the first winter. Limited permits and restrictions on harvest of antlerless animals outside Glacier are expected to minimize the effect of increased vulnerability to hunting (J. Williams, pers. comm.).

Regeneration in previously burned areas (Crystal Creek Fire) provides excellent forage for whitetailed deer, as well as elk and moose, and seral regrowth following the Rampage and Middle Fork Fires will provide forage benefits the first spring and thereafter. The long-term habitat improvements for whitetailed deer, elk and moose will outweigh the occasional mortality or temporary displacement caused by these fires, or possible short-term decline from a decrease in cover and forage and increased predation during the first winter. These fires will have a long-term positive effect on wolves that may result in larger pack size or possibly more than one pack using the fire area again.

POST-FIRE OBSERVATIONS: No wolves have been observed during post fire reconnaissance, but previous data suggests that they may cross the fire perimeter. The fire, and associated suppression and rehabilitation activities, will have a transitory and probably minor affect on wolves.

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Grizzly Bear

Grizzly bear habitat occurs throughout the Rampage and Middle Fork Fire Complex area, and most of the habitat within the fire area is described as Management Situation 1 (management decisions will favor the needs of the grizzly bear) by the Interagency Grizzly Bear Committee (IGBC). The Rampage and Middle Fork Fire Complex occurred within the Lower Middle Fork Flathead Bear Management Unit (BMU) and impacted 4 of the 8 subunits within this BMU. BMUs are divided into subunits that approximate the area of a female grizzly home range. The Rampage and Middle Fork Fire Complex encompassed parts of the home ranges of several grizzly bears, perhaps even most of the home ranges of a bear or two. Denning habitat, based on criteria developed during research on a study of grizzly bear ecology south of the fire area in the Swan Mountains of Montana (Mace and Waller 1997), has been mapped (FNF files) and includes very limited portions on eastern edge of the Middle Fork Fire and the north, south, and eastern edges of the Rampage Complex. Other non-mapped selection criteria, especially soil conditions, may limit even these small areas as suitable grizzly bear denning habitat. Other important seasonal habitats encompassed by these fires include riparian vegetation, including dense spruce stands, along the Middle Fork and major tributaries, and patches of berry-producing shrubs, especially huckleberry, widely-dispersed throughout the area. Grizzlies also make opportunistic use of available ungulate carrion or live animals, especially deer fawns or calves of elk or moose. Fish apparently form little if any part of the diet of grizzly bears in this area.

The Rampage and Middle Fork Complex Fires are included in the Northern Continental Divide Ecosystem Grizzly Bear Recovery Area. No critical habitat has been designated for grizzly bears.

DIRECT AFFECTS: No radio-collared management grizzly bears have used the area burned by the Rampage or Middle Fork Complex Fires during 2002 or 2003. There have been 5 sightings of grizzly bears recorded from within the Rampage or Middle Fork Fire area since 2000. Few sightings are reported from this area due to its remote nature.

There are probably a number of bears with a portion of their home ranges within the fire perimeters and, if they were near the fire, they would have been able to leave the area and temporarily move to adjacent unburned areas. Some bears may have sought carcasses of fire-killed animals and thus received a short-term benefit from the fire, but the removal of vegetation will have a negative impact on grizzlies in the short-term. Immediate sprouting of herbaceous vegetation will provide some forage this fall, but not enough to compensate for losses to the fire, depending on the species, amount and quality of bear foods in the area. Portions of the Rampage Fire Area are known as prime huckleberry foraging areas for grizzly bears, especially the Lake Isabel area.

The increase of human activity within the fire areas may have contributed to displacement of any bears present. Displacement by human activity within the fire perimeter probably would have been minimal, since the fire itself would probably have displaced most bears, directly and indirectly due to immediate and temporary loss of forage resources. However, bears displaced to or already using unburned areas outside the fire perimeter could have been displaced by suppression activities, including helicopter bucket drops or low elevation reconnaissance flights.

INDIRECT AFFECTS: Vegetation within the Rampage and Middle Fork Complex Fires was affected in a mosaic pattern, with varying degrees of understory mortality. Fire effects that return the vegetation to young plants should be beneficial to grizzly bears, in the long-term, because it improves forage conditions. Herbaceous vegetation will be quickest to respond, with improved conditions during the first year post-fire. Woody plants will take longer and it may require 3-20 years for huckleberry sprouts to produce a berry crop depending on burn severity (T. Carolin, pers. comm.). The unburned patches within the fire perimeter will

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continue to provide forage opportunities, and the burned areas will result in more vigorous plants and higher quality forage in the future. Some areas that burned probably had huckleberries and perhaps other berry-producing shrubs that were declining in production that will now benefit from the rejuvenating effects of fire. Huckleberries are the most important summer/fall food source for bears preparing for winter denning. Removal of large acreages of huckleberry shrub fields could cause bears to wander more widely in search of alternative food sources. Such behavior may make them more likely to encounter human developments and create conflicts. The result would be higher than normal mortality of bears and higher levels of property damage. Similar concerns were raised following the Moose Fire of 2001, yet there were no unusual levels of bear-human conflicts. However, more acreage is burning in 2003, including known high-value huckleberry foraging areas, thus precautions are justified. Intensive efforts raising public awareness would be beneficial. These efforts may include direct contact with local residents, newspaper notices, and radio and television announcements. Local agencies should be prepared to use aversive conditioning techniques, such as rubber bullets and bear dogs, to intercept and shepherd wandering bears away from areas of potential conflict.

US Forest Service grizzly bear habitat value maps show that only small areas of high value habitats burned. High value habitats were those with ratings 50 or higher (Table 1). Although the fire perimeters are preliminary and the Habitat Value maps are dated (1988), they indicate that the effects of the fires on grizzly bear habitat may be of low significance. Continued burning within the current perimeter or expansions of the fire outside the current perimeter may increase the impact on bear habitat.

Table 1. Percent of seasonal habitats (spring, summer, fall) => 50 Habitat Value burned by watershed response class (Low, Moderate, High).

Subunit	%Burned	Season	Hi	Mod	Low
Lincoln Harrison	18	Sp	1	2	20
		Su	1	2	17
		Fa	1	2	14
Nyack Creek	4	Sp	1	2	18
		Su	<1	1	4
		Fa	<1	1	4
Pinchot Coal	33	Sp	11	13	19
		Su	8	9	15
		Fa	8	9	15
Muir Park	20	Sp	6	6	11
		Su	6	6	10
		Fa	5	6	10

POST-FIRE OBSERVATIONS: No grizzly bears or grizzly bear sign were observed during post fire reconnaissance. Displacement by the fire will have a short-term negative impact on grizzly bears through the fall and into next spring. Bears should move back into the burned area next spring, with forage conditions dependent on moisture levels and burn severity. Spring and summer feeding opportunities will improve during the first few years postfire. Berry production will begin making a significant contribution to grizzly bears within 5-20 years (depending on severity), and persisting as an important food source for 30-40 years. Thus these fires will have a short-term negative and a long-term positive affect. Suppression activities are having an adverse affect through the additive impact of increased helicopter activity and increased human presence affecting unburned grizzly foraging habitat around the fire perimeter. Rehabilitation activities are expected to be less extensive and intensive than suppression, and should have a lesser impact.

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Canada Lynx

Canada lynx habitat, as defined in the Lynx Conservation Assessment and Strategy (Ruediger et al 2000) occurs in the higher elevations of the Rampage Fire and Middle Fork Complex Fires. Subalpine fir habitat types provide both foraging and denning habitat, and younger lodgepole pine stands may provide foraging habitat. The status and trend of the lynx in Glacier NP and surrounding areas is unknown. There has been only 1 recorded sighting of lynx or their tracks in the fire area since 1960, which occurred in 1972. However, winter track surveys have detected the presence of lynx in the adjacent Park and Ole Creek drainages within the past several years (GNP files).

DIRECT AFFECTS: If lynx were present during the fire, including any young of the year, they would have been able to leave the area. The mobility of lynx would make it very unlikely any mortality resulted from the fire. The increase of human activity within the fire area may have displaced lynx for a brief period. Displacement within the fire perimeter would have been minimal, since lynx avoid large open areas (Ruediger et al, 2000), and would have left during the fire and avoided it after. If lynx remained in unburned patches within the fire perimeter, they may have been susceptible to displacement. Lynx in forested habitat outside the perimeter of the fire may have been displaced by activities in those areas, including helicopter use or activities along trails. However, closure of large areas of the park to visitor use during the fires may have offset fire-related suppression and monitoring activity by reducing human use in those areas. The number of lynx inhabiting the area is unknown, but is probably small.

INDIRECT AFFECTS: Natural disturbance processes such as fire can provide foraging habitat for lynx when resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Ruediger et al, 2000). These characteristics include a dense, multi-layered understory that maximizes cover and browse at both ground level and at varying snow depths throughout the winter. The portions of the fires which experienced high and moderate fire intensity resulting in greater than 25% mortality of the understory should result in improved snowshoe hare habitat as the early seral species of grasses, forbs, root sprouting brush, and lodgepole pine regenerate in the burned areas. Because of the mosaic pattern of the burns, the snowshoe hare's preference for cover, or edge habitat, should also be met. As the hare population increases in these areas, lynx foraging opportunities should increase. However, elimination of forest (hiding) cover and foraging areas (snowshoe hare habitat) due to the fire will reduce available lynx habitat for 10-20 years, until stems of winter browse species, especially lodgepole pine, reach sufficient size to extend above average snow depths. The fire will therefore result in short-term negative effects, followed by long-term habitat benefits.

POST-FIRE OBSERVATIONS: No Canada lynx or their tracks were observed during post fire reconnaissance. Suppression and rehabilitation activities probably had little effect, since the fire would have displaced lynx. Lynx habitat has been reduced by the fires, and will result in short-term impacts, perhaps extending for 15 years or more, but because the fires will likely improve future foraging habitat for the lynx, they will have long-term benefits.

Bull Trout

DIRECT EFFECTS: The Middle Fork of the Flathead and its tributaries within the Rampage and Middle Fork Complex Fire areas contain bull trout. It is likely that some bull trout were killed by temperature increases in some portions of Coal Cr. However, direct mortality resulting from the fire is probably minimal. Some bull trout may have been killed through helicopter water dipping activities. Again, the total mortality from this cause is likely low, as most fish could probably avoid the bucket.

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INDIRECT EFFECTS: Flow modeling conducted as part of this report's Watershed Assessment predicts that ash wash, suspended sediment, and increased turbidity will decrease water quality downstream of the burned area. Sediment deposited in pools and channels will decrease the availability of spawning habitat. Suspended sediment levels may result in fish kills in Coal Creek. Changes in canopy cover and stream morphology could result in short term negative changes in water temperature. However, long-term entrainment of large woody debris may increase channel complexity resulting in increased productivity and long-term net benefits for bull trout.

POST-FIRE OBSERVATIONS: No bull trout were observed during suppression or post-fire reconnaissance. However, No formal stream surveys were conducted.

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Rampage and Middle Fork Complex Fire Species List**

The following federally listed species were identified as occurring, or having habitat, within the Flathead National Forest and Glacier National Park. Potentially affected federally listed species include:

SPECIES	STATUS
Bald Eagle, <i>Haliaeetus leucocephalus</i>	THREATENED
Gray Wolf, <i>Canis lupus</i>	THREATENED
Grizzly Bear, <i>Ursus arctos</i>	THREATENED
Canada Lynx, <i>Lynx canadensis</i>	THREATENED
Bull Trout, <i>Salvelinus confluentus</i>	THREATENED

IV. DETERMINATION OF EFFECTS

TERESTRIAL T & E

Determination of affect is **may affect, not likely to adversely affect**, for the fire, suppression, and rehabilitation actions to the federally listed bald eagle and gray wolf.

Determination of affect is **may affect, likely to adversely affect** for the fire and suppression actions, and **may affect, not likely to adversely affect** for rehabilitation actions to the federally listed grizzly bear.

Determination of affect is **may affect, likely to adversely affect**, for the fire, and **may affect, not likely to adversely affect** for suppression and rehabilitation actions to the federally listed Canada lynx and Bull trout.

V. RECOMMENDATIONS

1. BAER Management Recommendations

1. Recommendations with Specifications: All determinations documented in this assessment should be reevaluated, and emergency Section 7 Consultation conducted as needed, if additional rehabilitation measures or vegetation management activities are proposed after September 25, 2003. If non-emergency management activities are proposed, another Biological Assessment should be prepared.
2. Potential cumulative effects of the fires which occurred this year throughout western Montana and Idaho have not been considered in this Rampage and Middle Fork Complex Fire BAER Wildlife Assessment.
3. The Flathead National Forest Food Storage Order, and the Glacier National Park Bear Management Guidelines and Regulations must be implemented and adhered to during all

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suppression and rehabilitation actions. This is necessary to minimize bear-people conflicts, and potential management actions, including removals, directed at habituated or food-conditioned grizzly bears.

4. Local residents should be advised of the potential for increased bear presence and informed of ways to minimize conflicts. Local agencies should be prepared to shepherd or relocate bears away from potential conflict sites.
5. Maintaining connectivity between the Middle Fork of the Flathead River and spawning habitat in Coal Creek is critical. Monitor to assure migration routes are not blocked by debris jams and that sections of the migratory habitat do not become dewatered during low flows through substrate that may collect above the debris jams.
6. Reduce the amount of sediment reaching the bull trout habitat, especially the spawning habitat. Some decline in habitat quality within the fire perimeter is anticipated until watershed conditions stabilize. Monitor watersheds to determine sources of sediment. Where monitoring shows problems with excess sediment delivery further actions will be considered to reduce sediment input.
7. Monitor stream temperatures at key areas. If bull trout are no longer found or redds are not observed it will help identify if a thermal barrier now exists.

V. CONSULTATIONS

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