ERRATA:
Mount Rainier National Park
Fire Management Plan Environmental Assessment
Revised 7/20/05

Introduction
Attach this document, which makes minor corrections and additions, to the Mount Rainier National Park Fire Management Plan Environmental Assessment to comprise a full and complete record of the environmental impact analysis. Although Errata may also often contain responses to public comments, there were no substantive written public or verbal comments provided on the plan during the public review period, which included a series of public and interagency meetings.

The following additions to the Fire Management Plan come from interagency comments on the text and from additional information provided in a Biological Assessment prepared for the U.S. Fish and Wildlife Service during formal consultation under Section 7 of the Endangered Species Act.

Additions from Interagency Comments

Fire Management Objectives
Page 11: Replace the second bullet under the first objective with:
- *Ensure that fire management activities result in no injuries to the public, including injury from smoke. Limit the number of annual injuries to fire personnel to no more than 10% of the past five- year average.*

Page 11: Replace the 5th bullet under the fourth objective with:
- *Evaluate air quality impacts for all fire management activities (suppression, wildland fire use, prescribed fire, and hazard fuel reduction).*

Pages 11- 14: Replace all dates (by spring 2004, by 2005, etc.) with “Upon approval of the Fire Management Plan”

Affected Environment
Page 43: Under Air Quality, replace the National Ambient Air Quality Standards paragraph with the following:

National Ambient Air Quality Standards (NAAQS)

National Ambient Air Quality Standards (NAAQS) must be met. The federal Clean Air Act (as amended in 1990) required the Environmental Protection Agency (EPA) to identify NAAQS to protect public health and welfare. Standards have been set for six pollutants: ozone (O_3), carbon monoxide (CO), Nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$) and lead (Pb).

An area where a standard is exceeded more than the allowable number of times over a three year period is classified as a non- attainment area and is subject to more stringent planning and pollution control requirements. The park is located in Pierce County, which is within the jurisdiction of the Puget Sound Clean Air Agency (PSCAA), and within Lewis County, which is within the jurisdiction of the Southwest Clean Air Agency (SWCAA). Additional air quality management responsibilities are afforded to the Washington State Department of Ecology, the Washington State Department of Natural Resources, and to the Environmental Protection Agency (Region 10).

Pages 62- 63: Replace the section under Affected Environment – Park Operations and Visitor Services beginning with Smog with the following:

Smog
Ozone can trigger serious respiratory problems.

NITROGEN OXIDES (NO_x) *causes a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including nitrogen dioxide, nitric acid, nitrates, and nitric oxide.*

Ground-level Ozone
Is formed when NOx and volatile organic compounds (VOCs) react in the presence of heat and sunlight. Children, people with lung diseases such as asthma, and people who work or exercise outside are susceptible to adverse effects such as damage to lung tissue and reduction in lung function.

Ozone can be transported by wind currents and cause health impacts far from original sources. Millions of Americans live in areas that do not meet the health standards for ozone. Other impacts from ozone include damaged vegetation and reduced crop yields . Effects of ozone on vegetation have been demonstrated to occur at levels of ozone less than the ambient standards for human health protection.

Page 63: Delete the section on Global Warming and replace the sections below it with the following:

Toxic Chemicals
In the air, NOx reacts readily with common organic chemicals and even ozone, to form a wide variety of toxic products, some of which may cause biological mutations. Examples of these chemicals include the nitrate radical, nitroarenes, and nitrosamines.

Visibility Impairment
Nitrate particles and nitrogen dioxide can interfere with the transmission of light by scattering or absorbing it, reducing visibility in urban areas and regionally in national parks.

GROUND-LEVEL OZONE (O_3) *even at low levels can adversely affect sensitive individuals. It can also have detrimental effects on plants and ecosystems.*

Page 64: Insert "*scenic vistas*" after airsheds in the section on Smoke Sensitive Areas.

Environmental Consequences
Air Quality
Page 67: Replace the third sentence under Air Quality with the following:
Other pollutants, such as oxides of nitrogen (NO_x), SO2 and mercury are also produced, but in a relatively small quantity when compared to other pollutants.

Page 68: Insert "*and local*" after state in the paragraph above Alternative 1 Impacts.

Page 68: Insert "*weather conditions*" after the first "fire" in the second paragraph of Alternative 1 impacts.

Page 70: Replace the first sentence above Alternative 3 Impacts with the following:
Smoke management concerns would be addressed during Wildland Fire Use by working with the Washington State and local agencies responsible for implementation of the Clean Air Act and for smoke management (e.g. Washington Departments of Ecology and Natural Resources, SWCAA and PSCAA.

Vegetation
(Page 80) Add the following sentence to the last paragraph of Ecological Effects of Fire on Vegetation:
It is probable that prehistoric use of fire has played a role in regulating forest and subalpine meadow boundaries.

Prehistoric and Historic Archeology
Page 94: Delete the reference to rock art sites in the first sentence.

Park Access/Range and Enjoyment of Visitor Activities/Recreational Opportunities
Page 106: Under Alternative 1 Impacts replace the first bullet with the following:

- *changes in scenic vistas, although every effort would be made to protect "integral vistas" as defined by the National Park Service based on amendments to the Clean Air Act;*

Page 107: Replace the paragraph that begins "To mitigate" with the following:
To mitigate some of the potential visitor experience impacts associated with large or small fire suppression activity the park would increase its fire prevention education program by disseminating fire information proactively as fires occur both within and outside the park. During park fires, information staff would be added at turnaround points.

Page 108: Under Alternative 1- 5 Information, Interpretation and Education Impacts (last sentence) add the following:
"*As with other interpretive activities, more emphasis would occur in developed areas.*"

Consultation and Coordination
Page 116: Add the following:
Squaxin Island Tribe
Larry Ross

Nisqually Indian Tribe
David Trout, Georgiana Kautz, and Jeannette Dorner

Cowlitz Indian Tribe
Mike Iyall, Taylor Aalvik, and David Russell

Puyallup Tribe of Indians
Judy Wright, Henry John, Larry LaPointe, Jeffrey Thomas

Appendix 1: Minimum Impact Suppression Techniques, Best Management Practices and Other Mitigation Strategies

Replace this summary appendix with the following document (which is the same as the Fire Management Plan Appendix 34):

MOUNT RAINIER NATIONAL PARK
MINIMUM IMPACT SUPPRESSION TACTICS (MIST) GUIDELINES
(Rev. 7/20/05)

MINIMUM IMPACT SUPPRESSION TACTICS (MIST) GUIDELINES

NPS Guidelines, Plus Additional Recommendations for Mount Rainier National Park

I. CONCEPT

The concept of Minimum Impact Suppression Tactics (MIST) is to use the minimum amount of forces necessary to effectively achieve the fire management protection objectives consistent with land and resource management objectives. It implies a greater sensitivity to the impacts of fire tactics (both suppression and fire use) and their long- term effects when determining how to implement an appropriate suppression response. In some cases, MIST may indicate cold trailing or wet line may be more appropriate than constructed hand line. Individual determinations will be dependent on the specific situation and circumstances of each fire.

The change from *Fire Control* to *Fire Management* has added a new perspective to the role of the fire manager and the firefighter. The objective of putting the fire "dead- out" by a certain time has been replaced by the need to make unique decisions with each fire start, to consider the land and resource objectives, and to decide the appropriate management response and tactics which results in minimum costs and resource damage.

Traditional thinking, "the only safe fire is a fire without a trace of smoke" is no longer valid. Fire management now means managing fire "with time" as opposed to "against time." This change in thinking and way of doing business involves not just the firefighter, but all levels of management as well.

Actions on all wildfires within land management agencies protected wilderness areas will be those having a minimum impact on the physical resources associated with each site. In so doing, the principle of fighting fire aggressively but providing for safety first, will not be compromised.

MIST is not intended to represent a separate or distinct classification of firefighting tactics but rather a mind set of how to manage a wildfire while minimizing the long- term effects of the suppression and holding actions. When the term MIST is used in this document it reflects the above principle.

The key challenge to the line officer, fire manager and firefighter is to be able to select the wildfire tactics that are appropriate given the fire's probable or potential behavior. The guiding principle is always least cost plus loss while meeting land and resource management objectives. It is the second part of this statement which must be recognized more than it has in the past. Appreciations of the values associated with wilderness have been more difficult to articulate but, nevertheless, are important. As this recognition emerges, actions must be modified to accommodate a new awareness of them.

These actions, or MIST, may result in an increase in the amount of time spent watching, rather than disturbing, a dying fire to insure it does not rise again. They may also involve additional rehabilitation measures on the site that were not previously carried out.

When selecting an appropriate management response, firefighter safety must remain the highest concern. In addition, fire managers must be assured the planned actions will be effective and will remain effective over the expected duration of the fire.

II. GOALS

The goal of MIST is to halt, herd or delay fire spread in order to maintain the fire within predetermined parameters while producing the least possible impact on the resource being protected, in the safest manner. These parameters are represented by the initial attack incident commander's size- up of the situation in the case of a new start or by the escaped fire situation analysis (EFSA) in case of an escaped fire.

It is important to consider probable rehabilitation need as a part of selecting the appropriate suppression response. Tactics that reduce the need for rehab are preferred whenever feasible.

III. RESPONSIBILITY

As stated previously, safety is the highest priority. All action will be anchored to the standard fire orders and watch out situations. Safety will remain the responsibility of each person involved with the incident.

The intent of this guide is to serve as a checklist for the Incident Commander (IC), Section Chiefs, and all field supervisors/firefighters. Accomplishment of minimum impact suppression techniques originates with instructions that are understandable, stated in measurable terms, and communicated both verbally and in writing. Evaluation of these tactics both during and after implementation will further the understanding and achievement of good land stewardship ethics during fire management activities.

The following responsibilities and guidelines are for park Superintendents, IMT (incident management teams), and firefighters to consider. Some or all of the items may apply, depending upon the situation.

A. Park Superintendent / Agency Liaison Responsibilities

1. To transmit and define the land management objectives of the fire area to a fire team or persons managing the fire. This can be accomplished through a delegation of authority. It is recommended that a park Agency Liaison be assigned on all incidents to assist the fire team or IC.
2. The Superintendent or their acting designee shall sign and review the WFSA/WFIP for compliance. (Wildland fire situation analysis, WFSA or wildland fire implementation plan, WFIP).

B. Resource Advisor (READ) Responsibilities

This position should be filled by a qualified park employee or trainee. Their responsibility is to insure the interpretation and implementation of WFSA/WFIP and other oral or written line officer direction is adequately carried out.

1. Provide specific direction and guidelines as needed.
2. Consult with fisheries and wildlife biologists, cultural resource staff, wilderness staff, and other specialists as needed.
3. Participate at fire team planning sessions, provide input, review IAP (incident action plan) and attend daily briefings to emphasize resource concerns and Park management's expectations.
4. Provide assistance in updating WFSA/WFIP, when necessary.
5. Conduct site visits on the fire, as necessary, due to resource concerns or as requested by the Superintendent or fire team.
6. Participate in incident management team debriefing and assist in evaluation of team performance related to MIST.

C. IMT Fire Team Responsibilities

IC, Command and General Staff Responsibilities:

The IC, Command and General Staff should consider the following:

1. Evaluate tactics during planning and strategy sessions to see that they meet Superintendent's objectives, T&E conservation measures and MIST, both verbally and through the EFSA/WFSA/WFIP.
2. Establish and nurture a dialogue with the resource advisor and/or agency liaison assigned to the fire team.
3. Notify Superintendent or agency liaison if T&E conservation measures are impacted.
4. Discuss MIST with field supervisors during overhead briefings to gain full understanding of tactics.
5. Ensure MIST techniques are implemented during line construction, as well as, other resource disturbing activities.
6. Review actions on site and evaluate for compliance with Superintendent's direction/delegation and tactical effectiveness in achieving fire management protection objectives.

Planning Section Responsibilities:

The Planning Section should consider the following:

1. Use resource advisor(s) to evaluate that management tactics are commensurate with land/resource objectives and incident objectives. Involve the resource advisor in the development and updating of the daily of the WFSA/WFIP.
2. Ensure that documentation and signatures are obtained on the WFSA/WFIP.
3. Use an assessment team to get a different perspective of the situation.
4. Use additional consultation from "publics" or someone outside the agency, especially if the fire has been or is expected to be burning for an extended period of time.
5. Ensure that instructions for MIST are listed in the IAP (incident action plan) and relayed to field personnel.

Operations Section, including field Supervisor's Responsibilities:

The Operations Section should consider the following:

1. Adjust line production rates to reflect the MIST, while placing fire fighter safety first.
2. Emphasize MIST techniques during each operational period briefing and explain conservation measures expectations for instructions listed in incident action plan.
3. Anticipate fire behavior and ensure all instructions can be implemented safely
4. Minimize or avoid stream course disturbance, sedimentation, and actions that will result in increased water temperature.
5. Maintain minimum no- touch buffer within established area of fish- bearing streams. This could include up to 300 feet within the area of these streams and is dependent on site specific prescriptions currently being developed.
6. If helicopters are involved, use long line remote hook in lieu of constructing helispots to deliver/retrieve gear.
7. Brief helibase personnel on the park's designated water source/dip sites; provide pilots with maps of lakes.
8. Consider use of helicopter bucket drops and water/foam before calling for an air tanker or retardant.
9. Avoid cutting/falling old growth trees; work with agency liaison and READ.
10. Consider coyote camps versus fixed campsite in sensitive areas. See Logistic section on the following pages.

11. If a dozer is necessary (near park boundaries or developed areas) use a brush blade for line building.
12. Detail objectives for extent of mop- up necessary, for instance: "_____ distance within perimeter boundary."
13. Monitor suppression tactics/conditions.

Chemical Fire Retardant, Foam and Fuel

1. Wherever possible, avoid using chemicals when there is a potential for contamination of waterways (based on proximity, wind direction, wind speed, size and frequency of loads, etc.). Avoid use of retardant or foam within 300 feet of streams or within designated critical habitat. Use of retardant should also be avoided in areas with lakes, bogs, or swamps as effects on aquatic biota may be prolonged. Consult with resource advisors.
2. Do not pump directly from streams if chemical products are going to be injected into the pump or pumping system. If chemicals are needed, use a fold- a- tank from which to pump water.
3. If possible, do not dip helicopter buckets from streams where juvenile or adult salmon may be present. Mount Rainier National Park biologists will provide a list of these waterways. (Firefighter and public safety will always take precedence, and if helicopter drops are needed, they will be utilized.)
4. Use of helicopter buckets will occur only after chemical injection systems (storage containers) have been removed from the bucket or helicopter.
5. Keep refueling, fuel storage, and fuel trucks outside designated critical habitat, or utilize spill pads and/or containment units.
6. Use spill pads under portable pumps and fuel cans/fuel lines connected to pumps.
7. Report any chemical spill or contamination to the Agency Liaison or Superintendent.

Field Supervisors (DIVS, STRC, CRBW, module leaders, etc.) Responsibilities:

The field supervisors should consider the following:

1. Ensure that crew superintendents, dozer, falling bosses and single resource bosses understand what is expected.
2. Discuss minimum impact tactics with field personnel and monitor results.
3. Report any loss of T&E habitat in conjunction with the listed conservation measure objectives.
4. If helicopters are involved, use natural openings as much as possible; minimize cutting only to allow safe operations. Avoid construction of landing areas in high visitor use areas.
5. Provide feedback on implementation of tactics; were they successful in halting fire spread, what revisions are necessary?
6. Look for opportunities to further minimize impact to land and resources during the suppression and mop- up phase.
7. Document and report any hazardous fuel spills.

Fire Fighter Personal Camp Conduct

1. Use “leave no trace” camping techniques.
2. Minimize disturbance to land when preparing bedding site. Do not clear vegetation or trench to create bedding sites.
3. Use stoves for cooking.
4. Don’t burn plastics or aluminum, “pack it out” with other garbage.
5. Keep a clean camp and store food and garbage so it is unavailable to all animals. Ensure items such as empty food containers are clean and odor free, never bury them.
6. Select travel routes between camp and fire and define clearly.
7. Carry water and bathe away from lakes and streams. Personnel must not introduce soaps, shampoos or other personal grooming chemicals into waterways.

Logistics Section Responsibilities:

The Logistic Section should consider the following:

Campsites Considerations and Personal Conduct

1. Ensure actions performed around areas other than Incident Base, (i.e.) dumpsites, camps, staging areas, helibases, etc., results in minimum impact upon the environment.
2. In sensitive area, consider use of portable facilities (heat/cook units, latrines).
3. Educate fire fighters on proper food storage practices. Garbage and food items will be handled appropriately by firefighters to minimize attraction of wildlife. Consider the use of bear containers for food storage.
4. Consider impacts on both present and future users. An agency commitment to wilderness values will promote those values to the public.
5. Locate facilities outside of wilderness whenever possible.
6. Use existing campsites if available. Lay out the camp components carefully from the start. Define cooking, sleeping, latrine, and water supply.
7. Coordinate with the Resource Advisor in choosing a site with the most reasonable qualities of resource protection and safety concerns.
8. If existing campsites are not available, select campsites that isn't unlikely to be observed by visitors/users.
9. Camps, staging areas, and base heliports will be located outside designated habitat, if at all possible, and will be identified on a map prior to implementation.
10. Change camp location if ground vegetation in and around the camp shows signs of excessive use.
11. Do minimal disturbance to land in preparing bedding and campfire sites. Do not clear vegetation or do trenching to create bedding sites.
12. Minimize the number of trails and ensure adequate marking. Select alternate travel routes between camp and fire if trail becomes excessive.
13. Evaluate short- term low impact camps such as coyote or spike versus use of longer- term higher impact camps.
14. New site locations should be on impact resistant and naturally draining areas such as rocky or sandy soils, or openings with heavy timber.
15. Avoid camps in meadows, along streams or on lakeshores. Located at least 200 feet from lakes, streams, trails, or other sensitive areas.
16. Do not use nails in trees.
17. Consider fabric ground cloth for protection in high use areas such as around cooking facilities.
18. Latrine sites should be a minimum of 300 feet from water sources.
19. Consider the use of portable vault toilets in spike camps. If not, waste cat holes should be dug 6 to 8 inches deep, with toilet paper packed out.

IV. IMPLEMENTATION GUIDELINES

Minimum impact management is an increased emphasis to do the job of managing a fire while maintaining a high standard of caring for the land. Actual fire conditions and good judgment will dictate the actions. Consider what is necessary to monitor fire spread and ensure it is contained within the fireline or designated perimeter boundary.

Where large fire affect more than about 10% of a Section 7 watershed, it is recommended that a scientific group of experts be convened to prepare a peer reviewed assessment or analysis of the short and long term effects from the wildfire, suppression actions and rehabilitation. The assessment should also recommend actions, (if there are any) that may be appropriate for the burned or unburned areas with the watershed.

A. Safety

- Safety and communications is of utmost importance.
- Ensuring that safety is the first priority and primary concern of all firefighters
- Encouraging firefighters to routinely review LCES and apply the 18 Watch Out Situations and 10 Standard Fire Orders during their incident tenure
- Be particularly cautious with: aerial hazards, unburned fuel between personnel and the fire, burning or partially burning live and dead trees
- Be constantly aware of the surroundings, of expected fire behavior, and possible future fire perimeter (one or two days hence).

B. Conservation Measures

When used in the context of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) (Act), "conservation measures" represent actions proposed by the Federal agency that are intended to further the recovery of and/or to minimize or compensate for project effects on the species under review. The following conservation measures were agreed to by the Park and U.S. Fish and Wildlife Service biologists as required measures to minimize adverse impacts to listed species and their habitats.

Northern Spotted Owl and Marbled Murrelet

1. No stand replacing fires will be allowed to burn in a spotted owl 100- acre core area at any time.
2. Only non- motorized suppression techniques will be used in the 100- acre core area of spotted owl territories during the early nesting season
3. Ground fires will be allowed to burn up to 10 percent of a spotted owl 100- acre core area beginning August 1
4. Spotted owl territories will be maintained with at least 55 percent of the 1.8- mile circle and 75 percent of the 0.7- mile circle in suitable habitat.
5. All fires that occur in unsurveyed suitable spotted owl habitat or within active nesting territories of the 0.7- mile circle before August 1 will be suppressed.
6. All fires that occur in occupied marbled murrelet habitat before August 6 will be suppressed.
7. No more than 45 acres of stand replacing fires will occur in occupied marbled murrelet habitat within five year period.
8. No more than 927 acres of stand replacing fires will occur in suitable spotted owl habitat or unoccupied murrelet habitat within five year period.
9. Hazard fuels treatments will occur after August 5.
10. Retardants will be used outside of suitable spotted owl and murrelet habitat. If retardants need to be used in suitable spotted owl or murrelet habitat, it will be addressed under future emergency consultation.
11. From March 15 to July 31, ground fires are permitted up to 10 percent of the 0.7 mile circle in non- nesting owl territories.

Terrestrial

1. A qualified resource advisor will be assigned to fires as needed to minimize impacts to threatened and endangered species.
2. Information regarding location of sensitive wildlife resources will be provided to the Incident Commander for consideration in planning fire activities.
3. As much as possible, disturbance to known owl nests will be minimized by following USFWS guidance on disturbance distance thresholds during fire suppression and fire use operations. (See chart)

4. When possible, crews will hike into and out from a fire rather than flying.
5. When possible, hand tools will be used rather than power equipment.
6. When possible, helicopters will fly from nearby airports and helibases, rather than staging within threatened and endangered species habitat *in* the park.
7. When possible, helicopter operations in the park will be staged at Kautz Creek or at sites > 4500 rather than other forested areas of the park.
8. When possible, helicopters will fly greater than 120 yards above the tree canopy, or greater than 550 feet above ground level (AGL) over threatened and endangered species habitat.
9. Removal of mature coniferous trees will be minimized.
10. Garbage and food items will be handled appropriately by firefighters to minimize attraction of corvids.
11. Over sensitive areas, flights and other noise producing activities will be limited within 2 hours of sunrise and sunset, when possible.
12. Whenever possible, planned activities (such as hazard fuel reduction) within suitable habitat will be conducted outside of the breeding seasons for listed bird species (or as late as possible in the breeding season) unless site- specific protocol surveys conducted prior to fire management activities document no use of the area by the species.

Aquatic Resources

<u>Fire Suppression (Retardants, Foams, and Water Withdrawals)</u>

1. A qualified resource advisor will be consulted on fires greater than 0.25 acres regarding the presence of federally listed fish species.
2. Evaluate suppression of fires in riparian habitat within bull trout watersheds to minimize impacts to bull trout. The Resource Advisor can provide maps of these areas.
3. Avoid using retardants, foams, and surfactants near lakes or flowing streams (e.g. not to be applied within 300 feet of waterway with listed fish species).
4. Avoid water withdrawals from fish bearing streams whenever possible (See Map).
5. Direct the spraying of foam away from waterways whenever possible.
6. Avoid back flushing pumps and charged hoses into lakes or flowing streams. Utilize check bleeder valves whenever possible. Direct flow away from water sources when draining pumps or charged hoses.
7. Stream profile will be restored in areas where check dams were constructed.
8. If tactically possible, use of foam or retardant will be limited to upslope areas. Helicopter bucket dipping from streams in or adjacent to spawning should be avoided, including inlet streams to lakes.
9. Helicopter bucket dipping should be conducted only after chemical injection systems have been removed, disconnected or rinsed clean if foam is not needed for that fire suppression activity. If foam application is necessary, crews will consider whether to use a remote dip tank away from water sources.
10. Pump intakes placed in fish bearing lakes or streams will be covered with 1/8 inch or less screened material.
11. Avoid the use of riparian areas (300 feet from flowing water) as landing areas and refueling areas for helicopter operations whenever possible.
12. Locate fire camps away from riparian areas whenever possible.

<u>Sediment Control</u>

1. Limit fire lines to three feet in width, construct erosion control structures, and rehabilitate them to minimize sediment delivery to streams whenever possible.
2. To protect fisheries resources, stream disturbing activities shall generally occur during the dry season from July 15 through August 15.

3. Erosion control methods shall be used to prevent silt- laden water from entering the stream whenever deemed necessary. On larger fires, Federal Burned Area Emergency Rehabilitation (BAER) Standards may be utilized.
4. Wastewater from project activities and water removed from within the work area will be routed to an area landward of the ordinary high water line to allow for removal of fine sediment and other contaminants prior to being discharged to the stream. Sediment entering the stream channel may affect spawning gravels, substrate embeddedness, pool frequency/quality and development of large pools. Chemical contaminants may have a negative biological affect on many forms of aquatic life including salmonids and macroinvertebrates.

Water Quality

1. In the event of a hazardous fuel spill, MORA will adhere to the Spill Prevention Control and Countermeasures Plan. On larger pumping and helicopter operations, minimal spill prevention kits will be available onsite. The desired outcome is to control, absorb, or contain the spill for clean- up and disposal.
2. Any machinery maintenance involving potential contaminants (fuel, oil, hydraulic fluid, etc) will occur outside the riparian area whenever possible
3. Prior to starting work each day, all machinery will be inspected for leaks (fuel, oil, hydraulic fluid, etc) and all necessary repairs will be made before the commencement of work.
4. Minimize the amount of time that heavy equipment is in riparian areas or stream channels.
5. Removal of mature coniferous and deciduous trees within 300 ft. of a wetland, stream, or river will be minimized. The crew will directionally fall trees towards the waterway.
6. Helicopter landings in stream and river channels will occur outside the active channel whenever possible.
7. Any hazmat spill will be reported to the resource advisor and documented
8. Not altering water courses to fight fire and limiting the use of chemical retardant, foam and gasoline (without secondary containment) near water resources.

B. Best Management Practices and Other Mitigation Strategies

General Strategies (affecting multiple resources)

1. Increase communication, cooperation and coordination with other park divisions, neighboring agencies, Native American Tribes, and private landowners.
2. Comply with all federal and state regulations governing air pollution and smoke management standards
3. Comply with all applicable NPS policy and guidelines related to wild land fire management and ecosystem health.
4. Utilize controlled burn intensities to result in a fast- moving, lower temperature impact fire.
5. Require post- fire rehabilitation of fire lines, including efforts to reduce compaction by scarifying the soil, and installing natural erosion barriers.

Air Resources

The Superintendent will comply with all federal and state regulations governing air pollution and smoke management standards and all applicable NPS policy and guidelines related to wild land fire management and ecosystem health.

1. No burning would be conducted when air regulatory agencies declare air pollution episodes and impaired air conditions for Pierce or Lewis County.

2. Park personnel would obtain updated burning information (1- 800- 323- BURN) on the day of the burn and follow the instructions that apply for the day and location of the proposed burning.
3. To limit impacts to visitor use, no burning is permitted during weekends.
4. All materials earmarked for burning would be placed in clearly marked piles at designated burn areas, such as the Kautz Creek maintenance area or Ohanapecosh Wastewater Treatment Plant. Proper signage to identify and describe what materials are placed there for burning is necessary.
5. Burn piles would be located at least 50 feet from structures.
6. As appropriate, flammable debris would be cleared from the area.
7. Burning would only be conducted during periods when adjacent fuel moisture was high (with an ignition component of less than 50 percent) and winds were calm or light.
8. Adequate suppression equipment and personnel would be on hand (a connected water hose, or at least five gallons of water and a shovel available nearby).
9. To limit impacts to visitor use, no burning is permitted during weekends.
10. Washington State Smoke Management Plan. All prescribed burning and debris disposal would comply with regulations contained in the Washington State Department of Natural Resources Smoke Management Plan. Small burn piles up to about six feet in diameter and would contain less than 100 tons (109,718 kilograms) of natural vegetation. (This meets the definition of small fires under the smoke management plan.) For prescribed fires that would consume 100 tons or more of material, the park would apply to Washington Department of Natural Resources, including the Department of Ecology for smoke management approval. Burns would be timed to minimize smoke impacts on air quality and visibility utilizing favorable conditions of atmospheric stability, mixing height and transport winds. No piles would be ignited during smoke management burn bans or *visibility protection periods* (including from about Memorial Day to Labor Day).
11. Limiting the number of acres and amount of fuel burned, assessing timing and method of ignition.
12. Determining the fuel moisture content of fuel.
13. Coordinating with other agencies and land owners to limit the number of fires occurring simultaneously.

Soils

1. Selecting procedures, tools and equipment with the least possible impact to the Environment.
2. Implementing the use of water (bucket drops or wet- lining) as a fire suppression Technique.
3. Ensuring that firefighting equipment is well maintained to prevent spills of lubricants, fuels or other materials (as well as using ground cloths beneath such equipment to prevent accidental releases).
4. Allowing the fire to burn to a natural barrier.
5. Using the minimum necessary depth and width on fire line construction.
6. Covering fire lines with organic material as part of the rehabilitation process;
7. Installing water bars or other silt protection measures in sensitive areas;
8. Minimizing the felling of trees and bucking of downed logs along the fire line and within the perimeter of the fire.
9. Minimizing the limbing of vegetation adjacent to the fire line.
10. Removing or cutting vegetation only as necessary to prevent fire spread.
11. Limiting the locations of fire camps, helispots, hand lines, intensive mop- up and other concentrated fire activities to non- sensitive sites.
12. Leaving standing dead trees (snags).
13. Using native materials for sediment traps.

14. Using existing spike camps or camping in resilient areas (rocky or sandy soils) showing signs of recent human disturbance (while avoiding wet meadows, water shorelines and other sensitive areas).
15. Avoiding the use of rehabilitated fire line as a travel corridor to minimize soil compaction.
16. Lessening soil disturbance by ensuring that hot spots and smoldering fires are out;
17. Refraining from creating piles of debris to burn or excessively spreading burning fuels, letting fuels burn out naturally.
18. Using mulch or soil netting, as appropriate, to minimize or prevent erosion.

Water Resources

1. Establishing spike camps at least 200 feet from water sources.
2. Disposing of human waste either by removing it entirely from the site (preferred) or via a 6- 8 inch deep dispersed "cat- hole:"
3. Capturing and transporting fire camp gray water to acceptable dump sites.
4. Using biodegradable soap and containing wastewater associated with its use.
5. Removal of all garbage, including food scraps regularly.
6. Rehabilitation of fire lines, including implementing erosion control measures that decrease sedimentation.
7. Using mulching or check dams, as appropriate, to prevent or minimize sedimentation;
8. Not altering water courses to fight fire.
9. Prohibiting the use of chemical retardant, foam and gasoline (without secondary containment) near water resources and avoiding the use of retardant and foam elsewhere.
10. Dipping from only from approved water sources under established conditions (regarding water depth, sensitive resources and method).
11. Avoiding fire line construction along steep hillsides above park waters.

Vegetation

1. Ensuring that firefighting equipment or supplies are not contaminated with noxious weed seeds (consider steam- cleaning equipment, as appropriate prior to transport into park or use in sensitive areas).
2. According to the Mount Rainier Restoration Handbook (1990), the following actions would be used to limit the effects of fire lines on vegetation. Constructed fire lines would be rehabilitated when the fire is out and the fireline is no longer needed for control actions. A rehabilitation plan would be written prior to action. If necessary, fire lines would be filled to grade to prevent channeling of water and attendant erosion. Upon filling to grade, restoration would include replanting with salvaged vegetation or covering with duff and excelsior, as needed. Scattering brush, dead limbs or rocks randomly along the trail could also help to impede water erosion and to camouflage the lines.
3. Dependent on the type of terrain, the following minimum standards for fire line rehabilitation from the Wildland Fire Resource Advisor's Task Book (NPS 1992) would be used:

Flat or Gentle Slopes

a. Recontour line to match surrounding terrain by pulling soil, litter, duff and rocks back over line.
b. Remove/recontour trenches.
c. Scatter piles of slash near and over line.
d. Flush cut stumps.

Steep Slopes

a. Rake along contour to create small, shallow trenches across fall line
b. Recontour line as above to match surrounding terrain by pulling 2- 4 inches of litter and duff back over line.

c. Remove/recontour trenches.
d. Place rock (with previously exposed lichen side up) and logs randomly on fall line to intercept adjacent runoff.
e. Scatter piles of adjacent slash near and over line.
f. Flush cut stumps.
g. Trees to be felled and left on site would not be bucked or limbed, except in developed areas or along designated trails.
h. Reseeding, which has largely proven unsuccessful, unless native species are used, would not be undertaken.
i. When possible, construction of fire lines would not be undertaken in sensitive subalpine areas.
j. Fire camps and other operations assemblages would take place in developed areas or areas where clear indications of recent human disturbance (bare ground) are present.
k. Fire lines of the minimum possible depth and width would be used.
l. Care would be taken to select suppression tactics, procedures, tools and equipment with the least possible impact to the environment.
m. Equipment used in firefighting would be cleaned prior to use in park firefighting efforts.
n. Mulches or other rehabilitation treatments, including straw bales would come only from sources approved by the park plant ecologist.

Wildlife

1. Use of developed areas or areas extensively disturbed by human impacts for staging fire suppression activities.
2. Limiting the types of activities that would be performed at dawn, dusk or night as appropriate to minimize impacts to threatened and endangered species.
3. Relying on existing trails to the extent possible to access fires.
4. Relying to the extent possible on water sources outside the park for firefighting efforts.
5. Minimizing the use of fire retardant or foams in suppression efforts.
6. Ensuring that firefighting equipment was in good condition and using best management practices to ensure that spills of lubricants, fuels or other chemicals does not occur.

Rare, Threatened, and Endangered Species and Habitats

1. The park would continue to build its inventory and monitoring program for rare, threatened and endangered species and habitats, including conducting surveys to USFWS protocol as needed to cover future actions proposed by this plan. To the extent practicable, Prescribed Fire, under future environmental analysis, would either avoid nesting or spawning seasons or would not be conducted in areas where analysis of rare species and habitat had not been made.
2. For naturally occurring Wildland Fire (lightning strikes) and potential future Prescribed Fires, documentation of immediate post- fire threats to rare, threatened and endangered species and habitats and actions to prevent further degradation of these would occur immediately following fire use or suppression activities.
3. To the degree possible, direct, fire- related mortality of rare species, including known habitat or activity sites, would be avoided.
4. Suppression activities, fire effects monitoring and smoke production would be carefully monitored in the vicinity of known habitat in the decision process with respect to all fires (including suppression and use).
5. To the degree possible, construction of fire lines would avoid known rare, threatened or endangered species habitat.
6. During future Prescribed Fires, in known rare, threatened or endangered bird habitat post nesting season, cooler burn prescriptions would be used and some degree of hazard fuel removal could be used to limit the potential for crown fires.

7. Hazard fuel reduction will not remove any nest trees or other specific habitat for rare species.
8. In areas below 4,500 feet, Type III helicopters used in wildland fire suppression efforts would fly greater than 120 yards above the tree canopy, or greater than 550 feet above ground level (AGL) during the early nesting season (March 15 - August 5)] for both northern spotted owls and marbled murrelets.
9. Type III helicopters would be staged, to the degree possible, during nesting season fire suppression efforts above the elevation of northern spotted owl (4,500 feet) and marbled murrelet (3,800 feet) nesting habitat (e.g. Fourth Crossing rather than Kautz Creek).

Prehistoric and Historic Archeology

1. The park would continue to build its inventory and monitoring program for archeological resources, including conducting surface and subsurface testing as necessary to document the potential for archeological resources or to understand the extent of archeological resources found.
2. Prior to the development of Prescribed Fire plans (and subsequent environmental analysis), areas proposed for fires would be surveyed for the presence of archeological resources.
3. Heavy equipment or other ground disturbing activities would not be used in known sensitive archeological resources sites
4. The location and extent of known sensitive archeological resources would be considered in the decision to use wild land or prescribed fire.
5. Inclusion of park archeologist in the planning and suppression process
6. There would be no fire line construction in the vicinity of known archeological resources.
7. As appropriate during archeological assessment and monitoring there would be surface or subsurface surveys accompanied by screening of sediments as necessary to determine the presence or significance of archeological resources.
8. If prehistoric or historic archeological resources were discovered during any portion of a proposed action under the implementation of the alternatives that follow, work in the area associated with the find would cease until evaluated by the park archeologist or designated representative. If necessary or possible, relocation of the work to a non-sensitive area may be required to enable completion of additional site testing and documentation. Every effort would be made to avoid further disturbance to the site.
9. In the event of a significant find, consultation with the Washington State Historic Preservation Office and Native American tribes would occur and recommendations would be sought for appropriate treatment of the resources located.
10. Increased law enforcement patrols in known archeological sites following fires that removed surface vegetation obscuring sites
11. Confinement of mop- up activities to smaller areas to allow archeologists more lead time to examine the ground surface before crews complete their work.

Historic Structures

1. The park would continue to build its inventory and monitoring program for historic resources.
2. Facilitate the preservation of park historic buildings, structures and cultural landscapes in developed areas by conducting systematic Manual/Mechanical treatment of hazardous accumulations of fuel near these facilities. Treat 20 percent of the park per year.
3. Create defensible spaces, where possible, around developed areas to provide an additional measure of protection for facilities in these areas. By 2006, identify defensible spaces around National Historic Landmark District contributing structures.
4. As structures are rehabilitated, increase the use of fire suppression systems and other structural improvements that meet the Secretary of Interior’s Standards for

Rehabilitation of Historic Structures, resulting in no adverse effect. Prior to the development of Prescribed Fire plans (and subsequent environmental analysis), areas proposed for fires would be surveyed for the presence of historic resources.

5. Heavy equipment or other ground disturbing activities would not be used in known sensitive archeological resources sites.
6. The location and extent of known sensitive or significant historic resources would be considered in the decision to use wild land or prescribed fire.
7. Inclusion of park historical architect and historical landscape architect in the planning and suppression process
8. There would be no fire line construction in the vicinity of known historic resources.
9. If historic resources were discovered or affected during any portion of a proposed action under the implementation of the alternatives that follow, consultation with the State Historic Preservation Office would occur. If necessary or possible, relocation of the work to a non- sensitive area may be required to enable completion of consultation and documentation. Every effort would be made to avoid further disturbance to the site.
10. Increased law enforcement patrols near affected resources following fires.
11. Confinement of mop- up activities to smaller areas to allow historic resources professionals more lead time to understand fire effects to historic resources.
12. Structural inspections (post- fire condition assessment) of historic structures damaged by fire, including immediate mitigation measures such as bracing or weatherproofing.

Wilderness

1. Administrative use of aircraft would be permitted in accordance with Office Order 97- 1: Safety Orientation for New Employees and 79- 8: Aircraft Use Request and subsequent updates. Permission to use helicopters in wilderness is granted by the superintendent. Helicopter use in wilderness (for other than emergencies) would generally not be approved between July 1 and Labor Day and use is restricted to weekdays. Approval for helicopter use in non- emergency situations would be granted only if it has been determined to be the minimum tool to achieve the purposes of the area for protection of wilderness values.
2. There are no existing, constructed helicopter landing zones in wilderness. Natural openings would be used if approved under the minimum requirement for helicopter landing as detailed in the FMP. Minimal clearing would be used in an emergency if other safe alternatives have been ruled out. Site restoration would occur following this use.
3. Fixed wing and other aircraft use would conform to FAA regulations and mitigation to minimize or eliminate impacts to endangered species.
4. As detailed in the Wilderness Management Plan (1988), temporary work crew camps may be established within trailside camps or other resilient zones as approved by the superintendent (not within view or ¼ mile of established trail). Cache boxes, equipment and supplies would be kept out of sight as possible and removed when no longer needed and restoration would occur upon cessation of use.
5. Park use of power equipment is dictated by Office Order 87- 1: NPS Use of Mechanized Equipment and Stock for Administrative Activities Otherwise Not Permitted and the Wilderness Management Plan. The use of Manual/Mechanical equipment is constrained by the Wilderness Act and NPS policy. In determining the appropriate minimum tool for use in wilderness, consideration is given to effects on visitor experience, public safety and wilderness values. Resource protection and safety concerns would take precedence over economic considerations. Alternative methods to power tools would be considered based on the project objectives and minimum tool concerns. Use of power tools in wilderness would be confined, as much as possible, to the period prior to July 1 and after August 31. Depending on the size of the fire, the minimum tool could be the use of helicopters, chainsaws, portable pumps and air tankers. This would be determined on a case- by- case basis, considering numerous factors as noted above.

6. As discussed in the Wilderness Management Plan, the use of the minimum requirement/minimum tool concept would be employed for fires in wilderness. Specific emphasis would be on the natural role of fire in the park ecosystem and the need to modify fire use and fire suppression responses (as appropriate) to minimize their effects. Suppression standards, both tactical and strategic would be used to minimize the environmental effects of suppression activities. Rehabilitation of fire suppression impacts to park resources would occur as part of and immediately following mop- up.

V. FIRE LINE PROCEDURES

- Select procedures, tools, and equipment that least impact the environment.
- Give serious consideration to use of water as a fireline tactic (fireline constructed with nozzle pressure, wet lining)
- If the use of dozers or heavy equipment is being used to protecting developed areas or along the park boundary, avoid the use in riparian areas
- Avoid increasing fire intensities within critical habitat during burnout or backfire operations.

A. Hot- Line/Ground Fuels

1. Allow fire to burn to natural barriers, use barriers to aid line construction
2. Use cold- trail, wet line or combination when appropriate.
3. If constructed fireline is necessary, use only width and depth to check fire spread.
4. Consider use of fireline explosives for line construction.
5. Burn out and use low impact tools like swatter or 'gunny' sack.
6. Minimize bucking and cutting of trees to establish fireline; build line around logs when possible.
7. When called for use alternative mechanized equipment such as excavators, rubber tired skidders, etc. rather than tracked vehicles.
8. Use high pressure type sprayers on equipment prior to assigning to incident to help prevent spread of noxious weeds.
9. Dip from only from approved water sources under established conditions (regarding water depth, sensitive resources and method).
10. Avoiding fire line construction along steep hillsides above park waters.

B. Hot- Line/Aerial Fuels

1. Limb vegetation adjacent to fireline only as needed to prevent additional fire spread.
2. During fireline construction, cut shrubs or small trees only when necessary. Make all cuts flush with the ground.
3. Minimize felling of trees and snags unless they threaten the fireline or seriously endanger workers. In lieu of felling, identify hazard trees with a lookout or flagging.
4. Scrape around tree bases near fireline if it is likely they will ignite.
5. Use fireline explosives for felling when possible to meet the need for more natural appearing stumps.
6. Inside fireline: remove or limb only those fuels which if ignited will have potential to spread fire outside the fireline.
7. When using indirect attack:
8. Do not fall snags on the intended unburned side of the constructed fireline, unless they are an obvious safety hazard to crews working in the vicinity
9. On the intended burnout side of the line, fall only those snags that will reach the fireline should they burn and fall over. Consider alternative means to falling, (i.e.) fireline explosives, bucket drops.

10. TREES: burned trees and snags:
    a. MINIMIZE cutting of trees, burned trees, and snags. If possible, do not fell trees within designated critical habitat. If old growth is involved, have the Resource Advisor part of the decision process.
    b. Live trees will not be cut, unless determined they will cause fire spread across the fireline or seriously endangers workers. If tree cutting occurs, cut stumps flush with the ground and if possible, directionally fall trees near waterways towards any large stream or river.
    c. Scrape around tree bases near fireline if hot and likely to cause fire spread.
    d. Identify hazard trees with either an observer, flagging and/or glow- sticks.
    e. Consider the option not cutting the tree and constructing in- direct line to encompass the height of the tree, if it were to fall.

C. Mop- up Ground Fuels

1. Consider using "hot- spot" detection devices along perimeter (aerial or hand- held).
2. Cold- trail areas adjacent to unburned fuels
3. Do minimal spading; restrict spading to hot areas near fireline.
4. Cold- trail charred logs near fireline; do minimal tool scarring.
5. Minimize bucking of logs to extinguish fire or to check for hotspots; roll the logs instead if possible.
6. Return logs to original position after checking and when ground is cool.
7. Refrain from making bone yards; burned and partially burned fuels that were moved should be returned to a natural arrangement.
8. Consider allowing large logs to burnout. Use a lever rather than bucking to manage large logs which must be extinguished.
9. Use gravity socks in stream sources and/or a combination of water blivits and fold- a- tanks to minimize impacts to streams.
10. Consider using infrared detection devices along perimeter to reduce risk.
11. Personnel should avoid using rehabilitated firelines as travel corridors whenever possible because of potential soil compaction and possible detrimental impacts to rehab work, i.e. water bars.
12. Refraining from creating piles of debris to burn or excessively spreading burning fuels, letting fuels burn out naturally.
13. Using mulch or soil netting, as appropriate, to minimize or prevent erosion.

D. Mop up/Aerial Fuels

1. Burning trees and snags:
2. First consideration is to allow burning tree/snag to burn out or down (Ensure adequate safety measures are communicated).
3. Identify hazard trees with an observer, flagging, and/or glow- sticks.
4. If burning trees/snags pose serious threat of spreading firebrands, extinguish fire with water, bucket drops or dirt. Use FELLING by chainsaw as a secondary means.
5. Consider falling by blasting, if available.
6. Remove or limb only those fuels which if ignited have potential to spread fire outside the fireline.
7. Before felling consider allowing ignited tree/snag to burn out. Ensure adequate safety measures are communicated if this option is chosen.
8. Identify hazard trees with a lookout or flagging.

9. If burning trees/snag poses a serious threat of spreading fire brands, extinguish fire with water or dirt whenever possible. Consider felling by blasting when feasible. Felling by crosscut or chainsaw should be the last resort.
10. Align saw cuts to minimize visual impacts from more heavily traveled corridors. Slope cut away from line of sight when possible.

VI. AVIATION MANAGEMENT

One of the goals of Park and wilderness managers is to minimize the disturbance caused by air operations during an incident.

A. Aviation Use Guidelines

1. Maximize back haul flights as much as possible.
2. Use long line remote hook in lieu of constructed helispots for delivery or retrieval of supplies and gear
3. Use established water source/dip site map obtained from resource advisor
4. Take precautions to insure noxious weeds are not inadvertently spread through the deployment of cargo nets, buckets and other external loads.
5. Use natural openings for helispots and para- cargo landing zones as far as practical. If construction is necessary, avoid high visitor use areas.
6. Obtain the parks list of known helispots; consider maintenance of Park's existing helispots over creating new sites.
7. Obtain specific instructions for appropriate helispot construction prior to the commencement of any ground work.
8. Consider directional falling of trees and snags so they will be in a natural appearing arrangement. Avoid permanent marking/painting to visibly label the helispot.
9. Buck and limb only what is necessary to achieve safe/practical operating space in and around the landing pad area.
10. When possible, helicopters will fly greater than 120 yards above the tree canopy, or greater than 550 feet above ground level (AGL) over threatened and endangered species habitat.
11. In areas below 4,500 feet, Type III helicopters used in wildland fire suppression efforts would fly greater than 120 yards above the tree canopy, or greater than 550 feet above ground level (AGL) during the early nesting season (March 15 - August 5)] for both northern spotted owls and marbled murrelets.
12. Type III helicopters would be staged, to the degree possible, during nesting season fire suppression efforts above the elevation of northern spotted owl (4,500 feet) and marbled murrelet (3,800 feet) nesting habitat (e.g. Fourth Crossing rather than Kautz Creek).

B. Retardant Use

1. During initial attack, fire managers must weigh the non- use of retardant with the probability of initial attack crews being able to successfully control or contain a wildfire.
2. If it is determined that use of retardant may prevent a larger, more damaging wildfire, then the manager might consider retardant use even in sensitive areas. This decision must take into account all values at risk and the consequences of larger firefighting forces impact on the land.
3. Retardants are permitted outside of suitable spotted owl and murrelet habitat. If retardants need to be used in suitable spotted owl or murrelet habitat, it will be addressed under

emergency consultation. Between the years of 2005- 2009, the use of up to two retardant drops over T&E territories can happen, but notification to USFWS and documentation after the drop(s) must occur.

4. Consider impacts of water drops versus use of foam/retardant (ground versus aerial and effectiveness versus toxicity of available products).

VII. HAZARDOUS MATERIALS

A. Flammable/Combustible Liquids

- Store and dispense aircraft and equipment fuels in accordance with National Fire Protection Association (NFPA) and Health and Safety Handbook requirements.
- Avoid spilling or leakage of oil or fuel, from sources such as portable pumps, into water sources or soils.
- Store any liquid petroleum gas (propane) downhill and downwind from firecamps and away from ignition sources.

B. Flammable Solids

- Pick up residual fusees debris from the fireline and dispose of properly.

C. Fire Retardant/Foaming Agents

- Do not drop retardant or other suppressants near surface waters. Minimizing the use of fire retardant or foams in suppression efforts.
- After retardant drops in the backcountry, consult USFWS and document event.
- Use caution when operating pumps or engines with foaming agents to avoid contamination of water sources.

D. Fireline Explosives

- Near T&E species territories, the use of two blasts up to ½ mile long, equal to or greater than a 2 pound charge can be used.
- Remove all un- detonated fireline explosives from storage areas and fireline at the conclusion of the incident and dispose of according to Bureau of Alcohol, Tobacco, and Firearms (BATF) and Fireline Blaster Handbook requirements. Properly dispose of all packaging materials.

VIII. FIRE REHABILITATION

Rehabilitation is a critical need. This need arises primarily because of the impacts associated with fire suppression and the logistics that support it. The process of constructing control lines, transport of personnel and materials, providing food and shelter for personnel, and other suppression activities has a significant impact on sensitive resources regardless of the mitigating measures used. Therefore, rehabilitation must be undertaken in a timely, professional manner.

During implementation, the resource advisor should be available for expert advice and support of personnel doing this work as well as quality control.

A. Rehabilitation Guidelines

1. A fire pan should be use, but if not, clean the fire pit of unburned materials and fill back in.
2. Pick up and remove all flagging, garbage, litter, and equipment. Dispose of trash appropriately.
3. After fire spread is secured, fill in deep and wide firelines, and cut trenches.
4. If cultural and natural resource advisors recommend seeding, firelines may be fertilized and seeded with an approved seed mix.
5. Water bar, as necessary, to prevent erosion, or use wood material to act as sediment dams. Water bars or drain dips should be constructed at a 30 to 45 degree angle to the fireline. A berm height is not to exceed six inches in height. Assure down slope end of water bar is open and has adequate length to prevent runoff from reentering the line below.
6. If impacted trails have developed on slopes greater than six percent, construct waterbars according to the following waterbar spacing guide:

Trail Percent Grade	Maximum Spacing Ft.
6- 9	400
10- 15	200
15- 25	100
25+	50

7. Where soil has been exposed and compacted, such as in camps, on user- trails, at helispots and pump sites, scarify the top 2- 4 inches and scatter with needles, twigs, rocks, and dead branches. It is unlikely that seed and fertilizer for barren areas will be appropriate, in order to maintain the genetic integrity of the area. It may be possible, depending on the time of year and/or possibility of a rainy period, to harvest and scatter nearby seed, or to transplant certain native vegetation.
8. Blend campsites with natural surroundings, by filling in and covering latrine with soil, rocks, and other natural material.
9. Cut stumps flush with ground, scatter limbs and boles, out of sight in unburned area. "Wilderness cut" stumps by chopping up the surface with an axe or pulaski, to make it jagged and rough will speed natural decomposition.
10. Drag highly visible woody debris created during the suppression effort into timbered areas and disburse.
11. Consider using explosives on some stumps and cut faces of the bolewood for a more natural appearance.
12. Tear out sumps or dams, where they have been used, and return site to natural condition. Replace any displaced rocks or streambed material that has been moved. Reclaim streambed to its original state, when appropriate.

B. Vegetation

1. Ensuring that firefighting equipment or supplies are not contaminated with noxious weed seeds (consider steam- cleaning equipment, as appropriate prior to transport into park or use in sensitive areas).
2. According to the Mount Rainier Restoration Handbook (1990), the following actions will be used to limit the effects of fire lines on vegetation. A rehabilitation plan will be written prior to action. If necessary, fire lines will be filled to grade to prevent channeling of water and attendant erosion.

3. Scattering brush, dead limbs or rocks randomly along the fire line could also help to impede water erosion and to camouflage the lines.
4. Equipment used in firefighting will be cleaned/containment free, prior to use in park firefighting efforts.
5. Mulches or other rehabilitation treatments, including straw bales will come only from sources approved by the park plant ecologist.
6. Walk through adjacent undisturbed area and take a look at your rehab efforts to determine your success at returning the area to as natural a state as possible. Good examples should be documented and shared with others!

C. Restoration of Fire Suppression Activities

Tractor/dozer lines and man made Safety Zones:

1. Tractors and dozers are not used in fire suppression in Mount Rainier National Park. If an emergency circumstance required an exception, the following rehabilitation measures will be recommended:
2. Water bars should be constructed at a 30 to 45 degree angle. Height of water bars should not exceed 18 inches. Space 50 feet apart on slopes greater than 30% and 100 feet apart on slopes between 10 and 30 percent. The down slope side of the water bar needs to be opened and of adequate length to allow free flow of water off the tractor line.
3. Breakup and pull all berms, tractor piles and windrows. Lop and scatter slash on disturbed areas to achieve 50% percent ground cover on disturbed sites.
4. If cultural and natural resource advisors recommend seeding, impacted areas may be fertilized and seeded with an approved seed mix. Heavily compacted soils may need to be ripped prior to application of seed and fertilizer.
5. For any non- system roads: implement erosion control standards and restore the road to a pattern of use prior to its fire suppression usage.

IX. Burned Area Emergency Rehabilitation

1. A Burned Area Emergency Rehabilitation (BAER) team will be assigned to fires over 100 acres in size, if deemed necessary by the cultural and natural resources management staff.
2. The BAER Team should inter face with the Resource advisor and include park biologists.
3. After a fire is declared out, a park biologist should review the suppression and rehabilitation efforts to see if conservation measures were successfully implemented.
4. Where large fires affect more than about ten percent of a Section 7 watershed, it is recommended that a scientific group of experts be convened to prepare a peer reviewed assessment or analysis of the short term and long term effects from the wildfire, suppression actions, and rehabilitation. The assessment should also recommend actions (if there are any) that may be appropriate for the burned or unburned areas within the watershed.

X. REFERENCE MATERIALS

A. Toxicity Fire Retardants and Foams

Fire retardants and suppressants are used extensively in North America and are often applied in environmentally sensitive areas that may contain threatened fish species.

Generally, the relative effects and pathways for contamination of retardants and foams are related to the mechanism used to deliver the chemicals. For instance, fire fighters using pumps to apply foam have more directional control during application when compared to broadscale and less precise application during aerial drops. Pathways for contamination include direct application to a waterway via aerial drops from planes or helicopters. Additionally, there may be accidental discharge into streams by firefighters using hoses and residual foam associated with helicopter bucket drops during refilling from a water source. These effects may be localized or occur throughout an entire stream network.

The risk of toxicological effects of chemicals on salmonids is greatest when chemicals are applied directly to surface waters or reach surface waters by wind drift (Spence et al. 1996). All life history stages (eggs to adults) of listed fish may be affected. Fire- fighting chemicals are toxic to early life history stages of fish. Early life stages of fathead minnow (Pimephales promelas), rainbow trout (Oncorynchus mykiss) and chinook salmon (Oncorhynchus tshawytscha) were examined for acute toxicity to three fire retardants, Phos- Chek D75- F, Fire- Trol GTS- R and Fire- Trol LCG- R and two foams, Phos- Chek WD- 881 and Silv- Ex (Gaikowski et al. 1996a; 1996b).

The two foams were 10 times more toxic for rainbow trout and Chinook salmon, and 10 to 258 times more toxic for fathead minnow, than the fire retardants tested. The life stage of the exposed salmonids and minnows had a significant impact on the toxicity of the formulation. Eggs and eyed- eggs were almost always more resilient than later life stages, and fry which were actively swimming in search of food were the most sensitive (Gaikowski et al. 1996a; 1996b).

The following was taken directly from Gaikowski et al. (1998) to evaluate acute toxicities on fish species. Laboratory studies of five early life stages of rainbow trout were conducted to determine the acute toxicities of five fire- fighting chemical formulations in standardized soft and hard water. Eyed egg, embryo- larvae, swim- up fry, 60- and 90- day post- hatch juveniles were exposed to three fire retardants (Fire- Trol LCG- R, Fire- Trol GTS- R, and Phos- Chek D75- F), and two fire- suppressant foams (Phos- Chek WD- 881 and Silv- Ex). Swim- up fry of rainbow trout were generally the most sensitive life stage, whereas the eyed- egg life stage was the least sensitive.

Toxicity of fire- fighting formulations was greater in hard water than soft water for all life stages tested with Fire- Trol GTS- R and Silv- Ex, and 90- day old juveniles tested with Fire- Trol LCG- R. Fire- suppressant foams were more toxic than the fire retardants. The 96- h LC50s were rank ordered from the most toxic to the least toxic formulation as follows: Phos- Chek WD- 881 (11 - 44 mg/L) > Silv- Ex (11 - 78 mg/L) > Phos- Chek D75- F (218 - >3,600 mg/L) > Fire- Trol GTS- R (207 - >6,000 mg/L) > Fire- Trol LCG- R (872 - >10,000 mg/L); (ranges are the lowest and highest 96- h LC50 calculated for each formulation).

Gaikowski, M. P., Hamilton, S. J., Buhl, K. J., McDonald, S. F. and Summers, C. (1996a). Acute toxicity of three fire- retardant and two fire- suppressant foam formulations to the early life stages of rainbow trout (Oncorynchus mykiss). Environmental Toxicology and Chemistry 15, 1365- 1374.

Gaikowski, M. P., Hamilton, S. J., Buhl, K. J., McDonald, S. F. and Summers, C. (1996b). Acute toxicity of firefighting chemical formulations to four life stages of fathead minnow. Ecotoxicology and Environmental Safety 34, 252- 263.

Hamilton, Steve, Diane Larson, Susan Finger, Barry Poulton, Nimish Vyas, and Elwood Hill. Ecological effects of fire retardant chemicals and fire suppressant foams. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/othrdata/fireweb/fireweb.htm (version 02MAR98).

Foams and retardants known to be used in fire suppression (taken directly from Hamilton et al. 1998)

B. Fire Retardant and Form Products

Phos Chek (G75- F; Phos- Chek D75- F, Phos- Chek WD- 881; Phos- Chek 259F): Phos- Chek G75- F is a proprietary formulation composed of monoammonium phosphate and ammonium sulfate, fugitive coloring agent, and small amounts of gum- thickener, bactericide, and corrosion inhibitor (National Wildfire Coordinating Group, Fire Equipment Working Team 1991). Phos- Chek is typically applied from helicopter bucket or ground tanker in advance of a fire; other retardants with higher viscosity are applied from fixed- wing aircraft. The ammonium salts retard fire by chemically combining with cellulose as fuels are heated, as well as through evaporative cooling of the fuels. Phos- Chek is supplied by the manufacturer as a powder, which is mixed with water to the desired concentration before application.

Phos- Chek D75- F is a proprietary mixture of ammonium sulfate, ammonium phosphate, guar gum thickener, corrosion inhibitor, and orange coloring agent (F=fugitive coloring agent, i.e., color disappears in 2 to 3 days after exposure to sun light) (Monsanto, Ontario, CA). It functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos- Chef D75- F is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.2 pounds per gallon to produce 1.069 gallons of slurry, which is equivalent to 143.8 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos- Chek WD- 881 is a proprietary mixture of anionic surfactants, foam stabilizers, and solvents including hexylene glycol (Monsanto, Ontario, CA). It functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Phos- Chek WD- 881 is usually applied by ground operated units mounted on trunks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon per 100 gallon, which is then highly aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Phos- Chek 259F is a proprietary mixture of diammonium phosphate, guar gum thickener, other additives, and reddish coloring agent to mark aerial drop sites (Monsanto Company, Ontario, CA). The Material Safety Data Sheet states ammonia and phosphoric acid (when heated to approximately 200°F [93°C]) are hazardous decomposition products. Phos- Chek 259F functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos- Chek 259F is applied by aerial tanker. It is supplied by the manufacturer as a powder, and is prepared for field use by mixing 1.14 pounds per 1 gallon of water to produce slurry, which is equivalent to 136.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Silv- Ex.: Silv- Ex concentrate is a proprietary mixture of sodium and ammonium salts of fatty alcohol ether sulfates, higher alcohols, and water, as well as butyl carbitol and ethyl alcohol (Ansul, Incorporated 1994). It functions as a surfactant (i.e. detergent), allowing water to penetrate and expand over the surface of fuels to both cool and smother the fire. Silv- Ex, like other Class A foams, is applied operationally either from ground tankers or helicopters. Silv- Ex is supplied by the manufacturer as a liquid concentrate, which is mixed with water to the desired concentration before application.

Fire- Trol (GTS- R; LCA- F; LCM- R; FireFoam 103B; FireFoam 104): Fire- Trol GTS- R is a proprietary mixture of ammonium sulfate, diammonium phosphate, guar gum thickener, spoilage inhibitor, corrosion inhibitor, and iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, AZ). It functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount *r* unit surface area. Fire- Trol GTS- R is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.66 pounds per gallon to produce 1.1 gallons of slurry, which is equivalent to 198.93 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol LCA- F is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and orange coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire- Trol LCA- F functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire- Trol LCA- F is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 5 gallons of water to produce slurry, which is equivalent to 287.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol LCM- R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and red coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire- Trol LCM- R functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire- Trol LCM- R is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 4.25 gallons of water to produce slurry, which is equivalent to 344 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol FireFoam 103B is a proprietary mixture of anionic surfactants, foam stabilizers, and inhibiting agent (hexylene glycol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire- Trol FireFoam 103B functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire- Trol FireFoam 103B is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire- Trol FireFoam 104 is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (hexylene glycol, n- butyl alcohol, and butanol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire- Trol FireFoam 104 functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire- Trol FireFoam 104 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire Quench: Fire Quench is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (Texas Department of Corrections, Sugarland, TX). The Material Safety Data Sheet states that some oxides of sulfur are hazardous decomposition products. Fire Quench functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire Quench is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

ForExpan S: ForExpan S is a proprietary mixture of ammonium deceth 2, 2 sulfate, 2(2-butoxyethoxy) ethanol, ethanol, sodium myriteth 3 sulfate, myriteth- 3, and 1- dodecanol (Angus FireArmourLtd., Toronto, Ontario). The Material Safety Data Sheet states that some oxides of sulfur and nitrogen are hazardous decomposition products. ForExpan S functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. ForExpan S is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

4/13/04	**Early Season** **NSO Mar. 15- July 31**	**Late Season** **NSO Aug. 1 - Sep. 30**	**Non-nesting Season** **NSO Oct 1-Mar 14.**
.22 mi radius circle **(**100 acre) CORE TERR. **Below 4500 ft**	-NO fires, all territories -Use non-motorized suppression techniques (hand tools, etc. low noise disturbance)	-Less than 10% area affected by ground fire -No stand replacement fire	-Less than 10% area affected by ground fire -No stand replacement fire
0.7 mi radius circle (984 ac. minus 100 acres) OCCUPIED TERR. (non-nesting adults) **Below 4500 ft** ----------------------- **0.7 mi radius circle** ACTIVE NESTS (breeding owls) **Below 4500 ft**	-No intended stand replacement fires -Ground fire OK up to 10% (100 acres) ――― NO fire, all territories	-All fires acceptable -Must maintain 75% suitable habitat (up to 25% stand replacement OK in entirely suitable habitat) ――― -All fires acceptable -Must maintain 75% suitable habitat (up to 25% stand replacement OK in entirely suitable habitat)	-All fires acceptable -Must maintain 75% suitable habitat (up to 25% stand replacement OK in entirely suitable habitat) ――― -All fires acceptable -Must maintain 75% suitable habitat (up to 25% stand replacement OK in entirely suitable habitat)
0.7 to 1.8 mi radius circle (6,510 acres minus 984 acres) OCCUPIED TERR. (non-nesting adults) And ACTIVE NESTS **Below 4500 ft**	-All fires acceptable -Maintain 55% suitable habitat (up to 45% stand replacement fire OK in entirely suitable habitat)	-All fires acceptable -Maintain 55% suitable habitat (up to 45% stand replacement fire OK in entirely suitable habitat)	-All fires acceptable -Maintain 55% suitable habitat (up to 45% stand replacement fire OK in entirely suitable habitat)
Unsurveyed NSO habitat **Below 4500 ft**	NO fire	Up to 5-year total of 927 acres	Up to 5-year total of 927 acres

MURRELETS	**Early Season** **April 1 – Aug 5**	**Late Season** **Aug 6- Sept 15**	**Non-nesting season,** **Sept 16- March 30**
UNOCCUPIED Murrelet habitat **Below 3800 ft**	Up to 5 year total of 927 acres	Up to 5 year total of 927 acres	Up to 5 year total of 927 acres
OCCUPIED Murrelet habitat **Below 3800 ft**	NO fire	Up to 45 acres of stand replacement fire over 5 years	Up to 45 acres of stand replacement fire over 5 years

NWCG Guidance on Minimum Impact Suppression Tactics

In Response To the

10-YEAR IMPLEMENTATION PLAN FOR REDUCING WILDLAND FIRE RISKS TO COMMUNITIES AND THE ENVIRONMENT

TASK: Prepare awareness and training information on the use of minimum impact suppression activities and deliver through standard firefighting training program.

MINIMUM IMPACT SUPPRESSION TACTICS (MIST) ACTION ITEMS

ACTION ITEMS 1 & 2: *Critically review MIST policies, determine need to increase awareness of MIST, and recommend changes to policies and guidelines.*

POLICY

The change from **fire control** to **fire management** has added a new perspective to the role of fire manager and the firefighter. Traditional thinking that “the only safe fire is a fire without a trace of smoke” is no longer valid. Fire Management now means managing fire "with time" as opposed to "against time." The objective of putting the fire dead out by a certain time has been replaced by the need to make unique decisions with each fire start to consider the land, resource and incident objectives, and to decide the appropriate management response and tactics which result in minimum costs and minimum resource damage.

This change in thinking and way of doing business involves not just firefighters. It involves all levels of management. Fire management requires the fire manager and firefighter to select management tactics commensurate with the fire’s potential or existing behavior while producing the least possible impact on the resource being protected. The term used to describe these tactics is “Minimum Impact Suppression Tactics”, commonly called MIST. Simply put: MIST is a ‘do least damage’ philosophy.

MIST is not intended to represent a separate or distinct classification of firefighting tactics but rather a mind set - how to suppress a wildfire while minimizing the long-term effects of the suppression action. MIST is the concept of using the minimum tool to safely and effectively accomplish the task. MIST should be considered for application on all fires in all types of land management.

While MIST emphasizes suppressing wildland fire with the least impact to the land, actual fire conditions and good judgment will dictate the actions taken. Consider what is necessary to halt fire spread and containment within the fireline or designated perimeter boundary, while safely managing the incident.

Use of MIST **will not** compromise firefighter safety or the effectiveness of suppression efforts. Safety zones and escape routes will be a factor in determining fireline location

Accomplishments of minimum impact fire management techniques originate with instructions that are understandable, stated in measurable terms, and communicated both verbally and in writing. They are ensured by monitoring results on the ground. Evaluation of these tactics both during and after implementation will further the understanding and achievement of good land stewardship ethics during fire management activities.

GUIDELINES

The intent of this guide is to serve as a checklist for all fire management personnel. Be creative and seek new ways to implement MIST

INCIDENT MANAGEMENT CONSIDERATIONS

Fire managers and firefighters select tactics that have minimal impact to values at risk. These values are identified in approved Land or Resource Management Plans. Standards and guidelines are then tied to implementation practices which result from approved Fire Management Plans.

- Firefighter and public safety cannot be compromised.
- Evaluate suppression tactics during planning and strategy sessions to ensure they meet agency administrator objectives and MIST. Include agency Resource Advisor and/or designated representative.
- Communicate MIST where applicable during briefings and implement during all phases of operations.
- Evaluate the feasibility of Wildland Fire Use in conjunction with MIST when appropriate for achieving resource benefits.

RESPONSIBILITIES

Agency Administrator or Designee

- Ensure agency personnel are provided with appropriate MIST training and informational/educational materials at all levels.
- Communicate land and fire management objectives to Incident Commander.
- Periodically monitor incident to ensure resource objectives are met.
- Participate in incident debriefing and assist in evaluation of performance related to MIST.

Incident Commander

- Communicate land and fire management objectives to general staff.
- Evaluate suppression tactics during planning and strategy sessions to see that they meet the Agency Administrator's objectives and MIST guidelines.
- Monitor operations to ensure MIST is implemented during line construction as well as other resource disturbing activities.
- Include agency Resource Advisor and/or local representative during planning, strategy, and debriefing sessions.

Resource Advisor

- Ensure interpretation and implementation of WFSA/WFIP and other oral or written line officer direction is adequately carried out.

- Participate in planning/strategy sessions and attend daily briefings to communicate resource concerns and management expectations.
- Review Incident Action Plans (IAP) and provide specific direction and guidelines as needed.
- Monitor on the ground applications of MIST.
- Provide assistance in updating WFSA/WFIP when necessary.
- Participate in debriefing and assist in evaluation of performance related to MIST.

Planning Section

- Use Resource Advisor to help assess that management tactics are commensurate with land/resource and incident objectives.
- Ensure that instructions and specifications for MIST are communicated clearly in the IAP.
- Anticipate fire behavior and ensure all instructions can be implemented safely.

Logistics Section

- Ensure actions performed around Incident Command Post (ICP), staging areas, camps, helibases, and helispots result in minimum impact on the environment.

Operations Section

- Evaluate MIST objectives to incorporate into daily operations and IAP.
- Monitor effectiveness of suppression tactics in minimizing impacts to resources and recommend necessary changes during planning/strategy sessions.
- Communicate MIST to Division Supervisors and Air Ops/Support during each operational period briefing. Explain expectations for instructions listed in Incident Action Plan.
- Participate in incident debriefing and assist in evaluation of performance related to MIST.

Division/Group Supervisor and Strike Team/Task Force Leader

- Communicate MIST objectives and tactics to single resource bosses.
- Recommend specific tasks on divisions to implement MIST.
- Monitor effectiveness of suppression tactics in minimizing impacts to resources and recommend necessary changes to Operations Section Chief.

Single Resource Bosses

- Communicate MIST objectives to crew members.
- Monitor work to ensure that crews are adhering to MIST guidelines and specific incident objectives.
- Provide feedback to supervisor on implementation of MIST.

IMPLEMENTATION

Keep this question in mind: What creates the greater impact, the fire suppression effort or the fire?

Safety

- Apply principles of LCES to all planned actions.
- Constantly review and apply the 18 Watch Out Situations and 10 Standard Fire Orders.
- Be particularly cautious with:
    - Burning snags allowed to burn.
    - Burning or partially burned live and dead trees.
    - Unburned fuel between you and the fire.

Escape Routes and Safety Zones

- In any situation, the best escape routes and safety zones are those that already exist. Identifying natural openings, existing roads and trails and taking advantage of safe black will always be a preferred tactic compatible with MIST. If safety zones must be created, follow guidelines similar to those for helispot construction.
- Constructed escape routes and safety zones in heavier fuels will have a greater impact, be more time consuming, labor intensive and ultimately less safe.

General Considerations

- Consider the potential for introduction of noxious weeds and mitigate by removing weed seed from vehicles, personal gear, cargo nets, etc.
- Consider impacts to riparian areas when siting water handling operations.
    - Use longer draft hoses to place pumps out of sensitive riparian areas.
    - Plan travel routes for filling bladder bags to avoid sensitive riparian areas.
- Ensure adequate spill containment at fuel transfer sites and pump locations. Stage spill containment kits at the incident.

Fire Lining Phase

- Select tactics, tools, and equipment that least impact the environment.
- Give serious consideration to use of water or foam as a firelining tactic.
- Use alternative mechanized equipment such as excavators and rubber tired skidders rather than bulldozers when constructing mechanical line.
- Allow fire to burn to natural barriers and existing roads and trails.
- Monitor and patrol firelines to ensure continued effectiveness.

Ground Fuels

- Use cold- trail, wet line or combination when appropriate. If constructed fireline is necessary, use minimum width and depth to stop fire spread.
- Consider the use of fireline explosives (FLE) for line construction and snag falling to create more natural appearing firelines and stumps.
- Burn out and use low impact tools like swatters and gunny sacks.
- Minimize bucking to establish fireline: preferably move or roll downed material out of the intended constructed fireline area. If moving or rolling out is not possible, or the downed log/bole is already on fire, build line around it and let the material be consumed.

Aerial fuels–brush, trees, and snags:

- Adjacent to fireline: limb only enough to prevent additional fire spread.
- Inside fireline: remove or limb only those fuels which would have potential to spread fire outside the fireline.
- Cut brush or small trees necessary for fireline construction flush to the ground.
- Trees, burned trees, and snags:
    - Minimize cutting of trees, burned trees, and snags.
    - Do not cut live trees unless it is determined they will cause fire spread across the fireline or seriously endanger workers. Cut stumps flush with the ground.
    - Scrape around tree bases near fireline if hot and likely to cause fire spread.
    - Identify hazard trees with flagging, glowsticks, or a lookout.
- When using indirect attack:
    - Do not fall snags on the intended unburned side of the constructed fireline unless they are an obvious safety hazard to crews.
    - Fall only those snags on the intended burn-out side of the line that would reach the fireline should they burn and fall over.

Mopup Phase

- Consider using “hot- spot” detection devices along perimeter (aerial or hand- held).
- Use extensive cold- trailing to detect hot areas.

- Cold- trail charred logs near fireline: do minimal scraping or tool scarring. Restrict spading to hot areas near fireline.
- Minimize bucking of logs to check for hot spots or extinguish fire: preferably roll the logs and extinguish the fire.
- When ground is cool return logs to original position after checking.
- Refrain from piling: burned/partially burned fuels that were moved should be arranged in natural positions as much as possible.
- Consider allowing larger logs near the fireline to burn out instead of bucking into manageable lengths. Use a lever, etc. to move large logs.
- Use gravity socks in stream sources and/or combination of water blivets and fold- a- tanks to minimize impacts to streams.
- Personnel should avoid using rehabilitated firelines as travel corridors whenever possible because of potential soil compaction and possible detrimental impacts to rehab work.
- Avoid use of non- native materials for sediment traps in streams.
- Aerial fuels (brush, small trees, and limbs): remove or limb only those fuels which if ignited have potential to spread fire outside the fireline.
- Burning trees and snags:
  - *Be particularly cautious when working near snags (*ensure adequate safety measures are communicated).
  - The first consideration is to allow a burning tree/snag to burn itself out or down.
  - Identify hazard trees with flagging , glow- sticks or a lookout.
  - If there is a serious threat of spreading firebrands, extinguish with water or dirt.
  - Consider felling by blasting, if available.

Aviation Management

Minimize the impacts of air operations by incorporating MIST in conjunction with the standard aviation risk assessment process.

- Possible aviation related impacts include:
  - Damage to soils and vegetation resulting from heavy vehicle traffic, noxious weed transport, and/or extensive modification of landing sites.
  - Impacts to soil, fish and wildlife habitat, and water quality from hazardous material spills.
  - Chemical contamination from use of retardant and foam agents.
  - Biological contamination to water sources, e.g., whirling disease.
  - Safety and noise issues associated with operations in proximity to populated areas, livestock interests, urban interface, and incident camps and staging areas.
- Helispot Planning
  - When planning for helispots determine the primary function of each helispot, e.g., crew transport or logistical support.
  - Consider using long-line remote hook in lieu of constructing a helispot.
  - Consult Resource Advisors in the selection and construction of helispots during incident planning.
  - Estimate the amount and type of use a helispot will receive and adapt features as needed.
- Balance aircraft size and efficiency against the impacts of helispot construction.
- Use natural openings as much as possible. If tree felling is necessary, avoid high visitor use locations unless the modifications can be rehabilitated. Fall, buck, and limb only what is necessary to achieve a safe and practical operating space.

Retardant, Foam, and Water Bucket Use

- Assess risks to sensitive watersheds from chemical retardants and foam. Communicate specific drop zones to air attack and pilots, including areas to be avoided.
- Fire managers should weigh use of retardant with the probability of success by unsupported ground force. Retardant may be considered for sensitive areas when benefits will exceed the overall impact. This decision must take into account values at risk and consequences of expanded fire response and impact on the land.
- Consider biological and/or chemical contamination impacts when transporting water.
- Limited water sources expended during aerial suppression efforts should be replaced. Consult Resource Advisors prior to extended water use beyond initial attack.

Logistics, Camp Sites, and Personal Conduct

- Consider impacts on present and future visitors.
- Provide portable toilets at areas where crews are staged.
- Good campsites are found, not made. If existing campsites are not available, select campsites not likely to be observed by visitors
- Select impact- resistant sites such as rocky or sandy soil, or openings within heavy timber. Avoid camping in meadows and along streams or shores.
- When there is a small group try to disperse use. In the case of larger camps: concentrate, mitigate, and rehabilitate.
- Lay out camp components carefully from the start. Define cooking, sleeping, latrine, and water supplies.
- Prepare bedding and campfire sites with minimal disturbance to vegetation and ground.
- Personal Sanitation:
    - Designate a common area for personnel to wash up. Provide fresh water and biodegradable soap.
    - Do not introduce soap, shampoo or other chemicals into waterways.
    - Dispose of wastewater at least 200 feet from water sources.
    - Toilet sites should be located a minimum of 200 feet from water sources. Holes should be dug 6- 8 inches deep.
    - If more than 1 crew is camped at a site strongly consider portable toilets and remove waste.
- Store food so that it is not accessible to wildlife, away from camp and in animal resistant containers.
- Do not let garbage and food scraps accumulate in camp.
- Monitor travel routes for damage and mitigate by:
    - Dispersing on alternate routes or
    - Concentrating travel on one route and rehabilitate at end of use.
- If a campfire is built, leave no trace of it and avoid using rock rings. Use dead and down wood for the fire and scatter any unused firewood. Do not burn plastics or metal.

Restoration and Rehabilitation

- Firelines:
    - After fire spread has stopped and lines are secured, fill in deep and wide firelines and cup trenches and obliterate any berms.

- Use waterbars to prevent erosion, or use woody material to act as sediment dams.

Maximum Waterbar Spacing	
Percent Grade	Maximum Spacing, Feet
< 9	400
10 – 15	200
15 – 25	100
25 +	50

Table 1, Maximum Waterbar spacing.

- Ensure stumps are cut flush with ground.
- Camouflage cut stumps by flush- cutting, chopping, covering, or using FLE to create more natural appearing stumps.
- Any trees or large size brush cut during fireline construction should be scattered to appear natural.
- Discourage the use of newly created firelines and trails by blocking with brush, limbs, poles, and logs in a naturally appearing arrangement.

- Camps:
    - Restore campsite to natural conditions.
    - Scatter fireplace rocks and charcoal from fire, cover fire ring with soil, and blend area with natural cover.
    - Pack out all garbage.
- General:
    - Remove all signs of human activity.
    - Restore helicopter landing sites.
    - Fill in and cover latrine sites.
- Walk through adjacent undisturbed areas and take a look at your rehab efforts to determine your success at returning the area to as natural a state as possible.

Additions from Biological Assessment

The following additional information was developed and used for the Biological Assessment and may be inserted into the Environmental Assessment as shown below. In addition, the USFWS response to the Biological Assessment (BA), the revised Biological Opinion (BO) initially dated March 2, 2005, is incorporated by reference and may be considered an attachment to the Errata.

Page 15: Insert the following text above the heading "**Fire Management Strategy Definitions**"
Action Area
The action area is all lands that occur within MORA and adjacent areas potentially affected by the covered actions. The action area occurs in Pierce and Lewis counties in Washington State. For listed fish species, the action area includes the Upper White River, West Fork White, Huckleberry, Carbon, Mowich, and Upper Puyallup drainages and extends up to two miles downstream from the park boundary in these drainages. For listed bird species, the area includes all documented habitat and elevational areas above habitat (includes any vegetated zone in the park).

Page 17: Insert the following text after the two paragraphs describing "**Prescribed Fire**"
An approved (prescribed fire) burn plan is required for all prescribed fires prior to ignition. Prescribed fire implementation is not within the scope of this five- year fire plan and is not part of this environmental assessment.

Page 20: Insert the following text after the first paragraph describing **FMU – 1**:
Fire suppression retardant is very rarely used in MORA although it may be applied during periods of high fire activity, periods with low numbers of firefighters, and/or in remote portions of the park. MORA requests take coverage for the typical application of retardants and foams. MORA would conduct an Emergency Consultation for any errant drops that occur during fire management activities. Retardants have not been used at MORA in recent fires.

Foam used in fire suppression is typically applied by fire engines although it may be applied via helicopter bucket drops. Foam may be applied to fires along roadways and around buildings and park structures.

Commonly used long- term retardants are Phos- Chek D75- F, Phos- Chek D75- R and Fire- Trol GTS- R. These are mixtures of diammonium sulphate, diammonium phosphate, monoammonium phosphate, gum thickeners, iron oxide colouring agent, and preservatives (Hamilton *et al.* 1998). Long- term fire retardants are typically fertilizer salts which are mixed with water to ensure uniform dispersal. Even after the water has evaporated, the retardant remains effective until it is removed by rain or erosion. They form a combustion barrier after the evaporation of the water carrier, and their effectiveness depends on the amount of retardant per unit surface area. The ammonium salts chemically combine with cellulose as the fuels are heated (Hamilton *et al.* 1998), effectively removing the fuel.

Unlike the long- term retardants which remain effective after the water has evaporated, short-term fire retardants depend on the water they contain to retard or suppress the fire (USDA 1998). Rural fire fighting foams (Class A foams) are a sub- category of short- term retardants (or suppressants). Commonly used foams include Ansul Silv- Ex, Angus ForExpan S, Fire Quench, 3M Firebreak and Phos- Chek WD- 881, and all contain surfactants, foaming, and wetting agents. The foaming agents affect the rate at which water drains from the foam, and how well it adheres to the fuel. The surfactants and wetting agents increase the ability of the drained water to penetrate fuels thus reducing their ability to ignite. Fuels are insulated from heat, and air contact is also reduced. These retardants lose their effectiveness once the water has evaporated or drained from them (USDA 1998). Foams are typically applied in the field at concentrations between 0.1% and 1.0%.

MORA will only use federally approved retardants and foams. Specific foams and retardants known to be used in fire suppression (taken directly from Hamilton et al. 1998) can be found in Appendix 3.

Page 23: Insert the following text above the heading "**FMU –2 Wildland Fire Use for Resource Benefits Unit**"

"Application of Fire Suppression in Wildland Fire Suppression and Wildland Fire Use FMUs
In the Suppression Unit, all human- caused and lightning- caused fires will be suppressed. Note that fire suppression will occur in the Wildland Fire Use unit as well. All human- caused fires and natural ignitions not deemed appropriate for fire use will be also be suppressed in the Wildland Fire Use Unit.

Recent history records show that most lightning fires in this unit are suppressed or often are naturally- extinguished when they are very small – less than one- quarter acre. If in a given year, ten of these very small fires were managed with wildland fire use strategies instead of fire suppression, fire suppression acreage would only be reduced by one to two acres (0.4 – 1.0 ha). The majority of fire suppression acreage is due to very few fires that escape initial attack. This consultation covers suppression activities (below 4500 feet) for up to 6 acres per year, with one year (during the 5 years covered) of up to 56 acres. Area above listed bird habitat elevations will include 65 acres/year with one year of 5 including a large fire up to 310 acres. The five- year plan for total fire suppression is 650 acres. Any additional fire suppression acres during the life of this plan will require MORA to undergo emergency Section 7 consultation.

Fire Suppression Acreage Development - Below is what has been calculated for suppression in our recent 73- year suppression history:

1930-2003 Fire History Analysis – *all sources* of ignition***

Total acres of recorded fire, all starts	=5221
Total acres of recorded fire, all starts < 4500'	=461 (annual average of 6 acre/yr)
Total acres of recorded fire, all starts > 4500'	=4760 (an annual average of 65 acres/yr.)

***Elevation of fire is start point only, not average elevation of area burned

Recent fire history data indicates a very small number of acres burned in the category of "ignition points < 4500' elevation". Obviously the *extents* of the fires above/below 4500' are not the same as the documented ignition point. Fires that start in one elevation category can spread downhill or uphill into the other elevation category.

Approximately 80% of park- documented fire ignitions < 4500' since 1930 were less than 0.25 acres. For purposes of this 5- year projection, we used 2003 fire season extents as a basis for one high elevation and one low elevation relatively "large" suppression fire. The two fires in 2003 used in analysis are the two largest recorded natural- caused fires at MORA since 1930. The 2003 fire season can be characterized as a year with well below normal spring/summer precipitation in the midst of a moderately dry period corresponding with the apparent warm phase of a Pacific Decadal Oscillation (PDO) (Univ. of WA web site http://www.jisao.washington.edu/pdo/). Mote et. al. (1999) found that most of the 20th Century large fires (> 80,000 ha.) documented in Washington national forests corresponded with warm, dry phases of the PDO. We used the recent history average annual fire size to represent the remaining four years in the plan.

Acres *greater than* 4500 feet elevation

The Redstone fire of 2003 was the largest suppression fire (310 acres) above 4500 feet since the 1930's. To calculate a total high elevation acreage, we used 65 acres/year average (multiplied by four years) plus a one- year large fire of up to 310 acres for a 5- year total of 570 acres of suppression fire at *greater than* 4500 feet.

Habitat acres *less than* 4500 feet elevation
Similarly, the largest low elevation fire in more than 20 years was the Panther Creek fire of 2003 at 56 acres. To calculate a total "low" elevation acreage, we used 6 acres/year average from above (multiplied by four years) plus a one year total of 56 acres for a 5- year total of 80 acres of suppression fire at *less than* 4500 feet.

<u>Hazard Fuel Treatment Acres in Suppression Units and Elsewhere</u>- Each major developed area and campground would be treated (Table 5) at some degree (as defined in Appendix A). The brushing, limbing, and less than 8" DBH tree removal will result in patchy fuel treatment patterns in previously- modified environments with very little if any actual habitat loss for listed birds. No roads, trails, or wilderness areas will be treated. Minor treatmnent (limbing and brushing only) will occur adjacent to historic structures in wilderness.

Table 5. Areas slated for hazard fuel treatment in the next five years

Developed Area	Acres Treated	Within 300 ft of lake or stream with listed fish
Longmire	25.5	N
Carbon Entrance	0.5	Y
CG - Cougar Rock	34.6	N
CG - Ipsut Creek	6.7	Y
CG - Ohana	36.1	N
CG - Sunshine Point	2.6	N
CG - White River	15.6	Y
Nisqually Entrance	4.1	N
Ohanapecosh	10.8	N
Paradise	10.4	N
Sunrise	2.7	N
White River	3.8	N
Tahoma Woods	20.6	N

Application of Hazard Fuel Reduction in Suppression and Wildland Fire Use FMUs

<u>Hazard Fuel Treatment Acres in Suppression Units and Elsewhere</u>
Each major developed area and campground would be treated (Table b) to some degree (as defined in Appendix B). The brushing, limbing, and small tree removal will result in patchy fuel treatment patterns in previously- modified environments with very little if any actual habitat loss for listed birds. No roads, trails, or wilderness areas beyond the immediate vicinity of historic structures will be treated.

Table b. Areas slated for hazard fuel treatment in the next five years

Developed Area	Acres Treated	Within 300 ft of lake or stream with listed fish
Longmire	25.5	N

Carbon River Entrance	0.5	Y
Campground - Cougar Rock	34.6	N
Campground - Ipsut Creek	6.7	Y
Campground - Ohanapecosh	36.1	N
Campground - Sunshine Point	2.6	N
Campground - White River	15.6	Y
Nisqually Entrance	4.1	N
Ohanapecosh	10.8	N
Paradise	10.4	N
Sunrise	2.7	N
White River	3.8	N
Tahoma Woods	20.6	N

Page 23, at end of last paragraph (under heading FMU 2 – Wildland Fire for Resource Benefits Unit): Insert the following: "(although the prescribed fire portion of this is not expected to occur within the next five years – the expected life of this plan). This Wildland Fire Use unit is most of the park – only the small suppression unit and the alpine environments in the park are not included in this unit."

Page 24, at end of first bullet: Insert the following "(including threatened and endangered species and habitat)"

Page 24 above heading "Management Considerations to Operational Implementation": Insert the following:

Application of Wildland Fire Use (and Suppression) in Wildland Fire Use FMU
This unit comprises most of the park. Wildland Fire Use can be applied anywhere in this unit when management criteria are met. Note that fire suppression will occur in the Wildland Fire Use unit as well. All human- caused fires will be suppressed in the Wildland Fire Use Unit. Additionally, only a portion of the naturally- ignited fires in the WFU unit will meet criteria to be managed as a Wildland Fire Use

Fire Use Treatment Acres – Projections for fire use are primarily based on the "ancient" 1203-1934 fire history. Ancient fire reported acres are primarily large fires that are currently understood to be stand- replacement fires (mostly natural ignitions). The 800- year history of ancient fires provides us the best basis to understand park fire frequency under a natural regime. **However, this analysis is limited only to the forested zones of the park**. *Recent* fire history analysis, however, provides a comparison of total acres of *natural ignition* fires burned by elevation zone (4500' cutoff).

1930-2003 Fire History analysis – *natural* (lightning) ignitions***

Total acres of recorded fire, natural	= 946
Total acres of recorded fire, natural < 4500	= 326
Total acres of recorded fire, natural > 4500	= 620

***Elevation of fire is start point only, not average elevation of area burned

Less than 4500 feet elevation
Ancient fire history is based on forested communities. Since all communities below 4500 feet are forested, the fire frequency for each community was easily calculated for this zone. Park analysis provided 185.4 average acres/year less than 4500 feet of burned area during that **ancient fire period**. So 185.4 x 5 years is *927 acres of stand replacement "habitat loss" acreage less than 4500 feet*.

Greater than 4500 feet elevation

Ancient fire history analysis does not provide for non- forested communities above 4500 feet. A surrogate is needed to evaluate fire *extent* above 4500 feet. The acreage ratio of above/below 4500 feet fire ignitions in **recent history** is 620/326 or 1.9. Using the ratio of 1.9 to reflect that there is, on average, 1.9 times more area burned by natural fires above 4500' provides a surrogate multiplier. If we multiply 185 x 1.9 = 351, we arrive at the figure of 351 acres/year burned above 4500 feet. 351 acres/year x 5 years = *1755 acres of burned area > 4500' over the 5- year period.* 1755 acres above + 927 acres below = *2682 total acres parkwide that is affected by fire use over the next five years*.

Page 24, after last paragraph: Insert the following:
All human- caused fires will be suppressed in both FMU's.. For all fire suppression in park wilderness, the park will employ minimum impact suppression tactics (MIST) whenever and wherever possible (realizing that there will be exceptions). Lightning- caused wildland fires, occurring in FMU 2, would be analyzed to determine if they would pose unacceptable risks to life, safety, private property or natural or cultural resources that cannot be mitigated with the resources available. Wildland Fire Use fires enhance natural resources by allowing a natural process to occur with little intervention. If naturally ignited fires do not meet these established conditions, they would be suppressed. In the future, prescribed burning would be used in both FMUs but is beyond the scope of this five- year implementation plan.

<u>Page 37</u>, between 3rd and 4th paragraphs following Fire History: Insert the following:
Two sources of information are available to evaluate the park's recent fire history and the earlier pre- 20th century or "ancient" fire history. Recent fire history is compiled using park records from 1930 to present that provide ignition sources, dates, and areal extent of the fires. Ignitions were recorded as natural, human- caused, and unknown (Figure 2). All of these fires were managed under a suppression strategy. Ancient fire history and frequency in the forest zone was developed by reconstructing stand history and fire scar analysis conducted primarily by Hemstrom and Franklin (1982).

<u>Page 37- 38</u>, after Huff and Agee (1991) reference: Replace the next paragraph (which also appears below) with:

"Ancient Fire History
All but a fraction of the forest area in the park, specifically in the Carbon River watershed and valley floors, was affected by fire during the last 1,000 years (Hemstrom and Franklin 1982). The average natural fire rotation in Mount Rainier NP is approximately 465 years for the pre-European era (Franklin *et al.* 1988). The natural fire rotation in forested communities in the park ranges from 275 years to 616 years. Certain climatic patterns result in conditions that correspond with large- scale fires at MORA. *Every* major documented fire in the past 800 years has been preceded by an important drought period (Franklin *et al.* 1988) (Table 1).

In general, subalpine meadow establishment and maintenance is related to snow depth and duration rather than time since last fire disturbance (Huff and Agee 1991). Although not researched, ecotones at forest line and subalpine meadow may be maintained by fire.

Fire frequency varies with topographic position. The dates of major fire episodes vary along different slope aspects. For example, in the Ohanapecosh River valley, north and east facing slopes contain old growth forests of 700+ years. South and west facing slopes have stands 350 years old or less. The White, Cowlitz and Nisqually River watersheds have burned most frequently because of a general southerly aspect and lack of natural barriers to prevent disturbances outside the park from burning into the park (Hemstrom and Franklin 1982) (Table

2).

Because ancient fire history relies on current forest stand age, reported acres are generally from large, stand replacement fires.

Page 38: Move Table 1 to this position, following the above text.

Page 39: Replace Table 2 with this Table:

Table 2. Ancient Fire Size by Watershed, Annual Averages, and Percent of Watershed Annually Impacted, Mount Rainier National Park

Park Watershed	*Acreage < 4,500 feet*	*Ancient Fire History Average Acres burned /Year < 4,500 feet*	*Fraction of Watershed burned on annual average*
Butter Creek	354	0.79	0.22%
Carbon River	9289	21.13	0.23%
Copper Creek	981	2.90	0.30%
Huckleberry Creek	2036	4.64	0.23%
Muddy Fork, Cowlitz River	8737	23.17	0.27%
Mowich River	4953	11.70	0.24%
Nisqually River	7491	18.33	0.24%
Ohanapecosh River	19874	49.89	0.25%
Puyallup River (or south)	3461	7.77	0.22%
Skate Creek	26	0.05	0.19%
Tahoma Creek	4729	11.82	0.25%
West Fork White River	3654	8.60	0.24%
White River	8890	24.56	0.28%
	74,472	**185.4**	

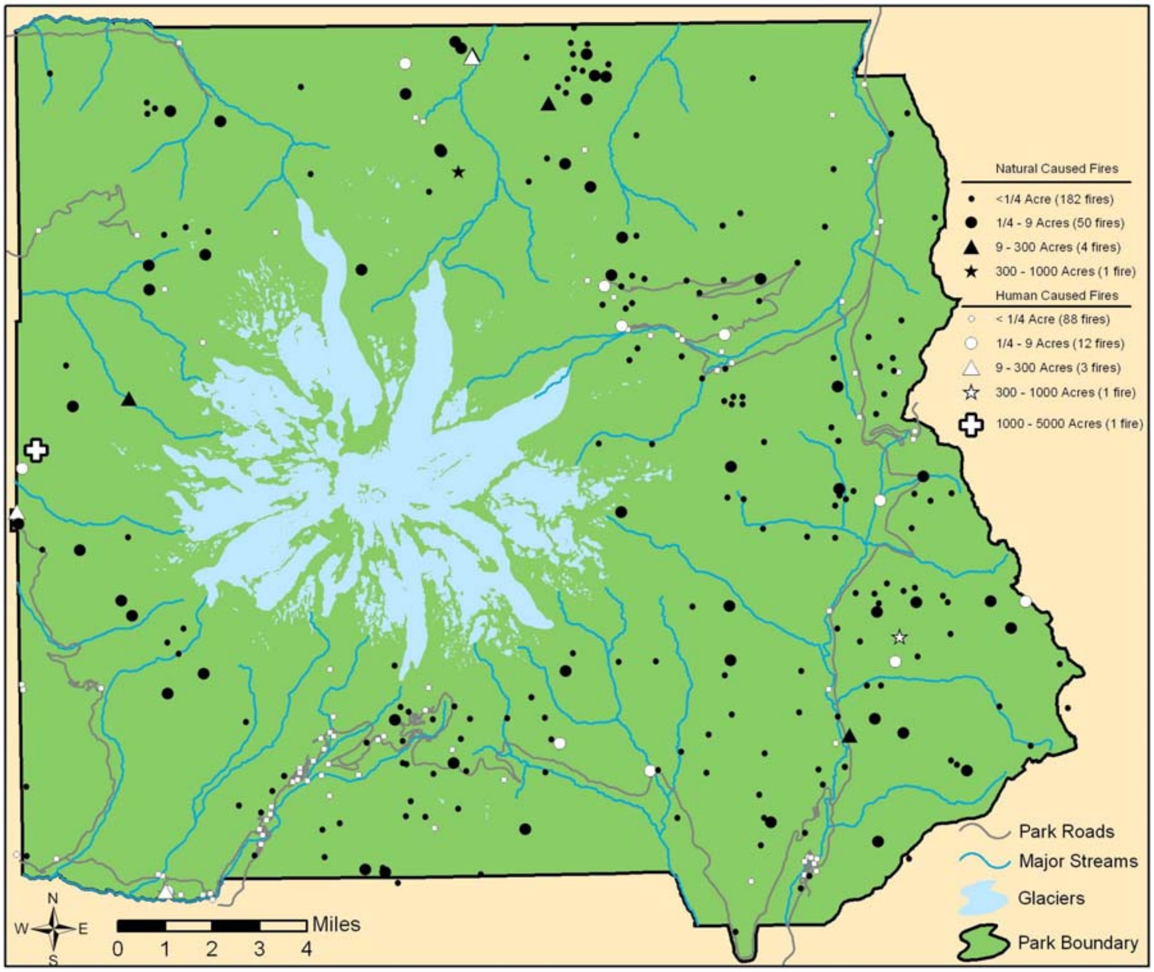
Page 38, Insert the following heading above the paragraph beginning "Historically"
Recent Fire History

Page 39: Insert the following text, diagrams and tables below the paragraph beginning "Historic records show"

Below 4500 feet elevation (listed bird habitat)
Based on a recent park inventory, a total of 237 *natural- source* ignitions were recorded since 1930. Of those, 80 began below 4500 feet in elevation. Nearly all fires below 4500' were very small, suppressed fires – 80% were less than 0.25 acres in size (Table 3). Only three of 80 fires in the 73-year period were greater than 9 acres in size (45, 56, and 203 acres).

Above 4500 feet
157 *natural- source* ignitions were recorded above 4500 feet. Somewhat like lower elevation fires, average fire size (including human caused ignitions) was small with a 74- year average of less than 4 acres. The largest fire documented was a human- caused ignition estimated at 3500 acres in 1930. The second- largest fire in recent history was also human- caused in 1934 at 633 acres in size.

Recent history shows a *normal* year at Mount Rainier as having few small natural fires and many years where none occur at all. This fact is important in fire management implications. Ancient fire history in forests indicates that large stand- replacing fires occur following drought conditions. Most fires, however, remain localized due to typically wet climatic conditions.



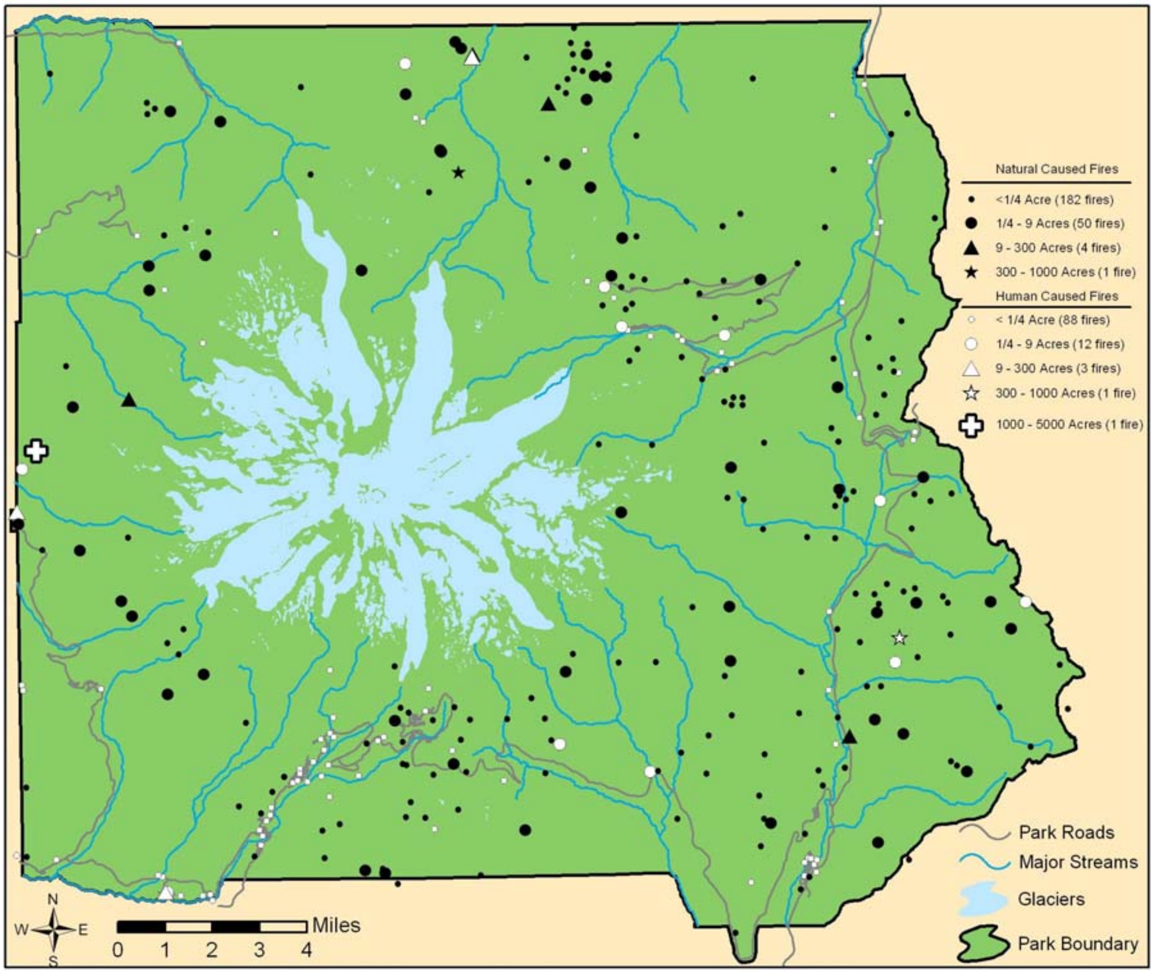


Figure 2. Fire Occurrence (Human and Natural Caused Fires) in Mount Rainier from 1930-2003

Table d. Recent Fire History Fire Size by Decade, *All Causes*, Mount Rainier National Park.

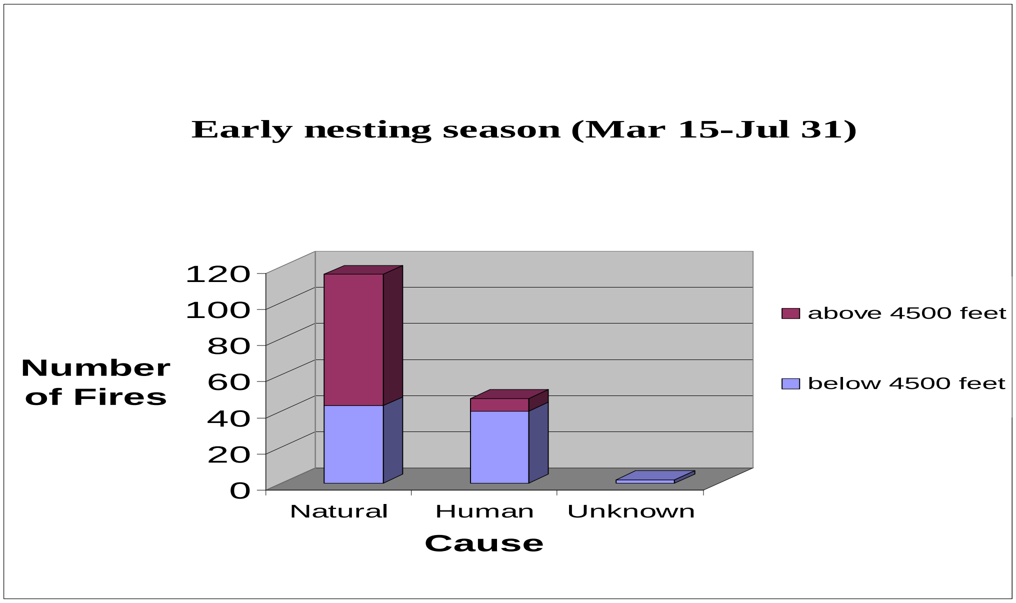
Decade	Less than 0.25 acres	0.25 – 9.0 acres	Greater than 9 acres
1930-1939	42	4	3
1940-1949	52	7	1
1950-1959	20	3	0
1960-1969	20	3	2
1970-1979	13	19	0
1980-1989	25	5	2
1990-1999	71	13	0
2000-2003	22	7	2
Total	265	61	10

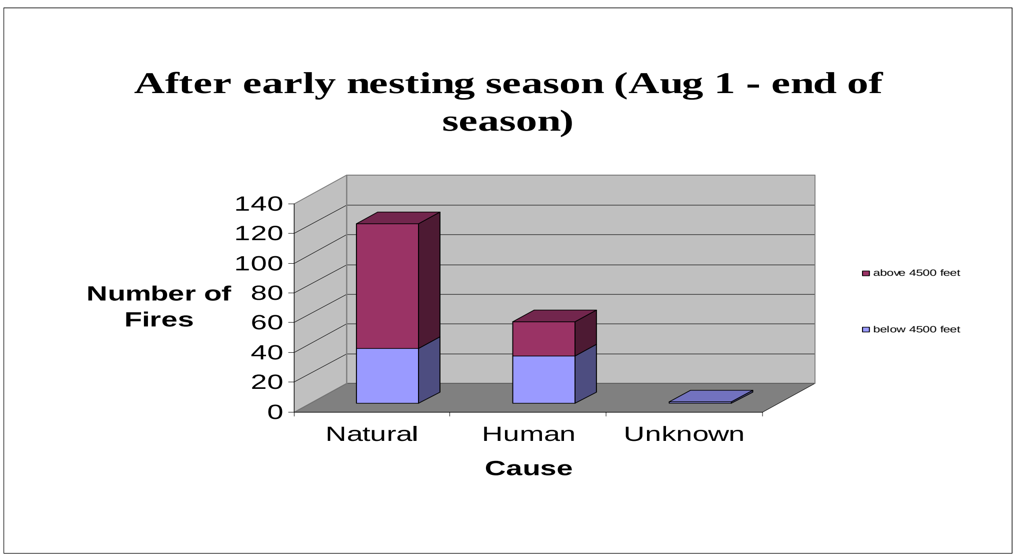
Table e. Fires Known to be Greater Than 5 Acres in Mount Rainier 1930-2003 that Occurred in Watersheds with Bull Trout and Chinook. Used to establish reference or baseline conditions related to fire in watersheds with listed fish and to provide a rough estimate of take associated with fire.

Drainage	Vicinity (Name)	Year	Size (Acres)	Elevation (ft)	Cause
Mowich River	Eagle Cliff	1970	5.00	4544	Natural/Lightning
Huckleberry Creek	Lake Eleanor	2002	5.00	5311	Natural/Lightning
West Fork White River	Redstone 2	2003	5.00	5549	Natural/Lightning
West Fork White River	Redstone 1	2003	5.00	5375	Natural/Lightning
Upper Carbon River	Moraine Park	1938	5.70	6026	Natural/Lightning
South Puyallup River	Klapatche	1942	26.00	4084	Equipment use/Logging line
Mowich River	South Mowich	1987	45.00	3642	Natural/Lightning
West Fork White River	Pigeon Peak	1930	50.00	3785	Miscellaneous/Other or Unknown
West Fork White River	Pigeon Peak.	1965	203.00	3711	Natural/Lightning
Huckleberry Creek	Grand Park	1965	230.00	5471	Natural/Lightning
West Fork White River	Redstone 3	2003	310.00	5011	Natural/Lightning
South Puyallup River	Sunset Park	1930	3500.00	4826	Incendiary/Other or Unknown

Page 41, Insert the following diagrams after the bullets:

Figure 3. Mount Rainier Fire Ignitions by Elevation 1930-2003 During or After Combined Early Nesting Season for Northern Spotted Owl and Marbled Murrelet





Page 56, Insert the following after Table 5:

STATUS OF THREATENED AND ENDANGERED SPECIES AND DESCRIPTION OF HABITAT REQUIREMENTS

Fire behavior in the Mount Rainier region tends to be mostly smoldering spots with infrequent higher intensity and severity fires that kill canopy and understory vegetation (including old growth trees) in the burned area. The acreage limits in this document are based on the likely scenario of fires, some intense enough to kill large trees, thus removing suitable old- growth habitat. Acreage limitations presented here are an attempt to balance the role of fire in the ecosystem with conservation of threatened and endangered species and habitat.

Northern spotted owls and marbled murrelets are dependent on old growth forests as habitat to a greater extent than other species. Research regarding impacts of fire on avifauna within Olympic National Park documented fire- caused vegetative changes to old growth forests that resulted in altered avian density and species composition (Huff 1983). Old growth forests were simplified after fire: 1) a high density of uniform size trees, 2) small snags, and 3) a lack of diverse vertical structure. Habitat heterogeneity was poorly developed in stands at 110 years post fire and at 181 years post fire. While it is true that these threatened bird species evolved with natural fire, the effects of natural fire on their populations was quite different when the entire Cascade Range was predominately covered with old growth forest. By the early 1990's, the Western Cascades Ecological Province Northern spotted owl habitat was highly fragmented (USFS 1994). In this context, old- growth dependent threatened birds have little alternative habitat to use while waiting for fire- killed habitat to regenerate.

A. Northern Spotted Owl

No critical habitat has been formally designated within Mount Rainier National Park, although approximately 82,000 acres of the park contain high quality Northern spotted owl habitat (NSO). Critical habitat was not designated because the park habitat is protected from adverse effects by virtue of its national park status. The draft recovery plan listed a number of threats to the population including low and declining populations, limited and declining habitat, poor habitat distribution, and predation.

Prior to 1997, the extent of Northern spotted owl surveys at MORA had been limited, with less than 25% of potentially suitable owl habitat examined. Only those surveys conducted after 1994 were done according to accepted protocols most recently outlined by Franklin *et. al.* (1996) and Forsman (1995). The most comprehensive inventory, when much of the park's suitable habitat was surveyed, was performed in 1997 and 1998. This inventory substantially improved the understanding of the distribution and reproductive status of NSO in MORA. Northern spotted owls are found up to 4500 feet in elevation in the park (although the 82,000 acre measurement includes areas up to 4800 feet that are potential habitat to potentially escape barred owl invasions). Twenty- seven demographic monitoring activity areas are documented since monitoring began (Myers and Schaberl 2003). Park NSO habitat constitutes approximately 40% of the Rainier Demographic Study Area, one of the 14 areas monitored throughout the range of the NSO. The latest meta- analysis by Anthony et. al. (2004) indicates that the Rainier DSA population is modeled with nearly an 11% annual decline.

Suitable Habitat. Suitable habitat for the Northern spotted owl is characterized by those forested stands capable of providing nesting, roosting, and foraging (NRF) habitat for the species. Suitable habitat is defined as old growth or late- successional coniferous forests with moderate to high canopy closure (>60 percent); multi- canopied, multi- species, with some trees greater than 30 inches in diameter at breast height with cavities, platforms, or mistletoe brooms capable of providing a nest site. These stands also typically have high levels of snags and coarse woody debris capable of providing prey base habitat for northern flying squirrels, bushy- tailed woodrats, red- backed voles and other small ground mammals.

Northern spotted owl dispersal habitat is defined as those forested stands with an average stand diameter equal to or greater than 11 inches in diameter and having a stand canopy closure equal to or greater than 40%. Forested stands in this condition permit young owls to disperse from the natal area and allow adult spotted owls to access other stands of suitable habitat without having to cross open ground.

Approximately 82,000 acres of the park is suitable habitat with an unknown (but relatively small) amount of dispersal habitat.

Breeding Season. For impacts analysis purposes, the breeding season for spotted owls is divided into an early season of March 15 to July 31, and a late season of August 1 to September 30.

Adult spotted owls begin territory establishment during the month of February and egg laying may begin as early as the second week of March and continue into April. Incubation may begin as early as late March and through the second week in April. Incubation takes approximately 30 days. Most fledglings leave the nest during late June, approximately 64 to 66 days after eggs are laid. Fledglings throughout the range of the owl normally remain within the nest stand through the month of September and begin dispersal in October.

Risk Analysis. Implementation of the park's fire plan has the potential to remove suitable spotted owl habitat each year and may result in the incidental take of spotted owls through habitat removal and/or a direct take of owls if the fire(s) burned into a nest stand during the breeding season, as well as noise disturbance, impacts from helicopter use, and possibly smoke effects. However, during suppression activities, owls will be taken due to noise disturbance and habitat alteration associated with fire suppression (i.e. construction of fire lines, firefighting). Using recent fire history as a guide, much of the fire activity and disturbance is likely to take place during or close to late nesting season. The effects on fledged juveniles are much less than during nestling stage. In the long term, maintaining a mosaic of early seral communities created by fire may produce optimum habitat conditions for spotted owls.

B. Marbled Murrelet

No critical habitat has been formally designated for marbled murrelets within MORA. Like the NSO, critical habitat was not designated because the park habitat is protected from adverse effects by virtue of its national park status. The murrelet population within Washington, Oregon, and California is thought to be declining at a rate of at least 4% per year (USFWS 1997). Suitable nesting habitat in Washington, Oregon, and California is found in old growth coniferous stands that are multi- layered with moderate to high canopy closure (Hamer and Nelson 1995, Nelson 1997). Forested stands with old growth remnants are also used. Trees with suitable nest platforms are typically greater than 200 years of age and at least 20 inches in diameter at breast height although trees in productive ground may develop these characteristics at a earlier age (or faster rate) (Ralph *et. al.* 1995). Younger trees may also develop platforms through mistletoe infestation or in reaction to damage from wind or ice.

At MORA, murrelets are known to occur in two *major* watersheds across five river valleys in areas below about 3800 feet elevation. Approximately 25,300 acres of forested area below 3,800 feet is defined as current habitat (Myers 2003). Inland surveys have been conducted since 1996 according to Pacific Seabird Group protocols in areas of all major park watersheds in both frontcountry and of backcountry settings. Murrelet presence is documented within four river area corridors – the Carbon, Mowich, Puyallup and Nisqually rivers. Occupied behavior detections have been documented at only three of the four locations (Myers 2003). We have mapped relatively contiguous *occupied* habitat for the within- park watersheds of the Carbon, Mowich, and Puyallup rivers at 8780 acres of occupied habitat below 3,800 feet. The Nisqually River detections were simply a small number of target detections documented by one RADAR survey in 2000 near the SW Nisqually Entrance area – no occupied behavior has been documented in the Nisqually watershed. Indeed, no ground observer has ever detected murrelets in that watershed despite many years of surveys at several locations (Myers 2003). No active nests have been located within the park. Although watersheds in the Eastern portions of the park are potential habitat, murrelets have never been documented in the area and are not included in the 25,300 acre current habitat estimate. These potential habitat watersheds, especially the Ohanapecosh/Muddy Fork/Stevens Creek portions of the Cowlitz watershed at more than 80 miles from ocean habitat, are presumed to be too far away from saltwater to be useful to murrelets.

Breeding Season. For the purposes of this analysis, the breeding season for murrelets is divided into an early season of April 1 to August 5, and a late season from August 6 through September 15 at MORA.

In Washington, on average, incubation begins in April and extends through July. Both sexes incubate the egg for about 30 days, and average nestling period extends from late May through August, lasting about 30 days. The total length of breeding season averaged 124 days (Hamer and Nelson 1995). Adults feed the chicks up to eight times a day, most often at dusk and dawn. Adults leave the chicks alone on the nest except when actively feeding. A fledgling's first flight is presumed to be from the nest directly to the marine environment.

Risk Analysis. The marbled murrelet is thought to be most vulnerable to noise disturbance during the early breeding season when adults are producing and incubating the eggs. Startling the adult from the nest while it is incubating the egg or chick could result in the loss of the egg or chick. Once the chick is left alone for most of the day, the risk of noise disturbance causing the loss of the murrelet is reduced. Throughout the entire breeding season, adult murrelet activity near the nest site is highest within 2 hours of sunrise and sunset. However, adult flights into/out of the nest have been documented at all hours of the day.

Surveys conducted by NPS and USFS on the Olympic Peninsula using the PSG protocol indicate murrelet detections generally peak in July and taper off at the beginning of August. Similar results have been found at Mount Rainier National Park (Myers 2003). Updated nest information for California and Oregon indicates that up to 20% of nests are active in August, while 8 to 10% are still active in September (Nelson pers. comm. 2001). Nelson estimates that approximately 90% of nests have fledged by August 20. Half of murrelet chicks in Washington for which a fledging date is known fledged by August 5, with a mean fledge date of August 2 (W. Ritchie, WDFW, pers. comm. 2/9/04). Obviously, the later potentially disturbing activities are carried out, the less likelihood there is for impacts to reproduction.

Actions described in the park's fire management plan will result in the loss of suitable murrelet nesting habitat. Fires result in loss of forest structural diversity (Huff 1983) and suitable nest trees, both necessary components of murrelet nesting habitat. Along with the potential risk of habitat loss is the direct loss of murrelets that may be nesting within suitable habitat stands, although this risk would diminish as the fire season progressed into the months of September and October. There is also a risk from noise disturbance and impacts associated with helicopter use. Further, it is unknown how much of an adverse affect smoke may have on nesting murrelets.

The marbled murrelet recovery plan (USFWS 1997) cites fire and smoke disturbance as possible or likely impacts on marbled murrelets, stating that more information is needed in order to fully protect murrelets within national parks. The plan states "As a consequence of such widespread habitat loss and the subsequent reduction in the range and vigor of the species, the murrelet is now more vulnerable to environmental fluctuations and catastrophes that the species otherwise would probably have been able to tolerate. These chance events, such as…fires… could now cause or facilitate the extirpation of the entire listed species or one or more of the Zone populations".

C. Bull Trout

Bull trout, historically was found in most major river systems in the Pacific Northwest and western Canada. Bull trout have been defined as a distinct species (Cavender 1978). Biologists had previously identified bull trout as Dolly Varden (*Salvelinus malma*), largely because of the external similarity of appearance. Both species occur together in western Washington.

Bull trout are a threatened species because of a host of factors. Habitat degradation and fragmentation from land management activities such as timber harvest, mining, road construction and maintenance, hydro power and water diversion are a primary factor. Over fishing and competition with introduced non- native fishes, such as brook trout *Salvelinus fontinalis*, are also contributing factors in their decline (Bond 1992; Donald and Alger 1993). Genetic studies have not been conducted on native charr in MORA to differentiate between bull trout and Dolly Varden. Therefore, we use the term "native charr" when discussing bull trout presence in the park. However, one specimen found in the Carbon River watershed in 1993 was positively identified as bull trout by Doug Markel, Oregon State University.

Several hatchery strains of native salmonids (rainbow and coastal cutthroat trout) were widely stocked throughout MORA along with nonnative fish (brook trout, rainbow, and intermountain cutthroat) that may have hybridized or replaced native stocks within their historic ranges. Park staff conducted fish surveys, of varying intensities, in 1993, 1995, 1999- 2003. Park staff have surveyed all park watersheds to determine the presence of native char (See Figure 5). Native char have been detected in the Upper White, West Fork, Carbon, Mowich, and Upper Puyallup watersheds within the park. Adult bull trout have been found by WDFW in the upper Carbon River downstream from the USFS Bridge 7820 (WDFW 1998). No native charr have been documented in the Nisqually, Cowlitz/Ohanapecosh or Huckleberry watersheds within the park.

Presently bull trout are listed across their range within the coterminous United States. Prior to the coterminous listing in 1999, five distinct population segments (DPS) of bull trout were identified. In June 1998, the U.S. Fish and Wildlife Service, determined threatened status under the Endangered Species Act for bull trout in two DPS in the Klamath River (Oregon) and Columbia River (Idaho, Montana, Oregon, and Washington). In April 1999, the Jarbidge River DPS of bull trout (Idaho and Nevada) was also determined to be threatened. Two more DPS of bull trout, the Coastal- Puget Sound (Washington) and St. Mary- Belly River (Montana), were also found to be threatened in November, 1999. This final listing resulted in all bull trout in the coterminous United States being listed as threatened (USFWS 1999). The Coastal- Puget Sound DPS bull trout encompasses all Pacific Coast drainages north of the Columbia River in Washington, including those flowing into the Puget Sound. The Coastal- Puget Sound DPS is significant to the species as a whole because it contains the only anadromous forms of bull trout in the coterminous United States. Also unique to this population segment is the overlap in distribution with Dolly Varden.

The Puget Sound Management Unit is one of two management units comprising the Coastal- Puget Sound DPS of bull trout. The Puget Sound Management Unit encompasses the geographic area of the Puget Sound region bounded by the Cascade crest on the east, the Kitsap Peninsula on the west, and Canadian border to the north. The Puget Sound Management Unit consists of eight core areas (a core area consists of one or more local populations of bull trout and their habitat) Chilliwack, Nooksack, Lower Skagit,pper Skagit, Stillaguamish, Snohomish- Skykomish, Chester Morse Lake, and Puyallup. Core areas consist of habitat that could supply all the necessary elements for every lifestage of bull trout (e.g., spawning, rearing, migration, overwintering, foraging), and have one or more local populations of bull trout. MORA falls within the Puyallup core area.

In Mount Rainier, native charr occur in the cold water streams of the Puyallup River basin which include several park watersheds including Carbon, Upper White River, West Fork (White), Mowich, and Upper Puyallup (north and south forks).

With the exception of the Nisqually and Ohanapecosh watersheds, bull trout continue to be present in nearly all major watersheds where they had been historically reported. The LaGrande Dam, on the Nisqually River RM 42.5 and completed in 1910, limits potential upstream use by anadromous fish, including bull trout. A natural barrier is also present, located near the LaGrande Dam, and likely eliminated any fish passage. There is

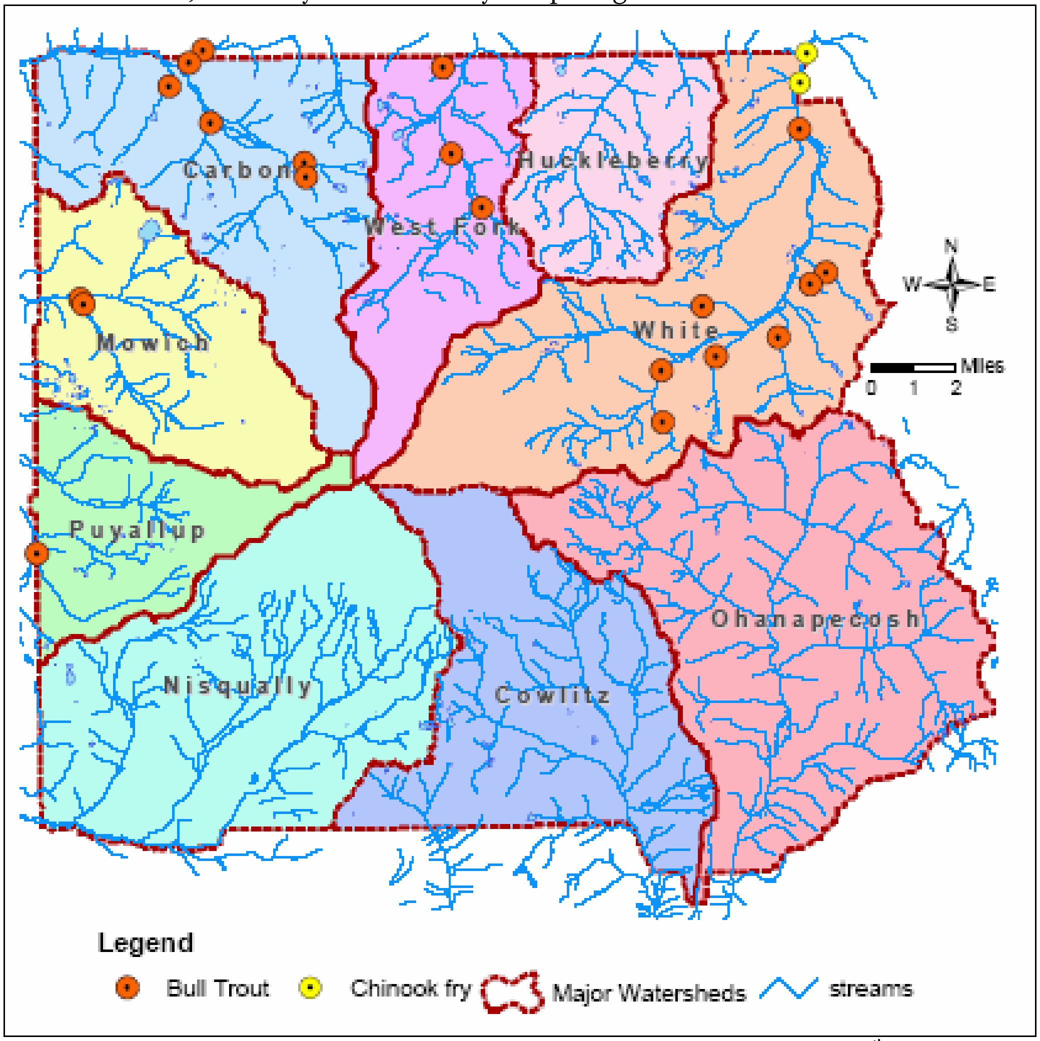


Figure 5. Native Charr and Chinook Salmon presence by watershed (6th field HUC)3. in Mount Rainier National Park.

currently no evidence of a remnant bull trout population existing upstream of these two dams (USFWS, 2004; Mount Rainier National Park, 2001).

Bull trout have relatively specific habitat requirements compared to other salmonids (Rieman and Mclntyre 1993). Habitat components that appear to influence distribution and abundance include water temperature, cover, channel form/stability, valley form, spawning and rearing substrates, and availability of migratory corridors (Rieman and Mclntyre 1993). Bull trout primarily inhabit colder streams, although individual fish are often found in larger river systems (Fraley and Shepard 1989; Rieman and Mclntyre 1993, 1995). However, water temperature above 15° C (59° F) is believed to limit bull trout distribution thereby partially explaining their patchy distribution within a given watershed (Fraley and Shepard 1989; Rieman and Mclntyre 1995). Bull trout habitat is characterized by clear cold water, silt- free rocky substrate in riffle run areas, well- vegetated streambanks, abundant in stream cover, deep pools, relatively stable flow regime and streambanks, and productive fish and aquatic insect populations. Bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993)

Bull trout exhibit resident and migratory life history strategies through much of their current range (Rieman and McIntyre 1993). Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). The size and age of maturity for bull trout is variable depending upon life- history strategy. Resident fish tend to have slower growth rates, reach maturity at a smaller size, and have lower rates of fecundity than the migratory form (Fraley and Shepard 1989; Goetz 1989). Adults range from 150 to 300 millimeters long for residents, and up to 600 millimeters for migratory fish (Pratt 1984; Goetz 1989). Individuals normally reach sexual maturity in 4 to 7 years, and can live as long as 12 years. Bull trout are iteroparous, spawning more than once in a lifetime.

Bull trout spawn in the fall after temperatures fall below about 8 degrees C. The spawning season varies but is considered to be from the beginning of September to the middle of October. In MORA, bull trout typically spawn from late August to November during periods of decreasing water temperatures (MNRP, 2001). Bull trout have been documented to travel as far as 250 kilometers to reach spawning grounds (Fraley and Shepard 1989).

Bull trout are opportunistic feeders with resident and juvenile migratory bull trout preying upon terrestrial and aquatic insects and small fish (Goetz 1989; Donald and Alger 1993). Adult bull trout are primarily piscivorus, feeding on various salmonids, yellow perch and sculpin species (Fraley and Shepard 1989; Donald and Alger 1993).

ESA Status and Distribution of Dolly Varden

Dolly Varden is proposed under the similarity of appearance provision of the Endangered Species Act. They occupy the same habitats and have nearly indistinguishable characteristics from bull trout. USFWS is opting to use the similarity of appearance provision to minimize the potential risk for take of bull trout by anglers fishing for dolly varden. However, protection for Dolly Varden under the ESA is extended only in those areas where Coastal- Puget Sound DPS bull trout overlap with Dolly Varden presence. No genetic studies have been conducted within the park to distinguish Dolly Varden from bull trout.

D. Puget Sound Chinook

Chinook salmon, *Oncorhynchus tshawytscha,* distribution historically ranged from the Ventura River in California to Point Hope, Alaska in North America, and in northeastern Asia from Hokkaido, Japan to the Anadyr River in Russia (Healey 1991).

The Puget Sound chinook salmon Ecological Significant Unit (ESU) was listed as threatened on May 24, 1999 (NMFS 1999). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. Based on available information, NMFS concludes that chinook salmon in the Puget Sound ESU are not presently in danger of extinction, but they are “likely to become endangered in the foreseeable future”. Therefore, NMFS determines that Puget Sound Chinook salmon warrant listing as a threatened species under the ESA. The ESU encompasses all naturally spawned runs of chinook salmon that occur below impassable natural barriers (e.g., longstanding, natural waterfalls) in the Puget Sound region.

The Lower Columbia River ESU was listed as a threatened species on March 24, 1999. The ESU includes all naturally spawned populations of chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between

Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring- run chinook salmon in the Clackamas River. Within freshwaters, habitat includes those areas with substrates suitable for egg deposition, juvenile feeding, sheltering, migratory pathways and refugia.

The earliest return records for White River spring chinook are from the Buckley fish trap in 1941 (Miyamoto 1986). Adult returns from 1942 to 1950 averaged 2,953. Declines in returns were lowest in the 1970's when approximately 50 fish returned in 1977. Currently White River spring chinook escapement numbers have increased primarily because of hatchery intervention programs initiated in the late 1970's. Between 1985 and 1996 naturally spawning fish have been steadily increasing and averaged 263 adults. It is presumed that chinook spawn in suitable habitat in the Upper White River in the park.   According to historic records, chinook were present in the park in the White River and West Fork of the White River, in the early part of the 20th century.

There is no reliable historical source of information on salmonid species abundance in the Puyallup River basin of record. Historically, runs of chinook (fall and spring stocks), were present in the Puyallup River system September through October, mostly in South Prairie Creek. Some Chinook ascend the diversion dam with passage conditions in the canyon are favorable but most are blocked at the diversion. Spring Chinook have been reported below the diversion. (USDA 1995)

The Carbon River is now the only river in the Park without a dam blocking anadromous fish passage. Recent (1993- present) fish surveys conducted by park staff have not detected their presence here (MRNP, 2001). However, no surveys have been conducted in the park specifically to detect chinook, due to the difficulties in surveying large glacial rivers.   The Carbon River Chinook runs, if present, would occur during the summer and fall.

LaGrande Dam, on the Nisqually River RM 42.5, limits potential upstream use by anadromous fish. A natural barrier may exists near the location of LaGrande Dam and likely prevented fish passage thereby eliminating any salmon utilization within the upper section of Nisqually River.

Runs of spring chinook begin their upstream migration in the Puyallup/ White river in late May. The spring chook run is defined as those fish that arrive at Buckely trap on August 15 annually (USDA, 1995). They are released above the dam flood control and have peak spawning in the White River headwaters between August- September. The fall chinook run arrives after August 15 and spawn September to mid November. Spawn timing is primarily October and precise location of natural spawning is not well known. A small population of native spawners still returns to the White River (USDA, 1995). Chinook outmigrate 1 year later in April/May coinciding with the natural spring run- off pattern of Mount Rainier. One observation of Chinook was made by park staff in May, 2002, in the White River, near the park boundary (See Fig. 5).

Page 90: Insert the following maps above the heading "Rare, Threatened and Endangered Wildlife, Impacts of Alternatives 1- 5 on Northern Spotted Owls"

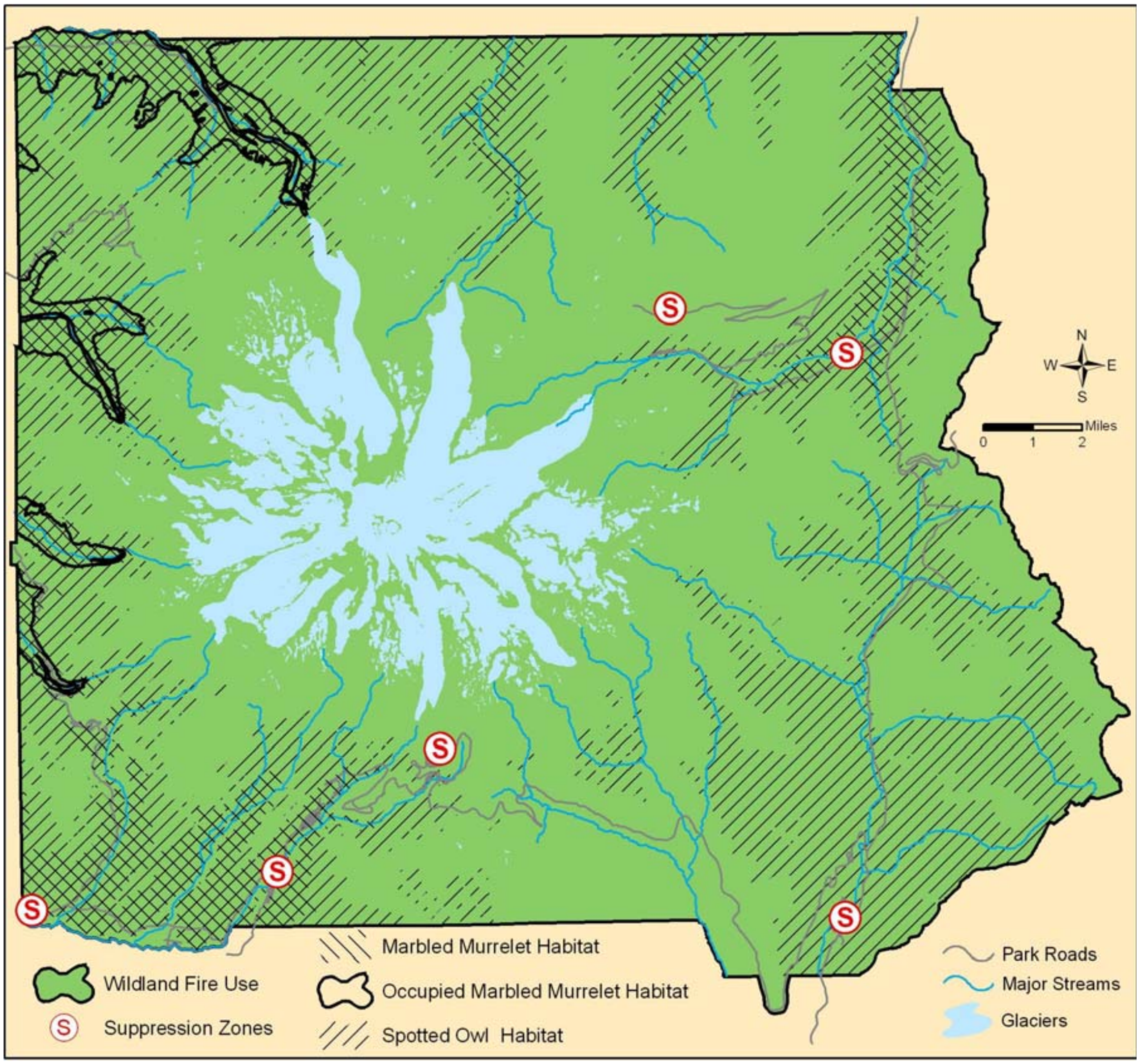


Figure 4. Fire Management Units, Northern Spotted Owl and Marbled Murrelet habitat types in Mount Rainier National Park

Page 91: Insert the following heading and text above the heading **Impacts of Alternatives 1-5 on Bald Eagles**.

SPECIFIC EFFECTS OF PROPOSED ACTIONS ON NORTHERN SPOTTED OWL AND MARBLED MURRELET

IMPACT FACTORS:

a) DISTURBANCE
It is very difficult to assess impacts of disturbance, or how several factors might cumulatively increase the degree of impact, on any wildlife species - particularly birds. The park's wildlife ecologist will determine how each factor will impact species using specific information on species, location and project.

The primary issues surrounding the disturbance type of impact are the noise produced, the visual disturbance, and the potential for those factors to disturb nesting birds. Potential for disturbance varies with the type of equipment, but also with ambient noise/visual level, topography, vegetation, duration, scope and intensity.

Noise. To assess impacts of noise on birds, one must consider the maximum noise level, the equivalent noise level (the level of a continuous sound with energy equal to the noise in question), the median level and the ambient level. Both decibel level and frequency spectrum are important in assessing impact of a noise. The following factors, in order of importance, affect how noise travels across a landscape: distance, wind speed and direction, temperature and humidity, surface softness or hardness, topography and, lastly, vegetation.

Response. Animals do not perceive sounds the same as humans do. For example, owls tend to be more sensitive in the middle frequencies than humans, but less so in lower frequencies (Delaney 2001). Analysis of impact must be made on a species specific basis, or use a closely similar species as a surrogate. An animal's response varies with the following factors: decibel level, duration, number and frequency of events, variation in decibel level over time, rate of onset, background noise, frequency distribution of the noise energy, reproductive status/stage, prior experience, visibility of source, presence of conspecifics or predators, position of animal relative to source, age, gender, individual temperament. The dose response will vary for each combination of noise, species.

Equipment. With regard to equipment, the emphasis should be placed on the loudness and suddenness of the noise produced.

For the purposes of Section 7 consultation on listed birds, USFWS and park staff have divided management tools into groups based on the level of noise they produce: 1) non- motorized handtools; 2) motorized handtools; 3) heavy machinery; 4) aircraft; 5) burning; and 6) blasting.

Non- motorized handtools produce very little noise. Motorized handtools, including chainsaws, produce more noise that can be heard over a distance. Heavy machinery, including graders, dump trucks, and excavators produce noise above regular autos and motorized handtools. In most places within the park, the level of noise produced by heavy machinery will be above ambient. Aircraft and blasting can produce a great deal of noise and concussive effects at various distances.

Visual Disturbance. Presence of humans and their equipment in locations where they normally are not present can cause a visual disturbance to wildlife, including birds. Research on other bird species, including Mexican spotted owls, show that recreational use can cause birds to flush, can influence courtship patterns and affect nesting success (Hebert and Golightly 2003). Visits by researchers to alcid nest colonies, especially early in the season, often lead to nest desertion (Hebert and Golightly 2003). Hebert and Golightly (2003) documented changes in behavior of both marbled murrelet adults and chicks during disturbance experiments using a chainsaw.

Ambient. The background level of noise and/or visual cues is known as the ambient level. Ambient noise can be caused by natural sounds such as stream noise, or can be caused by consistent human generated noise such as traffic sounds. Ambient visual levels can be caused by natural movements such as that generated by wind, rain, or other animals; or can be caused by consistent human generated movement such as traffic, or seasonal campground use. These can vary seasonally as weather, water levels and traffic patterns change. Animals living near constant ambient noise and movement sources may become habituated to those sounds/visual cues and are unlikely to be disturbed by that which falls within the range of the existing ambient level.

Topography. Topography can affect how sound carries; sound carries further over flat ground, or from a high point of ground. A ridge can serve as a buffer to noise and visual disturbance; a canyon can contain and amplify noise disturbance. The park has complex topographic terrain with few large valleys.

Vegetation. Sound does not carry as well or as far through vegetation as it does over open ground. Sound will carry much farther over clearcuts, meadows, wetlands, and especially open bodies of water. Thick vegetation may serve as a buffer from visual disturbance, and under some circumstances from noise disturbance as well.

Weather. Weather conditions may influence how well and how far sound travels.
Wind may carry sound further, or high ambient noise from wind or rain may mask noise.

Weather conditions may also influence how much an animal is affected by disturbance. Delaney et al. (1997) states that precipitation, wind and clouds "can limit foraging ability of raptors, and thereby place greater importance on next available foraging times. If disturbance events occur during those times, there could be a detrimental effect".

At MORA, cloudy conditions with precipitation and wind are common during much of the early-mid breeding season of Northern spotted owls and marbled murrelets.

Intensity. A noise or visual disturbance that starts low and builds, such as a vehicle driving down a road which approaches a nest area, would likely result in different risks than a sharp blast, an intense noise, or a sudden movement, such as operation of aircraft or other loud equipment, or the sudden approach of an aircraft with no visual warning (e.g. aircraft flying over a peregrine eyrie from behind). Generally it is thought that lower intensity noise or visual disturbance results in less risk to species than higher intensity noise or visual cues, or noise disturbance from a sharp blast.

Duration. The length of time over which unaccustomed noise or visual disturbances occur might effect how species respond to the disturbance. Generally it is thought that noises or movement of shorter duration would pose less risk to species than longer duration noises or movement. At some point, species might become accustomed to some long- term constant noise and movement, and if so, risks to species would decrease.

Scope. The scope of disturbance or habitat modification impacts is also considered to assess risks to a population or meta population. In general, impacts of like kind which are smaller in scope, in other words effect less occupied or potentially occupied habitat, would pose less risk to species than impacts which are larger in scope. The scope of impacts on populations is generally impossible to consider when assessing individual projects. This fire program programmatic consultation allows biologists to track and consider risk to species from the scope of all activities with potential impacts.

IMPACT FACTORS:

a) FIRE EFFECTS
Fire can impact threatened birds in the park through direct mortality of eggs and individuals, but also through removal of nesting habitat. The direct effects of fire on birds and their habitat relate to the intensity, duration, timing and scope of the fire. These factors, in turn, are determined by other factors, such as weather, topography, etc. A large, more intense, hot fire capable of killing old growth trees in a large area would obviously have much greater impacts on birds. Research in the park (Hemstrom and Franklin 1982) demonstrated that indirect effects of fire can be quite long- lasting, especially for larger- sized fires or fires in high elevation communities. Depending on forest site potential, it may take 200 years or more post fire to redevelop old- growth characteristics suitable for species such as murrelets.

b) SMOKE DISTURBANCE

Smoke is thought to be an impact on birds (USFWS 1997), however little research has been done on this topic. There are records of nesting N. spotted owls found dead apparently as a result of exposure to a significant level of smoke (P. Wolcott, pers. commun., 2004). It is difficult to assess impact factors, but many of the same factors that influence noise disturbance and fire effects likely apply to smoke disturbance as well. Certainly, weather and topography influence the effect smoke may have on birds. Fire factors, such as intensity, and duration, influence smoke effects. A fire smoldering in thick duff for an extended period may produce much more smoke than a hot, rapidly moving fire. Thick smoke may or may not impact bird behavior, navigation, or ability to find prey. Impacts are likely different during the early breeding season and the late breeding season.

DIRECT AND INDIRECT EFFECTS: LISTED BIRDS

Park biologists have determined that implementation of the proposed fire management program within MORA may affect, and is likely to adversely affect Northern spotted owls and marbled murrelets, through both direct and indirect effects. These determinations are based on analysis that presumed the worst case condition of direct loss of individuals and habitat loss or degradation which may or may not occur on an annual basis. Additional impacts will likely occur due to noise and smoke disturbance – especially through the higher elevation fires that are more likely at MORA. There is no way to precisely predict where fires may start or to accurately estimate how many acres of forested lands these fires consume or to what intensity within a given year. This five- year document provides some estimates based on fire history and best professional judgement.

1) Fire Suppression Program: Wildfires have the obvious potential to burn suitable habitat for species such as the Northern spotted owl and marbled murrelet which are dependent on late-successional forests for nesting habitat. Even though most wildfires since 1930 (natural and human caused) in MORA start above 4500 feet in elevation, they have the potential to back down onto lower elevations and stream drainages where suitable habitat for these species may occur. The fires could burn or degrade habitat that would take 100 years or longer to regenerate into suitable habitat once again. Smoke from wildfires may also drift into suitable habitat stands and result in disturbance to these species. The fires may also burn stands that may be occupied by any of these species resulting in a direct incidental take of the species. Because most fires occur in mid- to late- summer, the risks to the Northern spotted owl would be less than that of the marbled murrelet which may nest into September.

Habitat may also be negatively impacted by suppression efforts. The use of helicopters, airtankers, fireline explosives, pumps and chainsaws during wildfire situations will result in adverse affects to the listed bird species. Removal of trees during construction of fireline or hazard tree removal (on a localized level) will also adversely affect threatened and endangered species.

2) Wildland Fire Use: Wildfires have the obvious potential to burn suitable habitat for species such as the Northern spotted owl and marbled murrelet. Even though most wildfires since 1930 (natural and human caused) in MORA start above 4500 feet in elevation, they have the potential to back down onto lower elevations and stream drainages where suitable habitat for these species may occur. The fires could burn or degrade habitat that would take one hundred years or longer to regenerate into suitable habitat once again. Smoke from wildfires may also drift into suitable habitat stands and result in disturbance to these species. The fires may also burn stands that may be occupied by any of these species resulting in a direct incidental take of the species. Because most fires occur in mid- to late- summer, the risks to the Northern spotted owl would be less than that of the marbled murrelet which may nest into September.

3) Hazard Fuel Reduction - Manual/Mechanical Treatment: Manual/Mechanical treatment will have some adverse impacts on suitable habitat for the listed birds. Albeit in developed settings, many developed areas have the habitat characteristics for foraging (owls) and nesting habitat (owls and murrelets). Removal of woody debris from the ground will modify habitat for Northern spotted owl prey. Removal of ladder fuels and limbs and thinning stands will modify suitable habitat for Northern spotted owl and marbled murrelets. Fuel reduction actions will not directly remove habitat, however, for the maximum tree size for treatment is 8" DBH.   Noise disturbance from possible heavy equipment & chippers and especially hand- operated power tools will adversely affect owls and murrelets, but the timing of the activity will be after the early nesting season and maybe after the late nesting season. Timing of these activities may mitigate nearly all the concerns with noise disturbance. Additionally, many of these developed areas routinely (some more than others) have noise disturbance from motorized tools and equipment used in maintaining developed areas.

INTERDEPENDENT AND INTERRELATED EFFECTS:

Presence of humans in campgrounds and spike camps has the potential to increase corvid activity, and consequently lead to increased nest predation, due to improper storage of food and waste. However this is not anticipated to occur in any large degree. As per NPS policy, all food and garbage will be secured in such a way that they are not available to wildlife, and will be removed from the site during the decamping process. These provisions are principally in place due to bear management guidelines, but they also serve to prevent food habituation in other wildlife species.

Table 6 (Table 1 in BO). Number of Acres Treated by Activity

Key Assumptions of Anticipated Take

Activity:	Specific Activity for Analysis	Season of Activity	**Above 4500' Acres Affected** (disturbance, with little take)	**Below 4500' Habitat Acres (take)**
Wildland Fire Suppression	Burned area, firefighters, fireline construction, fuel reduction, helicopters, pumps, fireline explosives, smoke, retardant, foam	July through mid-Sept.	**570 acres** (Up to 65 acres/year with one year up to 310 acres)	**80 acres**
Hazard Fuel Treatment	*Limbing, brushing (**no trees cut >8 in. dbh**)* within developed areas. Additionally, fuel breaks **at least** *30 feet wide breaks along perimeter* of developed areas	August-October	**13 acres**	**141 acres** (the treatment in these acres will not fully equate to "habitat loss")
Wildland Fire Use	Burned area, Allowing natural fires to burn under specific conditions. Limited levels of suppression-type activities	July through mid-Sept.	**1755 acres** (351 acres/year)	**927 acres** (185.4 acres/year)
TOTAL			**2338 acres**	**1,148 acres** (**931** acres suitable habitat lost)

Since it is not possible to predict when and where fires will occur in the future, this estimate of take is based on fire history, proposed changes in the park's fire management program and park wildlife ecologist's best estimate of impacts to listed birds. Several key assumptions were used in this assessment:

- All fires and mechanical treatments below species- appropriate elevations occur within suitable habitat.
- All fires *within suitable habitat* are potentially intense enough to kill old- growth trees. However, most fires in the region tend to be small, smoldering spots with some large, high intensity fires that kill most trees in the area.
- All suitable murrelet habitat is *not* occupied by marbled murrelets. NPS monitoring (Myers 2003, Lechleitner et. al. 1996) indicate that only three watersheds of 8780 acres of habitat in the park is considered contiguous occupied habitat. Forests in the three watersheds are relatively wet: they include creek and river valleys where forests have been largely untouched by fire,

some for more than 1000- 1200 years (Franklin et. al 1988). Marbled murrelet detections (8 inbound) were recorded by RADAR in 2000 near the Nisqually entrance. Despite years of field observer surveys, no murrelets have ever been detected on Eastern watersheds.

- All suitable habitat may be utilized by Northern spotted owls. However, the park routinely will conduct demographic monitoring on what is suspected to be most of the spotted owl territories in the park. This assumption does not take into account interactions between barred owls and spotted owls.
- Effects of fire- related activity above 4500' in elevation or disturbance issues within habitat may be indirect effects and potentially not within critical disturbance distances established in the scientific literature

On the whole, these estimates likely slightly over- estimate take for many years but dramatically under- estimate take for other years. If acreages exceed these in any year, NPS staff will contact USFWS immediately to initiate emergency consultation or to reinitiate this consultation.

Page 91, Replace the two paragraphs on Bald Eagles with:
Northern Bald Eagle. Due to the lack of suitable large river/large lake habitat, bald eagles may use the park seasonally but there is no evidence of breeding activity in or adjacent to the park. A wintering population centers along the Cowlitz River several miles south of MORA (T. Kogut, pers. commun. 2003). Since there is no evidence that eagles reside or breed within Mount Rainier National Park, the fire management program would have **No Effect** on this species

Page 92: Replace the heading "Mammals" and the first, and third paragraphs with:
E. Other Species (Including Effect Determinations)

Gray Wolf. Historically, the wolf was present in the state of Washington but thought to have been eliminated as a breeding resident by 1930 (Young 1944, USDI 1987). Gray wolves were historically found in the park. Numerous observations were recorded from the late 1800s – 1920s (Taylor and Shaw 1927). Recent wolf observation reports in the park (in the last 20 years) have not been confirmed by biologists. The Washington Department of Fish and Wildlife (WDFW), however, maintains a database of a small number of these in the park area that they consider to be reliable observations. Semi- domesticated hybrid wolf- dogs were documented by the WDFW and NPS in the eastern portions of the park during the 1990s. Hybrids may be the source of the recent reports. Multifaceted carnivore surveys were conducted at MORA from 2000- 2002 to include the National Lynx Detection Protocol, snow tracking, and baited camera stations (Mount Rainier National Park unpublished data). No wolf evidence was documented. Since there is no documented evidence that wild wolves occur within Mount Rainier National Park, the fire management program would have **No Effect** on this species.

Grizzly Bear. Historically, the grizzly was present in the state of Washington but thought to have been eliminated as a breeding resident by 1930 (Young 1944). The park contains some suitable grizzly bear habitat, but there have never been confirmed sightings of grizzlies in the park. In 1993, grizzly bear tracks were identified by WDFW a few miles west of MORA boundaries. No observations were recorded in that vicinity or anywhere near the park since 1993. Since there is no evidence that grizzly bears occur within Mount Rainier National Park, the fire management program would have **No Effect** on this species.

Canada Lynx. Historically, the lynx was present in the state of Washington but thought to have been eliminated as a breeding resident by 1930 (Young 1944). The last lynx documented at MORA was in 1934. Recently, multifaceted carnivore surveys were conducted at MORA from 2000- 2002 to include the National Lynx Detection Protocol, snow tracking, and baited camera stations. No lynx detections were generated from these efforts or from any other means since 1934 (Mount

Rainier National Park unpublished data). Since there is no documented evidence that lynx currently occur within Mount Rainier National Park, the fire management program would have **No Effect** on this species.

Page 93: Replace the following heading: “Impacts of Alternatives 1- 5 on Rare, Threatened or Endangered Fish. . .” and the two paragraphs that follow with:

EFFECTS OF THE PROPOSED ACTIONS ON LISTED FISH SPECIES:

A. ENVIRONMENTAL BASELINE

The environmental baseline represents the current set of basal conditions to which the effects of the proposed action are then added. NOAA Fisheries, and adapted by US Fish and Wildlife Service for bull trout (USFWS, 1998), have related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (water quality, habitat access, habitat elements, channel condition and dynamics, flow/hydrology, watershed conditions, disturbance history, and riparian reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g., indicators for water quality include temperature, sediment, and chemical contamination) that are measured or described directly. Based on the measurement or description, each indicator is classified within a category of the properly functioning condition (PFC) framework: 1) properly functioning, 2) at risk, or 3) not properly functioning. Properly functioning condition is defined as “the sustained presence of natural habitat forming processes in a watershed that are necessary for the long- term survival of the species through the full range of environmental variation.” Table 7 includes environmental baseline for each watershed within MORA.

Table 7. Environmental baseline conditions for watersheds (6th field HUCs) with listed salmonids. Information is based on watershed analyses and best professional judgment.

Environmental Baseline			
Environmental Indicators	**Properly functioning**	**At Risk**	**Not Properly Functioning**
Water Quality			
Water Temperature	WH; HU; WF; CA; MO; PU		
Sediment	WH; HU; WF; CA; MO; PU		
Chemical contaminants/nutrient	WH; HU; WF; CA; MO; PU		
Habitat Access			
Physical barriers	CA	WH; HU; WF; MO; PU	
Habitat Elements			
Substrate	WH; HU; WF; CA; MO; PU		
Large woody debris	WH; HU; WF; CA; MO; PU		
Pool frequency	WH; HU; WF; CA; MO; PU		
Pool quality	WH; HU; WF; CA; MO; PU		
Off-channel habitat	WH; HU; WF; CA; MO; PU		
Refugia	WH; HU; WF; CA; MO; PU		
Channel Condition			
Width/depth ratio	WH; HU; WF; CA; MO; PU		
Streambank Condition	WH; HU; WF; CA; MO; PU		
Floodplain connectivity	WH; HU; WF; CA; MO; PU		
Flow/Hydrology			
Peak and base flows	WH; HU; WF; CA; MO; PU		
Watershed Conditions			
Road densities and location	HU; WF; MO; PU		WH; CA
Disturbance history**	HU; WF; MO; PU; CA;WH		
Riparian reserves	WH; HU; WF; CA; MO; PU		

*River codes: WH=Upper White; FW=West Fork White; CA=Carbon; MO=Mowich; HU=Huckleberry; PU= Upper Puyallup (north and south forks).
**Disturbance History: Properly functioning includes natural disturbances such as debris flows and glacier outburst floods that occur frequently within the park.

Many of the headwater reaches of the Puyallup River basin, the third largest tributary to Puget Sound, originate in MORA. The Puyallup River basin includes the following major rivers and their tributaries: the Puyallup, Mowich, Carbon, and the White Rivers including the West Fork White River and Huckleberry Creek. Those portions occurring in the park are primarily comprised of steep gradients and most are highly influenced by glacial turbidity and are subject to a myriad of factors that influence baseline conditions in watersheds throughout the park. The cold, glacial mountainous character of the habitat presents some natural limits to Chinook salmon production. Most small tributaries offer little or no access to habitat. The following information provides some background on general watershed conditions taken from the Washington State Conservation Commission (WSCC 1999).

White River*:*
The White River, the largest tributary to the lower Puyallup River, originates at the terminus of the Winthrop, Fryingpan, and Emmons glaciers on the northeast flank of Mount Rainier located in Mount Rainier National Park and drains an area of approximately 494 square miles. The White River then flows through the Mount Baker- Snoqualmie National Forest and converges with the lower Puyallup River at river mile 10.4. (USFWS 2004). Flowing from its origin to the confluence with the Puyallup River it is approximately 68 miles in length.

Early in this century the majority of the White River flow was naturally directed north into the Green and Duwamish Rivers. A small overflow channel, called the Stuck River, flowed south from the vicinity of Auburn into the Puyallup River at Sumner. A rain on snow event triggered a flood on November 14, 1906 creating a debris dam in the White River and the entire flow was redirected into the Stuck River, nearly doubling the flows in the lower Puyallup. The former White River channel into the Green River went dry as a part of this event. A permanent concrete diversion wall was constructed at Auburn in 1914 to prevent the White from returning to the Green River. The White River remains a tributary of the Puyallup. The upper White River is physically unstable as it cuts through a series of glacial and mudflow deposits. Given the relatively steep gradient and gravelly soils that the river cuts through there is a tremendous amount of sediment transported within this system annually.

Critical to the natural production of salmonids within this basin are two impassable dams that prevent salmon from reaching their natal spawning areas, prohibit the passage of large woody debris (LWD), and disrupt the natural sediment transport process. Puget Sound Energy operates the Lake Tapps diversion dam at RM 24.3 and the U.S. Army Corps of Engineers operates a flood control dam (Mud Mountain Dam) at RM 29.6. Water from the Lake Tapps Diversion Dam is returned to the White River at RM 3.5. Returning adult salmon are trapped at the diversion dam (R.M. 24.3), trucked upstream of Mud Mountain Reservoir, and released back into the White River at RM 33.9. The operation of these two projects essentially eliminates 9.6 miles of mainstem spawning and rearing habitat. Tributaries accessible to anadromous fish are very limited in the upper White River.

Principal tributaries in the upper White River are Fryingpan, Shaw, Sunrise, and Klickitat. The valley floor is narrow with extremely steep mountain slopes. Above Fryingpan Creek, the dense conifer forest gives way to low scattered conifers, then to bare rock slopes, perennial snowfields and glaciers. Development is extremely limited and is oriented mostly to park management or recreation.

Much of the upper channels are unstable with considerable braiding and a number of falls, cascades, and very steep gradient. The substrate contains mostly boulder and bedrock with gravel patches. Over the lower section the channel remains steep and only a few moderate gradient stretches. The channel remains somewhat unstable exhibiting considerable braiding and major channel splitting. Substrate material is mostly boulder and a few cobble–gravel riffles over the lower stretches. Stream- side cover consists of moderate to dense stands of coniferous forest.

Huckleberry Creek: The headwaters of Huckleberry Creek contain steep gradient over the upper section with numerous cascades and small falls. The substrate is mainly boulders and cobble.

Gradient decreases over the lower section with partially confined channel consisting mainly fast riffles and a few deep pools. The substrate is boulder and gravel.

West Fork White River: The West Fork White's upper 5 miles present extremely steep gradient, with numerous falls, cascades and rapids with boulder–cobble substrate. Below Lodi Creek the gradient decreases with mostly fast riffles. Substrate in the lower channel is largely boulder-cobble with a few patchy gravel stretches. The valley floor is narrow with extremely steep mountain slopes. The bottom contains mixed dense conifer and deciduous forests that gives way to low scattered conifers, then to bare rock slopes, perennial snowfields and glaciers.

Carbon River: The Carbon River drains the Carbon and Russell Glaciers and flows westerly to join the mainstem Puyallup River near river mile 18 (USFWS, 2004). The headwaters are a braided system flowing through a broad, relatively flat floodplain and moderate to low stream gradient (Williams 1975). The river has a glacial source that delivers large pulsed volumes of sediments to the system and relatively steep tributary streams as supporting features (Williams 1975). Although, some localized constricted canyon exists the reach is generally flat and braided. The braided active channels are quite unstable with bedload consisting of large boulders and pockets of fine materials.

There are no known artificial blockages, dams or diversions, in the upper Carbon River system. There exist a number of adult and juvenile salmonid barriers in its tributary streams. The only remaining levees and revetments in this portion of the subbasin are low profile, remnant structures within MORA between the Carbon River Road and the active river channel. The Carbon River entrance road functions similarly as a levee inhibiting channel migration. Historical timber harvest activities have resulted in the loss of the old growth conifer tree recruitment. Therefore, the basin, outside of the park, is generally starved of necessary LWD. The lack of LWD is thought to be a limiting factor in channel stability and habitat necessary for successful salmonid production.

The Upper (North and South) Puyallup and Mowich Rivers: One of the most defining features in this subbasin is the Electron Hydroelectric Project. Puget Sound Energy Corporation operates this project on the mainstem Puyallup River with a diversion dam at RM 41.8 and an associated powerhouse at RM 31.2. Initially constructed in 1904, the dam completely blocked anadromous salmonid access to miles of mainstem river habitat and tributaries above the dam. In addition, water diverted from the main channel bypasses and partially dewaters 10 miles of mainstem channel, impacting both upstream and downstream fish passage, rearing, and spawning habitats. The upper Puyallup and Mowich Rivers are located upstream from Puget Sound Energy's Electron Diversion Dam.

A 1997 Resource Enhancement Agreement between Puget Sound Energy and the Puyallup Tribe of Indians provided salmonid access above Electron dam, and for the first time established a minimum flow in the bypass reach. A recently constructed fishway has been in operation since October 2000. With the full implementation of the Resource Enhancement Agreement an additional 12 miles of mainstem and over 23 miles of tributary habitat would eventually reopen. Numerous passage barriers exist on tributary streams within MORA.

The Puyallup River drains the Tahoma and the Puyallup glaciers on Mount Rainier and flows generally northwest to Commencement Bay (USFWS, 2004). Principal watersheds include North and South Fork Puyallup and the Mowich River. The upper miles of the Puyallup cuts through steep narrow valley of dense conifer forest. Outside MORA are recent logged areas in various stages of reforestation. The upper South Puyallup River is an unconfined channel incising through ancient mudflow terraces. The Mowich River drains the North and South Mowich and

Flett Glaciers and enters the upper Puyallup at river mile 42.3 (USFWS, 2004). The upper 2 miles present steep glacial conditions with considerable braiding and fast boulder/cobble rapids. The next few miles the channel is moderately steep to steep gradient with numerous cascades and a few pool- riffle areas.

B. DIRECT AND INDIRECT EFFECTS OF PROPOSED ACTIONS ON LISTED FISH

The ESA implementing regulations define effects of the action as “the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline.” Direct effects are the immediate effects of the project on the species or its habitat. To evaluate direct and indirect effects associated with the various activities, it is critical to address the duration that life history stages spent in freshwater (Table 8).

Many of the proposed actions are likely to adversely affect PS bull trout and may likely affect PS Chinook. The management of wildland and human caused fire in MORA has the potential to significantly influence landscape level processes in MORA when compared to any other ongoing activities in the park. However, the magnitude of effects associated with the management actions are influenced by the duration of activities and whether salmonids or their redds are present.

Table 8 . Seasonal occurrence of adult, juvenile and embryonic life stages of listed salmonids in freshwaters of Mount Rainier National Park, Washington (based on park records and an adaptation by Pacific States Marine Fisheries Commission.)**.** Darkened areas indicate the presence of a specific life history stage in freshwater for each listed species. Open areas indicate the presumed absence of a life history stage in freshwater.

		Months											
Species and Distribution in MORA	**Life Stage**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Bull Trout	Adult												
White, West Fork White, Carbon, Mowich, Upper Puyallup	Young-of-Year and Juvenile												
	Eggs												
PS Chinook	Adult												
	Young-of-Year and Juvenile												
	Eggs												

In many aquatic ecosystems, fire is a natural process that has occurred for thousands of years. The effects of fires may be relatively benign where there is adequate connectivity, intact habitat, and a sufficient pool of species. However, the ffects of fire on aquatic systems may be direct and immediate or indirect and sustained over extended periods of time (Gresswell 1999). Perhaps the most significant negative effects occur to native populations that have already declined and become isolated (Gresswell 1999). Evidence suggests that local extirpation of fishes from fire is patchy, and that recolonization occurs rapidly.

Generally, the effects of fire on listed fish species will vary widely based on the proximity of the fire to fish bearing streams, steepness of slopes in burned areas, soil types, seasonal timing of the activity, condition of existing habitat, and relative abundance and extent of distribution of each population. Based on the fire management plan in MORA, the effects may occur in relation to the three different management actions: 1) fire suppression; 2) hazard fuel treatment and; 3) fire use.

During fire use, riparian vegetation could be burned to the extent that stream temperatures would rise and fish would be affected during catastrophic wildland fire. If such changes in riparian habitat occurred or if extensive fires caused major erosion or ash deposits in streams, it is likely that fish would be affected. As with other park species, however, fish have evolved in response to periodic disturbance by fire and it is reasonable that they would persist under Fire Use. Overall, fires would likely result in long- term beneficial effects to fish by increasing the nature and extent of woody debris in streams and rivers.

DIRECT EFFECTS

1. Water Quality

The expected negative impacts associated with fire suppression activities and effects from wildfire may result in short term changes in water quality including temporary increases in turbidity and sediment levels. Reductions in vegetation due to fire may expose soils and increase the likelihood of mass erosion. Short term negative effects include: the deposition of fine sediment that may significantly degrade spawning habitat and reduce survival of steelhead from egg to emergence (Phillips et al. 1975); sublethal effects from suspended sediments (e.g. elevated blood sugars and cough rates) (Servizi and Martens 1992); physiological stress and reduced growth; loss of intergravel cover for fish from increased sediment levels (Spence et al. 1996); avoidance of suspended sediments by juvenile salmonids (Bisson and Bilby 1982; Servizi and Martens 1992); and elevated turbidity levels that can reduce the ability of salmonids to detect prey and may cause gill damage (Sigler 1980; Lloyd et al. 1987). Moderate turbidity levels (11 to 49 NTU's) also may cause juvenile steelhead and coho to leave rearing areas (Sigler et al. 1984). Additionally, short- term pulses of suspended sediment have been shown to influence territorial, gill- flaring, and feeding behavior of salmon under laboratory conditions (Berg and Northcote 1985).

Another effect of fire is elevated water temperatures associated with the reduction in streamside vegetation. In a literature review, Gresswell (1999) reported the following as related to the influence of fire on water temperature: that maximum daily water temperatures increased 3.3 to 10° C in intensively burned sites one year after; maximum daily water temperatures were 5.6° C above temperatures predicted for unburned areas; and, elevated water temperatures may persist for decades.

2. Fire Retardants and Foams (Taken from Hamilton et al. 1998)

Fire retardants and suppressants are used extensively in North America and are often applied in environmentally sensitive areas that may contain threatened fish species. Generally, the relative effects and pathways for contamination of retardants and foams are related to the mechanism used to deliver the chemicals. For instance, fire fighters using pumps to apply foam have more directional control during application when compared to broadscale and less precise application during aerial drops. Pathways for contamination include direct application to a waterway via aerial drops from planes or helicopters. Additionally, there may be accidental discharge into streams by firefighters using hoses and residual foam associated with helicopter bucket drops during refilling from a water source. These effects may be localized or occur throughout an entire stream network.

The risk of toxicological effects of chemicals on salmonids is greatest when chemicals are applied directly to surface waters or reach surface waters by wind drift (Spence et al. 1996). All life history stages (eggs to adults) of listed fish may be affected. Fire- fighting chemicals are toxic to early life history stages of fish. Early life stages of fathead minnow (Pimephales promelas), rainbow trout (Oncorynchus mykiss) and chinook salmon (Oncorhynchus tshawytscha) were examined for acute toxicity to three fire retardants, Phos- Chek D75- F, Fire- Trol GTS- R and Fire- Trol LCG- R and two foams, Phos- Chek WD- 881 and Silv- Ex (Gaikowski et al. 1996a; 1996b). The two foams were 10 times more toxic for rainbow trout and chinook salmon, and 10 to 258 times more toxic for fathead minnow, than the fire retardants tested. The life stage of the exposed salmonids and minnows had a significant impact on the toxicity of the formulation. Eggs and eyed- eggs were almost always more resilient than later life stages, and fry which were actively swimming in search of food were the most sensitive (Gaikowski et al. 1996a; 1996b).

The following was taken directly from Gaikowski et al. (1998) to evaluate acute toxicities on fish species. Laboratory studies of five early life stages of rainbow trout were conducted to determine the acute toxicities of five fire- fighting chemical formulations in standardized soft and hard water. Eyed egg, embryo- larvae, swim- up fry, 60- and 90- day post- hatch juveniles were exposed to three fire retardants (Fire- Trol LCG- R, Fire- Trol GTS- R, and Phos- Chek D75- F), and two fire- suppressant foams (Phos- Chek WD- 881 and Silv- Ex). Swim- up fry of rainbow trout were generally the most sensitive life stage, whereas the eyed- egg life stage was the least sensitive. Toxicity of fire- fighting formulations was greater in hard water than soft water for all life stages tested with Fire- Trol GTS- R and Silv- Ex, and 90- day old juveniles tested with Fire- Trol LCG- R. Fire- suppressant foams were more toxic than the fire retardants. The 96- h LC50s were rank ordered from the most toxic to the least toxic formulation as follows: Phos- Chek WD- 881 (11 - 44 mg/L) > Silv- Ex (11 - 78 mg/L) > Phos- Chek D75- F (218 - >3,600 mg/L) > Fire- Trol GTS- R (207 - >6,000 mg/L) > Fire- Trol LCG- R (872 - >10,000 mg/L); (ranges are the lowest and highest 96- h LC50 calculated for each formulation).

3. Direct Mortality to Salmonids and Macroinvertebrates

More intense and severe fires may result in direct mortality to fish and their prey items.

4. Removal of water from streams with listed fish species

The removal of water from streams with listed fish may result in direct mortality although the extent of take is likely to be negligible. Water is typically taken from lakes and ponds via buckets suspended from helicopters in areas with five feet of water or greater. Streams and large rivers are often too shallow or difficult to access using this technique. No take of bull trout is expected during bucket drops due to their affinity to the stream bottom. Additionally, water removal may occur during withdrawals via pumping 3/32 inch screen) from pools in streams and rivers. Check dams may be used to facilitate pumping of water in areas with at least three feet of water. The dewatering or damming may result in take of listed fish.

INDIRECT EFFECTS

Indirect effects are defined as those that are caused by the proposed action at a later time, but still are reasonably certain to occur (50 C.F.R 402.02). Indirect effects may occur outside the area directly affected by the action. Indirect effects may include the effects of other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action. Indirect physical effects include hydrologic change, changes in channel morphology, increased sedimentation, changes in water yield, and increases in water temperature (Gresswell 1999).

1. Removal of Riparian Vegetation and Riparian Impacts
As part of hazard fuel reduction, vegetation will be removed around structures and developed areas in MORA over a 5- year period. The indirect effects associated with the removal of vegetation from structures located in riparian areas are expected to be localized and minimal. Riparian vegetation links terrestrial and aquatic ecosystems, influences channel processes, contributes organic debris to streams, stabilizes streambanks, and modifies water temperatures (Gregory 1991). Removal of vegetation may result in increased water temperatures that would further degrade already impaired water temperatures in some action areas. Elevated water temperatures may influence numerous attributes of salmonids including physiology, growth and development, life history patterns, disease, and competitive predator- prey interactions (Spence et al. 1996). Loss of vegetation also may reduce allochthonous inputs to the stream. Additionally, the removal of vegetation decreases streambank stability and resistance to erosion.

2. Changes in Channel Morphology
Hydrologic process controls channel morphology, sediment, and movement of woody debris. Erosion may be severe when vegetation and duff have been consumed by fire and there is high precipitation. Mass wasting and channel alteration are greatest in the first 10 years after a fire (Gresswell 1999).

3. Indirect Chemical Effects
The effects of fire on water chemistry may vary substantially. The presence of chemical constituents in smoke and ash may have profound effect on stream chemistry. Immediately after fire, waterways adjacent to burned areas may exhibit peak concentrations of nitrogen and phosphorus (Gresswell 1999). Chemical constituents in streams may remain elevated for years due to loss of vegetation

EXTENT OF ANTICIPATED TAKE OF LISTED FISH SPECIES

The proposed project is likely to adversely affect Puget Sound bull trout, and Puget Sound chinook, (Table 9). Take may be associated with short term sediment inputs, temporary changes in water quality (e.g. turbidity, temperature, and chemical composition), loss of riparian habitat, changes in channel morphology, and direct mortality. Overall, it is extremely difficult to precisely quantify take for listed fish species in relation to the fire management plan. We estimate total bull trout habitat to be 87 linear miles of streams and rivers. The total acreage potentially affected by fire suppression and fire use in the next five years is 2682 acres, approximately 1.14% of the total park acreage. From 1930- 2003, a total of 12 fires (>5 acres) occurred in drainages with bull trout (Table X1). We conclude that take of bull trout or Chinook could occur within park habitat and potentially affecting areas up to two miles downstream (e.g., impacts from landslides) from fire greater than five acres in size. Due to the small number of these fires that occur, we conclude that take of listed fish species would be minimal.
This analysis also includes take relative to retardant. MORA does not request take coverage for errant retardant and foam drops.

Table 9. Summary of the effects of fire management operations on aquatic habitats and listed species when work occurs adjacent to or in stream and river channels with listed salmonids (LAA=Likely to adversely affect; NLAA= Not likely to adversely affect)

Action	Bull Trout	PS Chinook
Fire Suppression	LAA	LAA
Hazard Fuel Treatment	NLAA	NLAA
Fire Use	LAA	LAA

CUMULATIVE EFFECTS ANALYSIS

Cumulative effects are defined as “those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation” (50 C.F.R 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Future federal actions related to hydroelectric systems, hatcheries, fisheries, and land management activities will be evaluated through separate Section 7 consultations. MORA assumes that future private and state actions will occur at similar intensities as in recent years.

State and private logging adjacent to the park boundary will likely continue to impact NPS administered threatened and endangered species habitat in the future. State fire management practices have the potential to impact park resources through noise disturbance, smoke effects, or fires escaping into the park.

Page 93: Insert the following map above the heading: Alternatives 1- 5: Impacts on Rare, Threatened or Endangered Fish. . .”

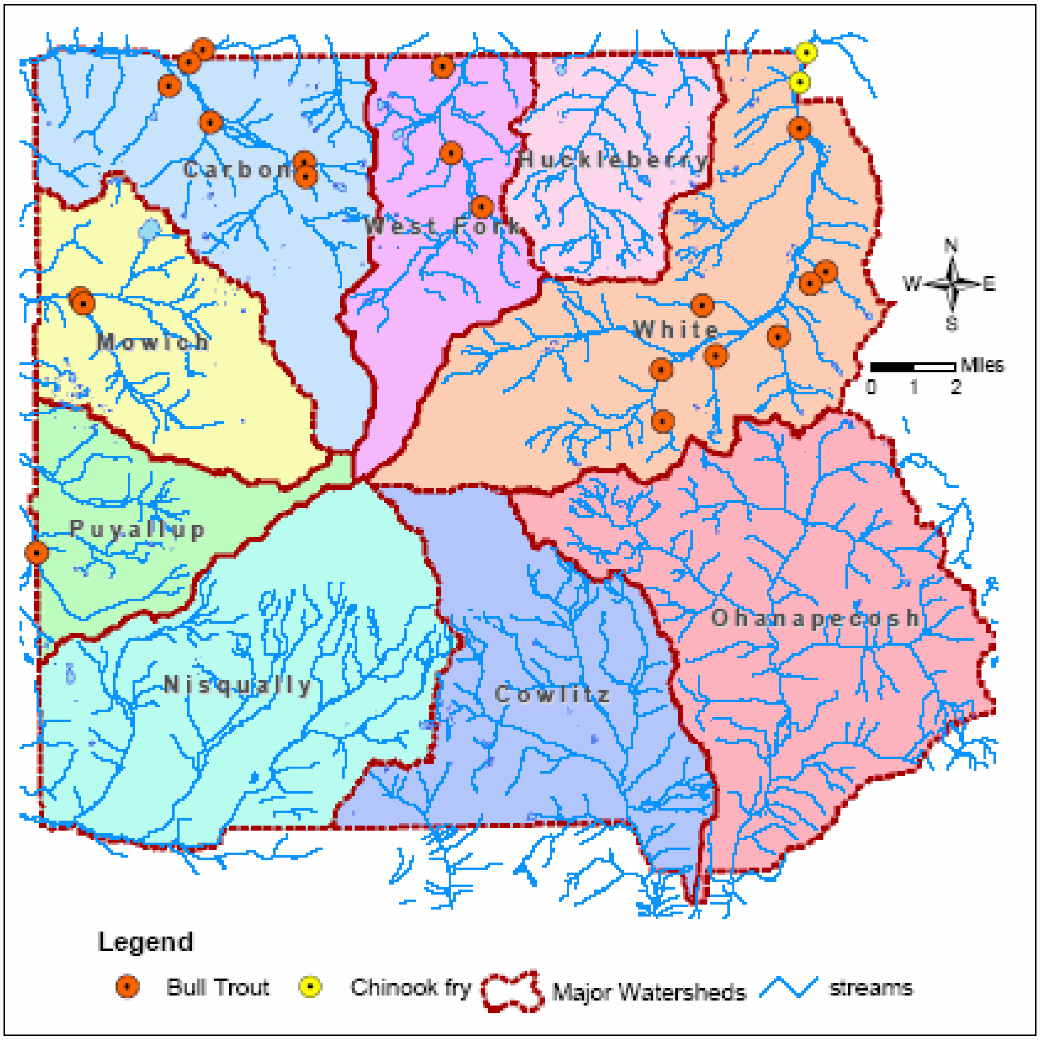


Figure 5. Watersheds with Bull Trout and Chinook Detections.

Page 131: Insert the following Appendix 3 after Appendix 2:

Appendix 3
Current Federally Approved Fire Suppression Retardants and Foams

The following are specific foams and retardants known to be used in fire suppression (taken directly from Hamilton *et al.* 1998).

Phos Chek (G75- F; Phos- Chek D75- F, Phos- Chek WD- 881; Phos- Chek 259F): Phos- Chek G75- F is a proprietary formulation composed of monoammonium phosphate and ammonium sulfate, fugitive coloring agent, and small amounts of gum- thickener, bactericide, and corrosion inhibitor (National Wildfire Coordinating Group, Fire Equipment Working Team 1991). Phos- Chek is typically applied from helicopter bucket or ground tanker in advance of a fire; other retardants with higher viscosity are applied from fixed- wing aircraft. The ammonium salts retard fire by chemically combining with cellulose as fuels are heated, as well as through evaporative cooling of the fuels. Phos- Chek is supplied by the manufacturer as a powder, which is mixed with water to the desired concentration before application.

Phos- Chek D75- F is a proprietary mixture of ammonium sulfate, ammonium phosphate, guar gum thickener, corrosion inhibitor, and orange coloring agent (F=fugitive coloring agent, i.e., color disappears in 2 to 3 days after exposure to sun light) (Monsanto, Ontario, CA). It functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos- Chef D75- F is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.2 pounds per gallon to produce 1.069 gallons of slurry, which is equivalent to 143.8 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Phos- Chek WD- 881 is a proprietary mixture of anionic surfactants, foam stabilizers, and solvents including hexylene glycol (Monsanto, Ontario, CA). It functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Phos- Chek WD- 881 is usually applied by ground operated units mounted on trunks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon per 100 gallon, which is then highly aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Phos- Chek 259F is a proprietary mixture of diammonium phosphate, guar gum thickener, other additives, and reddish coloring agent to mark aerial drop sites (Monsanto Company, Ontario, CA). The Material Safety Data Sheet states ammonia and phosphoric acid (when heated to approximately 200°F [93°C]) are hazardous decomposition products. Phos- Chek 259F functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Phos- Chek 259F is applied by aerial tanker. It is supplied by the manufacturer as a powder, and is prepared for field use by mixing 1.14 pounds per 1 gallon of water to produce a slurry, which is equivalent to 136.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

<u>Silv- Ex.:</u> Silv- Ex concentrate is a proprietary mixture of sodium and ammonium salts of fatty alcohol ether sulfates, higher alcohols, and water, as well as butyl carbitol and ethyl alcohol (Ansul, Incorporated 1994). It functions as a surfactant (i.e. detergent), allowing water to penetrate and expand over the surface of fuels to both cool and smother the fire. Silv- Ex, like other Class A foams, is applied operationally either from ground tankers or helicopters. Silv- Ex is supplied by the manufacturer as a liquid concentrate, which is mixed with water to the desired concentration before application.

<u>Fire- Trol (GTS- R; LCA- F; LCM- R; FireFoam 103B; FireFoam 104)</u>: Fire- Trol GTS- R is a proprietary mixture of ammonium sulfate, diammonium phosphate, guar gum thickener, spoilage inhibitor, corrosion inhibitor, and iron oxide as a coloring agent to mark aerial drop sites (Chemonics, Inc., Phoenix, AZ). It functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount *r* unit surface area. Fire- Trol GTS- R is usually applied by aerial tanker. It is supplied by the manufacturer as a powder concentrate, and is prepared for field use by mixing 1.66 pounds per gallon to produce 1.1 gallons of slurry, which is equivalent to 198.93 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol LCA- F is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and orange coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire- Trol LCA- F functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire- Trol LCA- F is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 5 gallons of water to produce a slurry, which is equivalent to 287.6 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol LCM- R is a proprietary mixture of ammonium polyphosphate, attapulgite clay thickener, corrosion inhibitor, and red coloring agent to mark aerial drop sites (Chemonics, Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states ammonia and sodium cyanide are hazardous decomposition products. Fire- Trol LCM- R functions as a long- term fire retardant that forms a combustion barrier after the evaporation of the water carrier. Formulation effectiveness depends on the amount of salt applied per unit surface area. Fire- Trol LCM- R is applied by aerial tanker. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 4.25 gallons of water to produce a slurry, which is equivalent to 344 gram/liter. Retardant use ranges from 0.41 liter/square meter (1 gallon/100 square feet) for fires in annual and perennial grasses or tundra to >2.44 liter/square meter (>6 gallon/100 square feet) for fires in mixed chaparral or heavy slash.

Fire- Trol FireFoam 103B is a proprietary mixture of anionic surfactants, foam stabilizers, and inhibiting agent (hexylene glycol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire- Trol FireFoam 103B functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire- Trol FireFoam 103B is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Fire- Trol FireFoam 104 is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (hexylene glycol, n- butyl alcohol, and butanol) (Chemonics Industries, Inc., Phoenix, AZ). The Material Safety Data Sheet states that there are no hazardous decomposition products. Fire- Trol FireFoam 104 functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. These formulations also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire- Trol FireFoam 104 is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

<u>Fire Quench:</u> Fire Quench is a proprietary mixture of anionic surfactants, foam stabilizers, inhibitors, and solvents (Texas Department of Corrections, Sugarland, TX). The Material Safety Data Sheet states that some oxides of sulfur are hazardous decomposition products. Fire Quench functions as a short- term fire suppressant that enhances the ability of water to penetrate fuel

sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. Fire Quench is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

ForExpan S: ForExpan S is a proprietary mixture of ammonium deceth 2,2 sulfate, 2(2-butoxyethoxy) ethanol, ethanol, sodium myriteth 3 sulfate, myriteth- 3, and 1- dodecanol (Angus FireArmourLtd., Toronto, Ontario). The Material Safety Data Sheet states that some oxides of sulfur and nitrogen are hazardous decomposition products. ForExpan S functions as a short-term fire suppressant that enhances the ability of water to penetrate fuel sources, thus reducing the ability of the fuel to ignite. This formulation also act by slowing the evaporation of water, increasing water retention on fuel sources, and reducing air contact with the fuel by insulating the fuel source from the heat of the fire. ForExpan S is usually applied by ground operated units mounted on trucks or portable trailers. It is supplied by the manufacturer as a liquid concentrate, and is prepared for field use by mixing 1 gallon of concentrate per 100 gallons of water, which is then aerated to produce huge volumes of foam. Mixtures can range from 0.1 to 1% concentrate, which is equivalent to 1 to 10 gram/liter.

Page 131: Insert the following Appendix 4 after Appendix 3 (above)

Appendix 4
ESSENTIAL FISH HABITAT

MORA requests Essential Fish Habitat (EFH) consultation, Puget Sound chinook salmon (Oncorhynchus tshawytscha) that inhabit waterways in the park. This EFH consultation is pursuant to the Magnuson- Stevens Fishery Management and Conservation Act. Salmon EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to chinook, Washington, Oregon, Idaho, and California, except above the impassable barriers. Salmon EFH also excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years).

Action Agency
The National Park Service, Mount Rainier National Park.

Essential Fish Habitat Background
The Magnuson- Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104- 267), requires federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. The objective of this assessment is to describe potential adverse effects to designated EFH for federally- managed fisheries species within the proposed action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action. EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (MSA §3). The Pacific Fisheries Management Council (PFMC) has designated EFH for federally- managed Pacific salmon fisheries (PFMC 1999).

The requirements of section 305(b) of the MSA (16 U.S.C. 1855(b)) provide that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NOAA Fisheries shall provide conservation recommendations for any federal or state activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

Description of Proposed Actions
The BA addresses the effects of fire management activities on listed fish species in MORA. A description of the actions may be found in the Biological Assessment. The proposed actions may adversely affect designated EFH for Pacific salmon (See Section on Direct and Indirect Effects in Biological Assessment).

Potential Adverse Effects Associated with Programmatic Actions
As described in detail in the ESA portion of this consultation, the proposed activities will result in detrimental, short- term, and adverse effects to Essential Fish Habitat for Pacific salmonids.

EFH Conservation Measures
Conservation measures discussed in the Biological Assessment will be implemented to minimize impacts to EFH.

Conclusion
The proposed actions outlined in the BA may result in adverse effects to EFH to Pacific Salmonids. The conservation measures outlined in the Biological Assessment are designed to minimize or negate impacts to EFH.

CONSERVATION MEASURES: TERRESTRIAL

- A resource advisor will be assigned to fires as needed to minimize impacts to threatened and endangered species.
- Information regarding location of sensitive wildlife resources will be provided to the Incident Commander for consideration in planning fire activities.
- As much as possible, disturbance to known owl nests will be minimized by following USFWS guidance on disturbance distance thresholds during fire suppression and fire use operations.
- When possible, crews will hike into and out from a fire rather than flying.
- When possible, handtools will be used rather than power equipment.
- When possible, helicopters will fly from nearby airports and helibases, rather than staging within threatened and endangered species habitat *in* the park.
- When possible, helicopter operations in the park will be staged at Kautz Creek or at sites > 4500 rather than other forested areas of the park.
- When possible, helicopters will fly higher than 0.25 mile over threatened and endangered species habitat.
- Removal of mature coniferous trees will be minimized.
- Garbage and food items will be handled appropriately by firefighters to minimize attraction of corvids.
- Flights and other noise producing activities will be limited within 2 hours of sunrise and sunset, when possible.

Whenever possible, planned activities (such as hazard fuel reduction) within suitable habitat will be conducted outside of the breeding seasons for listed bird species (or as late as possible in the breeding season) unless site- specific protocol surveys conducted prior to fire management activities document no use of the area by the species.

CONSERVATION MEASURES: AQUATIC RESOURCES

In addition to Appendix 1 in the Fire Management Plan EA, the following Best Management Practices (BMP's) are designed to minimize impacts to listed fish species and aquatic habitats:

Fire Suppression (Retardants, Foams, and Water Withdrawals):

- A resource advisor will be consulted on fires greater than 0.25 acres regarding the presence of federally listed fish species.
- Avoid using retardants, foams, and surfactants near lakes or flowing streams (e.g. not to be applied within 300 feet of waterway with listed fish species).
- Avoid water withdrawals from fish bearing streams whenever possible.
- Direct the spraying of foam away from waterways whenever possible.
- Avoid backflushing pumps and charged hoses into lakes or flowing streams. Utilize check bleeder valves whenever possible. Direct flow away from water sources when draining pumps or charged hoses.
- Stream profile will be restored in areas where check dams were constructed.
- If tactically possible, use of foam or retardant will be limited to upslope areas. Helicopter bucket dipping from streams in or adjacent to spawning should be avoided, including inlet streams to lakes.
- Helicopter bucket dipping should be conducted only after chemical injection systems have been removed, disconnected or rinsed clean if foam is not needed for that fire suppression activity. If foam application is necessary, crews will consider whether to use a remote dip tank away from water sources.

- Pump intakes placed in fish bearing lakes or streams will be covered with 1/8 inch or less screened material.
- Avoid the use of riparian areas (300 feet from flowing water) as landing areas and refueling areas for helicopter operations whenever possible.
- Locate fire camps away from riparian areas whenever possible.

Sediment Control:
- Limit fire lines to three feet in width, construct erosion control structures, and rehabilitate them to minimize sediment delivery to streams whenever possible.
- To protect fisheries resources, stream disturbing activities shall generally occur during the dry season from July 15 through August 15.
- Erosion control methods shall be used to prevent silt- laden water from entering the stream whenever deemed necessary. On larger fires, Federal Burned Area Emergency Rehabilitation (BAER) Standards may be utilized.
- Wastewater from project activities and water removed from within the work area will be routed to an area landward of the ordinary high water line to allow for removal of fine sediment and other contaminants prior to being discharged to the stream. Sediment entering the stream channel may affect spawning gravels, substrate embeddedness, pool frequency/quality and development of large pools. Chemical contaminants may have a negative biological affect on many forms of aquatic life including salmonids and macroinvertebrates.

Water Quality:
- In the event of a hazardous fuel spill, MORA will adhere to the Spill Prevention Control and Countermeasures Plan. On larger pumping and helicopter operations, minimal spill prevention kits will be available onsite. The desired outcome is to control, absorb, or contain the spill for clean- up and disposal.
- Any machinery maintenance involving potential contaminants (fuel, oil, hydraulic fluid, etc) will occur outside the riparian area whenever possible. This measure is designed to avoid/minimize the introduction of chemical contaminants associated with machinery.
- Prior to starting work each day, all machinery will be inspected for leaks (fuel, oil, hydraulic fluid, etc) and all necessary repairs will be made before the commencement of work. This measure is designed to avoid/minimize the introduction of chemical contaminants associated with machinery used in project implementation.
- Minimize the amount of time that heavy equipment is in riparian areas or stream channels.
- Removal of mature coniferous and deciduous trees within 300 ft. of a wetland, stream, or river will be minimized. The crew will directionally fall trees towards the waterway.

Helicopter landings in stream and river channels will occur outside the active channel whenever possible