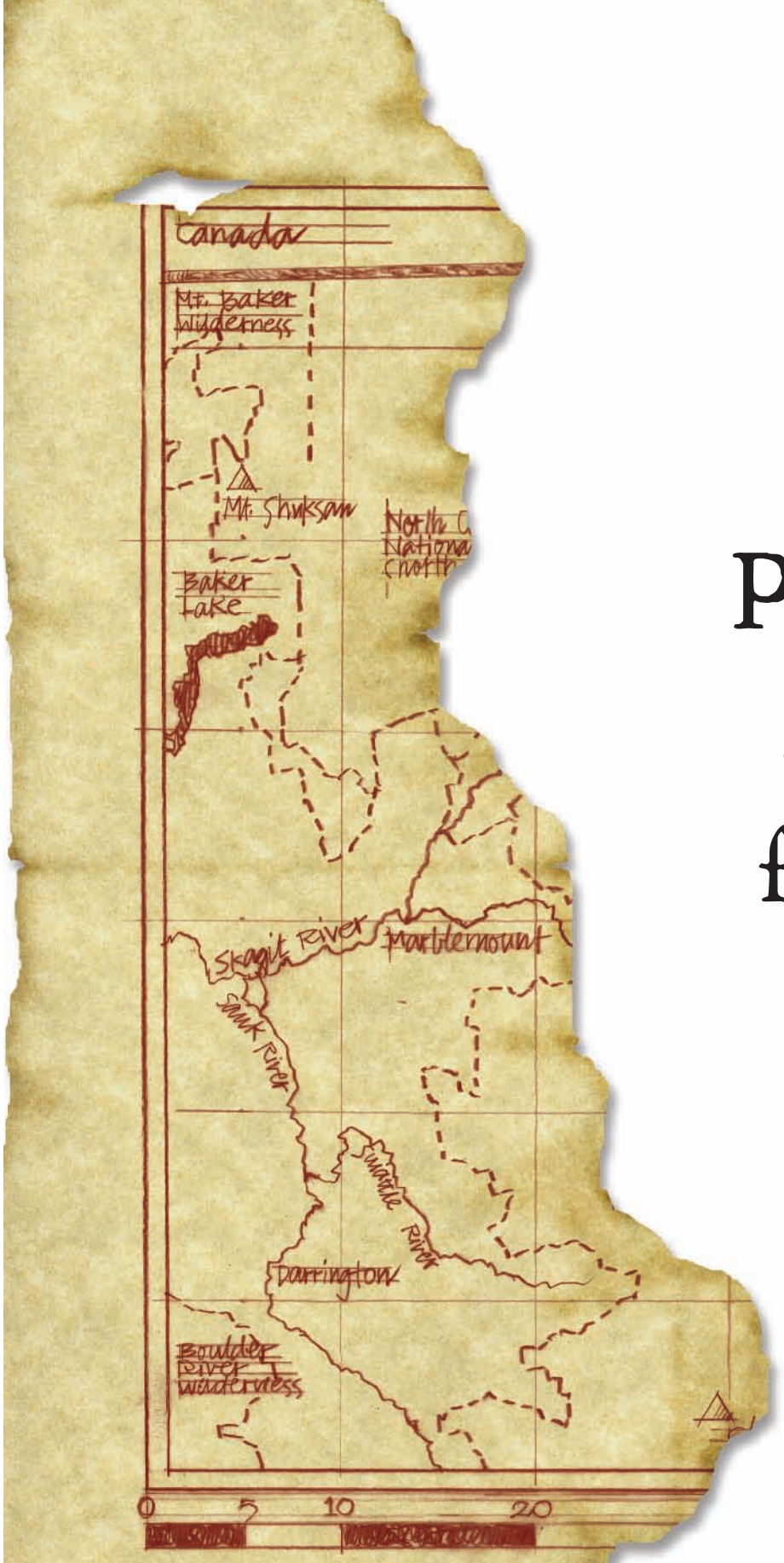


Purpose of and Need for Action

Welcome

You are now in the "Purpose of and Need for Action" chapter. Here are the topics you can read about.

INTRODUCTION

This "Purpose of and Need for Action" chapter describes the reasons why the National Park Service (NPS) is taking action at this time to evaluate a range of alternatives and management actions for the mountain lakes fishery in the North Cascades National Park Service Complex (the North Cascades Complex). This *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS) presents three action alternatives for managing the mountain lakes fishery and assesses the impacts that could result from continuation of the current management framework (the no-action alternative) or implementation of any of the three action alternatives. Upon conclusion of the plan/EIS and decision-making process, one of the four alternatives would become the "Mountain Lakes Fishery Management Plan" and guide future actions for a period of 15 years.

The National Park Service (NPS) is the lead agency for development of this plan/EIS, and the Washington Department of Fish and Wildlife (WDFW) is a cooperating agency.

This plan/EIS is mostly programmatic in nature, which means it provides a framework for taking a range of management actions. Some actions would require additional, more site-specific analyses before they could be implemented. If additional analyses were required, environmental compliance, including an opportunity for public comment, would be completed.

PURPOSE OF AND NEED FOR ACTION

The "Purpose of the Plan" section of this chapter explains what the plan/EIS is intended to accomplish. The "Need for Action" section explains why action is necessary at this time. Brief summaries of both purpose and need are presented here, but a great deal more information is available in the "Background" section of this chapter.

PURPOSE OF THE PLAN

The purpose of this plan/EIS is to guide actions by the NPS and WDFW in order to

conserve native biological integrity

provide a spectrum of recreational opportunities and visitor experiences, including sport fishing

resolve the long-standing debate and conflicts over fish stocking in the naturally fishless mountain lakes in North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area (which together make up the three NPS administrative units known as "North Cascades National Park Service Complex" or "the North Cascades Complex").

NEED FOR ACTION

In most NPS units, natural resources (including lakes and fish) are managed in accordance with the *Organic Act of 1916* and *NPS Management Policies*, which allow sport fishing unless it is specifically prohibited (NPS 2001a, 4.4.3), but prohibit stocking in most NPS waters (see the section in this chapter titled "Planning Documents for North Cascades National Park Service Complex"). In the North Cascades Complex, fish have historically been managed by a combination of agencies and user groups. This is partly because the enabling legislation for the North Cascades Complex does not define the angling activities that would be allowed within its boundaries, and partly because the area has a history of fish management by the state of Washington and sport fishing groups. This history of fish management pre-dates the 1968 establishment of the North Cascades Complex by many years (see "History of Fish Management in North Cascades Mountain Lakes" in the "Background" section of this chapter for more information on the North Cascades Complex enabling legislation).

Biological integrity refers to "the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region" (Karr and Dudley 1981).

The lakes that are the focus of this plan/EIS are the 91 mountain lakes in the North Cascades Complex that were once naturally fishless, evolving over hundreds or thousands of years without any fish, but have had some history of fish stocking since the late 1800s.

Because of the differences in policies and missions between the WDFW and the NPS, the two agencies drafted a Memorandum of Understanding in 1985, followed by a Supplemental Agreement in 1988 (see appendix A) that established a mutually agreed to list of lakes in North Cascades National Park that the WDFW would stock with fish as part of its fish management program while further studies were being done. A long-term research study was then initiated to determine how continued stocking practices would affect native biota in mountain lakes.

Biota: The combined plant and animal life of a particular region.

Before this research could be completed, the NPS was challenged in court by the North Cascades Conservation Council on several issues relating to management of the North Cascades Complex. As a result, the NPS entered into a 1991 Consent Decree (see appendix A), wherein the NPS agreed to complete its research and then "conduct a NEPA [*National Environmental Policy Act*] review of the fish stocking of naturally fish-free lakes." The research was completed in July 2002 (Liss et al. 2002) by a team that included scientists from the U.S. Geological Survey (USGS) - Biological Resources Division and Oregon State University (OSU). The research was completed in three phases; full reports of the findings for each of these phases are available on the NPS website at http://www.nps.gov/noca/pphtml/relatedlinks.html. This plan/EIS was initiated

shortly after the research was completed and is the document required in the 1991 Consent Decree.

OBJECTIVES IN TAKING ACTION

Objectives are more specific statements of purpose that support the goals an alternative must meet, to a large degree, for this plan/EIS to be considered a success. Meeting objectives to a large degree is part of what makes an alternative "reasonable." Objectives also support the purpose of this plan/EIS as stated in the "Purpose of the Plan" section above and help to resolve the need for action.

Objectives for fishery management are grounded in the North Cascades Complex's purpose, significance, and mission goals and are compatible with direction and guidance provided by both the *General Management Plan* (NPS 1988b) and *Strategic Plan* (NPS 2000a) for the North Cascades Complex (see the section titled "Planning Documents for North Cascades National Park Service Complex"). This plan/EIS must also be consistent with the following mission statement for the North Cascades Complex, which is derived from its enabling legislation (PL 90-544):

> As a unit of the National Park Service, the North Cascades National Park Service Complex is dedicated to conserving, unimpaired, the natural and cultural resources and values of North Cascades National Park, Ross Lake National Recreation Area and Lake Chelan National Recreation Area for the enjoyment, education, and inspiration of this and future generations. We also share responsibility for advancing a great variety of national and international programs designed to extend the benefits of natural and cultural resource conservation and outdoor recreation.

The following objectives were developed for this plan/EIS:

> Obtain support from interested parties and groups to implement a new management plan for mountain lakes within the North Cascades Complex should the governing agencies decide a new plan is needed.
>
> Advance the protection and rehabilitation of native biological integrity by maintaining native species abundance, viability, and sustainability.
>
> Provide a spectrum of recreational opportunities, including sport fishing, while minimizing impacts to the biological integrity of natural mountain lakes.
>
> Apply science and research in decision-making at multiple spatial scales that include landscape, watershed, lake cluster, and individual lakes.
>
> Provide to the public and interested parties full and open access to available information.

PROJECT SITE LOCATION

State Route 20 follows the Skagit River and Skagit River Hydroelectric Project for much of its way through the North Cascades Complex.

The 684,000-acre North Cascades Complex is located in the northwest part of Washington State, with its northern boundary forming the international border with Canada (see "Figure 1: Vicinity Map"). The North Cascades Complex is made up of three NPS administrative units: North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area. The North Cascades Complex lies within the Washington counties of Whatcom, Skagit, and Chelan. The only drivable access is by way of scenic Washington State Route 20, commonly referred to as the North Cascades Highway, which bisects the North Cascades Complex as it makes its way through Ross Lake National Recreation Area, the most accessible part of the North Cascades Complex. State Route 20 intersects with Interstate 5 approximately 70 miles to the west and with State Route 97 approximately 85 miles to the east. Three reservoirs within the Ross Lake National Recreation Area (Ross Lake, Diablo Lake, and Gorge Lake) serve as water gateways to the remote areas within the North Cascades Complex.

As shown on figure 1, many other public lands surround the North Cascades Complex. The Okanogan National Forest to the east includes two wilderness areas: the Pasayten Wilderness Area that runs along the eastern boundary of Ross Lake National Recreation Area and the Lake Chelan-Sawtooth Wilderness Area that is adjacent to the eastern boundary of the Lake Chelan National Recreation Area.

The Glacier Peak Wilderness Area adjoins most of the southern boundary of Lake Chelan National Recreation Area and the South Unit of North Cascades National Park. The Glacier Peak Wilderness Area encompasses parts of the Wenatchee National Forest and Mount Baker-Snoqualmie National Forest.

The Mount Baker-Snoqualmie National Forest extends along the western boundary of the North Cascades Complex and includes two other wilderness areas: the Noisy-Diobsud Wilderness (situated between North Cascades National Park and Baker Lake) and the Mount Baker Wilderness farther north. These two wilderness areas are adjacent to parts of the North Unit of North Cascades National Park. Fish stocking has occurred in the lakes within these National Forest System boundaries since the late 1800s.

The geographic study area for this plan/EIS includes all three administrative units of the North Cascades Complex. However, the focus of this document is the 91 naturally formed mountain lakes in the North Cascades Complex that have a history of fish presence. As noted below in the section titled "History of Fish Management in North Cascades Mountain Lakes," the North Cascades Complex comprises a total of 245 mountain lakes. At least 154 of these lakes have always been, and would continue to be, fishless regardless of the alternative selected. Because no changes in this policy are anticipated for any of the 154 lakes, and

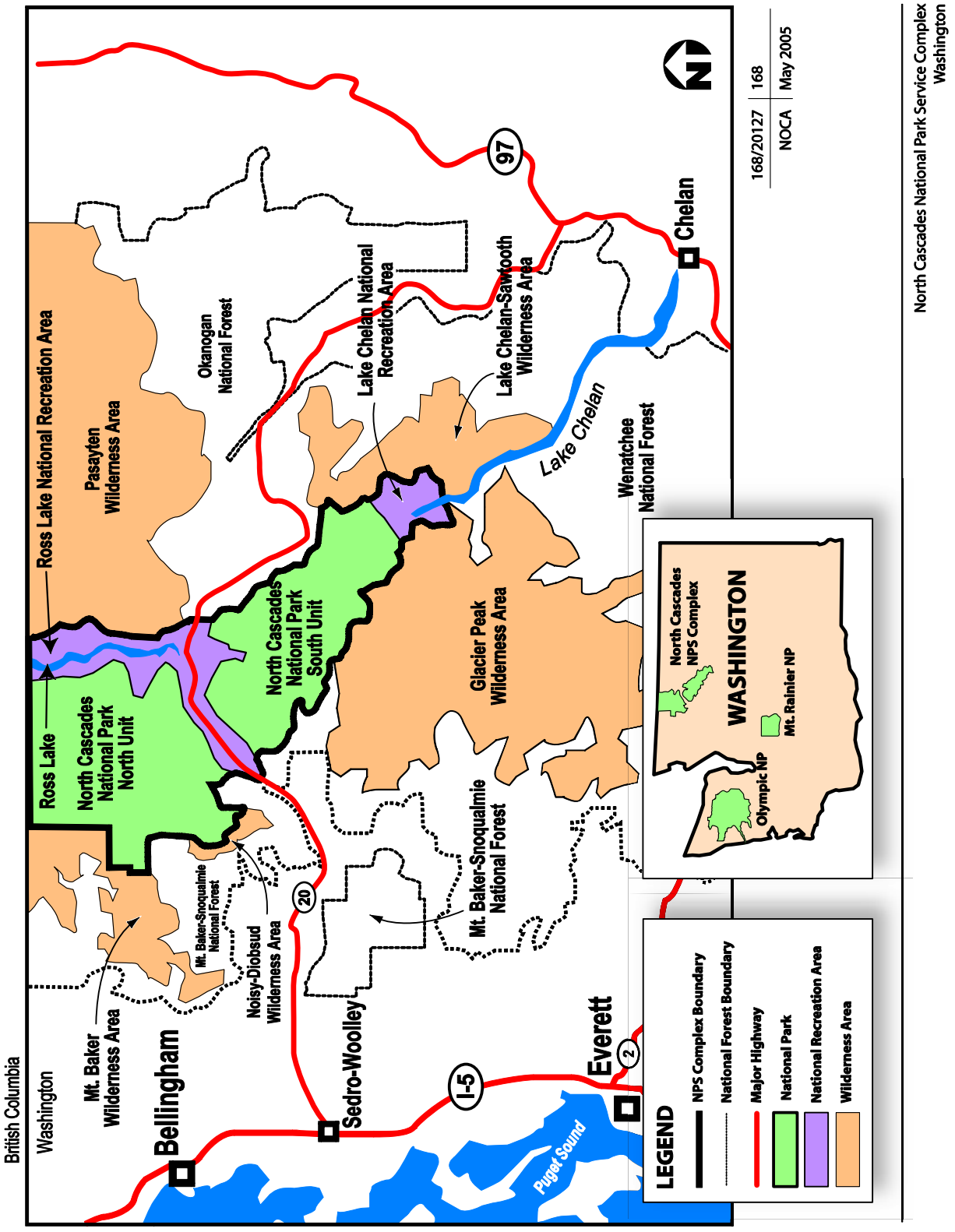


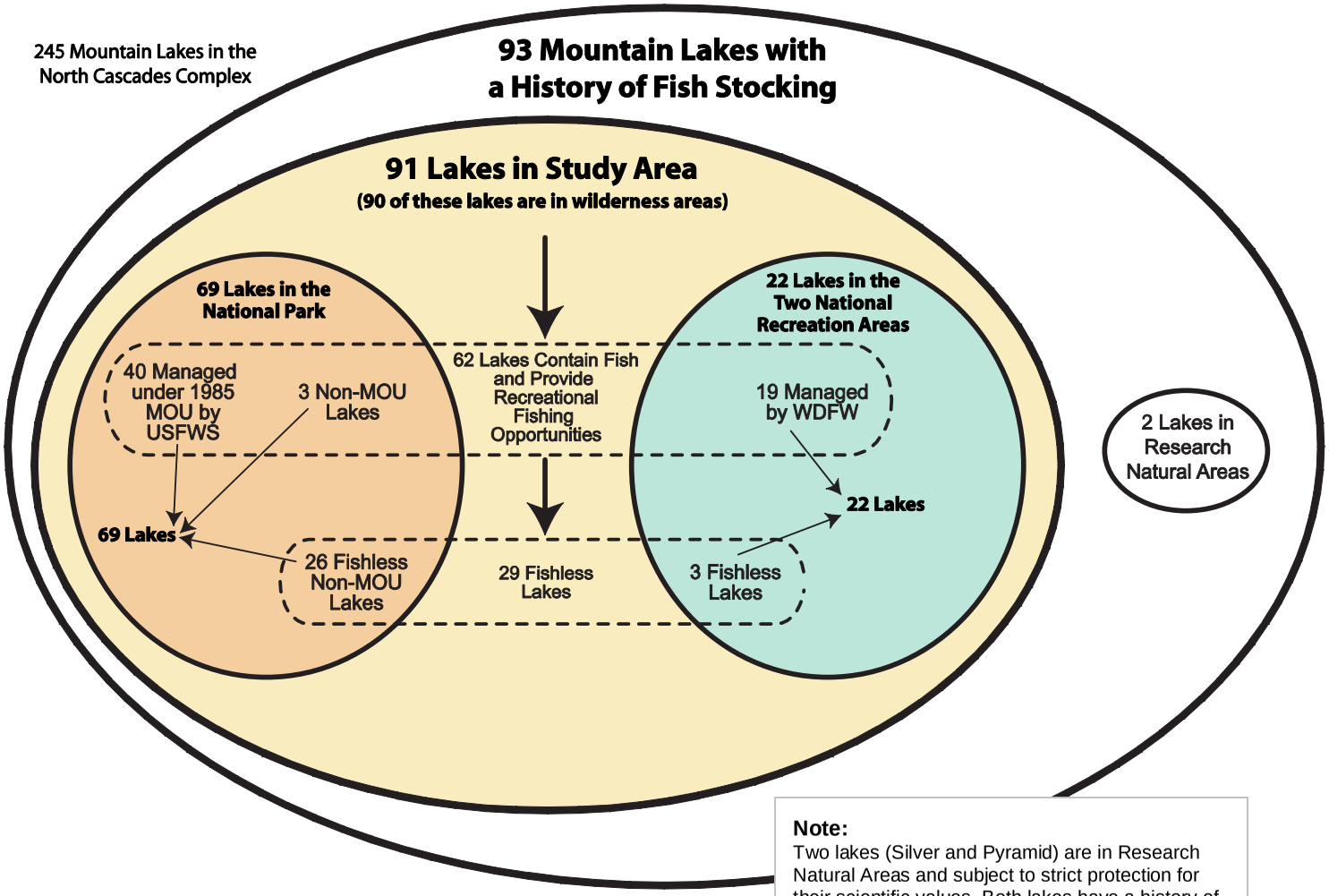
FIGURE 1: VICINITY MAP

because they have never been part of the managed fishery at the North Cascades Complex, they are not addressed further in this document. Reservoirs, streams, and their associated beaver ponds are also not included in this plan/EIS.

The 91 lakes include all naturally fishless mountain lakes that have documented stocking records, as well as those where no stocking records exist but where observations or harvest of fish have been documented. Documented stocking records are taken from the database maintained by Trail Blazers, Inc., a volunteer group founded in 1933 with a focus on fish stocking and surveying activities (see the section in this chapter titled "User Groups' Involvement in North Cascades Complex Fishery Management"). The 91 lakes analyzed in this plan/EIS include those stocked with fish that are now reproducing and self-sustaining, lakes that are stocked repeatedly because they contain nonreproducing fish, and lakes that have been stocked in the past, but are now fishless.

"Map 1" (contained in the envelope that accompanied this plan/EIS) shows the locations of the 91 lakes: 69 lakes are in the national park, 7 are in Ross Lake National Recreation Area, and 15 are in Lake Chelan National Recreation Area. Of the 69 lakes inside the national park boundary, the WDFW manages 40 under the terms of the 1985 Memorandum of Understanding with the NPS. The WDFW also manages 19 lakes in the national recreation areas—3 of those lakes are fishless and not actively managed. The remaining 29 lakes are not actively managed by either the WDFW or NPS. Of the 91 lakes, 62 currently have fish, and 29 are fishless (see figure 2).

FIGURE 2: MOUNTAIN LAKES IN THE NORTH CASCADES COMPLEX WITH A HISTORY OF FISH STOCKING



Note:
Two lakes (Silver and Pyramid) are in Research Natural Areas and subject to strict protection for their scientific values. Both lakes have a history of fish presence but are currently fishless. Silver Lake was last stocked in 1961, and 1980 surveys showed no fish remained. Pyramid Lake was last stocked in 1968, and 1999 surveys showed no fish were in the lake.

BACKGROUND

This section is divided into two parts—the administrative background, including the history of fishery management practices in the study area, and a summary of the scientific background, which includes major findings of the research study described above in the "Need for Action" section.

ADMINISTRATIVE BACKGROUND

From the time the United States established title to the Oregon Territory in 1846, until the 1890s, the area encompassing the North Cascades Complex was administered as part of the public domain. During the 1890s, Congress established two large forest reserves that were administered by the General Land Office of the Department of the Interior. Out of these reserves, Congress created Mount Rainier National Park in 1899, and the rest of the land was transferred to the administrative jurisdiction of the U.S. Forest Service, which established five national forests in the area. Over the years, in recognition of the outdoor recreation values of the area, the Mount Baker Recreation Area was established, and almost a million acres of wild and roadless primitive areas were set aside. In 1963 President Kennedy ordered a review of the North Cascades region to determine the highest and best use of the area. The resulting report included a recommendation to establish a national park, which Congress acted on, thus creating the North Cascades Complex in 1968 (Louter 2003).

HISTORY OF FISH MANAGEMENT IN NORTH CASCADES MOUNTAIN LAKES

The North Cascades Complex contains 561 natural water bodies that include lakes, tarns, and ponds. Approximately 245 (44%) of these water bodies are considered mountain lakes because of their elevation, size, and depth. As noted in the "Need for Action" section above, the focus of this plan/EIS is on the 91 mountain lakes that were stocked in the past or are currently stocked but that were once naturally fishless due to the lack of inlets or outlets to streams or the presence of impassable physical barriers (such as cascades) to upstream fish migration.

Fish stocking Thunder Lake in the early years.

Settlers began stocking North Cascades lakes in the late 1800s with exotic (nonnative) fish. By the 20th century, stocking was a routine management practice of the U.S. Forest Service and various counties.

In 1933 the Washington Department of Game (currently the WDFW) assumed responsibility for stocking mountain lakes throughout the state in order to establish and maintain a recreational fishery. The department's involvement grew largely out of the need to prevent haphazard stocking by individuals without expertise in biology. With particular emphasis on systematic assessment of fish

species and stocking rates, the department conducted the first high-lakes fisheries research. Since its creation, many agencies and groups have collaborated to assist in managing the natural resources in the North Cascades Complex. These include state and federal agencies, such as the WDFW, and sport fishing groups such as the Washington State Hi-Lakers and Trail Blazers, Inc. (see the section titled "User Groups' Involvement in North Cascades Complex Fishery Management").

According to Louter (2003):

> The 1960s marked an important turning point for resource management based upon ecological principles in national parks. The Park Service shifted its management direction in response to critics and scientific studies that claimed that the agency had too long managed parks for their scenic facade. Without scientific research to inform management decisions, the Park Service had manipulated nature's paradise—such as killing predators—often with unintended and long-term consequences to the natural systems of parks. The most influential critique of the agency's management of nature was the so-called Leopold Report of 1963. Prepared by the Advisory Board on Wildlife Management in National Parks, and chaired by A. Starker Leopold, son of ecologist Aldo Leopold, the report recommended maintaining, and when possible restoring, "natural park environments to the greatest extent possible." On May 2, 1963, Secretary of the Interior Stewart L. Udall approved the board's recommendations and directed that they become part of Park Service policy.
>
> Although Park Service policies and legislation would further strengthen the agency's commitment to environmental protection, the Leopold Report was its first expression and thus formed the cornerstone of the Park Service's management of North Cascades. Beginning in the late 1960s and early 1970s, the agency focused on ecological research and restoration as the primary elements of the park's resource management program. One of its major efforts was the protection and restoration of the park's fragile alpine ecosystems, but it also turned its attention to the question of fish stocking in the park's high alpine lakes.

Consistent with the recommendations of the Leopold Report, Sequoia Kings Canyon and Yosemite National Parks began phasing out trout stocking in the late 1960s. In 1972 the NPS released its policy that stated, "No artificial stocking of fish species exotic to a park will occur, artificial stocking of fish or eggs may only be employed to reestablish a native species. Naturally barren waters will not be stocked with either native or exotic fish species" (Louter 2003). Limited stocking was continued in these park units until 1991, when an agreement was negotiated with the state to terminate all fish stocking in these parks (Knapp 1996).

When the North Cascades Complex was established in 1968, its enabling legislation did not define the fishing activities that would be allowed within its

boundaries. This has left the *North Cascades Act* open to interpretation. According to Louter (2003),

> The WDFW has noted that the legislation did more than give it the authority to issue hunting and fishing licenses. In earlier versions of the Act, Lake Chelan had been included in the national park. But lobbying from hunters, who did not want to see some prime areas closed off to them, convinced Congress to place the region within a recreation area. Congress also responded to concerns about the state's fishery management program for Lake Chelan with the creation of the recreation area, for it specifically accommodated the fish hatchery programs in the Stehekin River drainage at the headwaters of the lake. The department further believed that because the Act granted it licensing authority for hunting and fishing, it recognized and thus approved of its past management practices in the new park. In short, it authorized the state game department [currently WDFW] to carry on with its fish stocking program (1986 memorandum [see appendix A]).

In addition to the influence of the Leopold report, *NPS Management Policies* (NPS 2001a) prohibit stocking in units of the NPS in order to protect native ecosystems.

To resolve differences in policy and to foster a spirit of cooperation, the NPS and WDFW negotiated a series of agreements beginning in 1979 that allowed stocking to continue in selected lakes in the North Cascades Complex. Currently, the management of mountain lakes is performed under a temporary extension of the 1985 Memorandum of Understanding and 1988 Supplemental Agreement between the two agencies. Both of these documents (see appendix A for copies) were written "to continue cooperative efforts in management of protection and enhancement of the fisheries and wildlife resources of mutual concern." The Memorandum of Understanding provided "Statements of Work" (or directives) for both the NPS and the WDFW. The three main management directives from the Memorandum of Understanding that, in part, pertain to fish management are

> To consult with the Department [WDFW] prior to initiating research projects or implementing plans, programs, or regulations affecting fish and wildlife species distribution, numbers, or public use of fish and wildlife found within areas administered by the Service [NPS].
>
> To practice those forms of management which will benefit fish and wildlife, and their habitats, and to maintain or restore their natural and historic distribution and abundance, consistent with the respective Service [NPS] policies and park objectives.
>
> To permit the harvest of fish and wildlife in accordance with applicable state laws and regulations of the Department [WDFW] in those areas under the jurisdiction of the Service [NPS], which are open to hunting and/or fishing. It is recognized that some park regulations may vary for management purposes.

To be able to continue stocking in light of NPS policies generally prohibiting it, a memorandum from the NPS Director was issued in 1986 (hereinafter referred to as the "policy waiver"). The policy waiver states "fishing is an acceptable recreational activity in the park, provided it is done consistent with *NPS Management Policies* and with provisions of the *General Management Plan*, and other approved plans" (see appendix A). The policy waiver only allowed stocking with fish species that are native to the national park or native to the ecological region. Any species native only to the ecological region were to be restricted so that the species did not become established (that is, reproducing populations) in natural zone waters. The waiver acknowledged long-standing fish-stocking practices and allowed for continued stocking in selected lakes while ecological research was conducted to determine the impacts of fish stocking. The policy waiver allowed fish stocking to continue in 17 lakes and self-sustaining (reproducing) fish populations to continue in 23 lakes in the park.

The 1988 Supplemental Agreement (also known as the Fisheries Management Agreement) formalized these practices in the 40 lakes inside the park for 12 years while planned research on the effects of fish management activities could be completed and assessed. Any additions or deletions to the list of lakes in the park would be made only by mutual agreement, and the two agencies would consult on the number and species of fish, specific lakes, and the schedule for the lakes to be stocked. The agreement added the caveat that research results would be considered in future decisions. A long-term research study was initiated by Oregon State University soon after the 1988 Supplemental Agreement was finalized. The Supplemental Agreement between the NPS and WDFW that permits fish stocking in the national park was reaffirmed in February 2000 and again in July of 2002. The agreement expired in December 2004. Any future agreements between the NPS and WDFW concerning mountain lakes fishery management, including fish stocking in the national park, would depend on the outcome of this plan/EIS process.

The lakes in the two national recreation areas were not part of the 1988 Supplemental Agreement, and the WDFW continued to manage the fisheries in the Ross Lake and Lake Chelan National Recreation Areas according to historical practices. The management program currently in place is further described as "alternative A" in the "Alternatives" chapter. In 1991 the North Cascades Conservation Council challenged the NPS on a number of issues that brought about a Consent Decree between the two parties. In part, the Consent Decree ordered the NPS to "conduct a NEPA [*National Environmental Policy Act*] review of the fish stocking of naturally fish-free lakes within [the park] upon completion of ongoing research." As noted above, this plan/EIS has been prepared, in part, as a result of the Consent Decree. This plan/EIS incorporates the results of the OSU study and other research into the impact analysis of the alternatives for management of the mountain lakes fishery as identified in the "Alternatives" chapter.

Despite the ongoing commitment to provide for a cooperative arrangement with the WDFW, there is still a question of what Congress intended when it established the North Cascades Complex in 1968 (NPS 1968). Throughout the years leading up to 1968, the WDFW and Trail Blazers had stocked 75 lakes in the newly designated North Cascades Complex. During public hearings on the

bill to establish the North Cascades Complex, NPS Director George Hartzog made statements as to whether the NPS intended to continue stocking lakes in the North Cascades Complex. In May 1967 he stated that within the park the NPS would not participate in a 'put and take' program, and would not concur with stocking lakes that historically did not have fish. Then, in July 1968, Director Hartzog stated, "[w]e have an active fish-[stocking] program in every single major park . . . [n]ow, if the stream already has its limit of fish comparable with its food-carrying capacity, then obviously, we do not engage in a put-and-take fishing program. But, we [stock] fish in practically every area that I can think of off the top of my head now, including all of our major parks." Proponents of stocking believed they were promised that stocking would continue after the park was established (Trail Blazers and Hi-Lakers, S. McKean, public scoping comment, 2003, see the "Public Comment Summary Report" for comments received during the public scoping process: http://www.nps.gov/noca/highlakes.htm).

Proponents of stocking also believed that the circumstances surrounding the creation of Lake Chelan National Recreation Area reflected the need to accommodate sport fishing and hunting. Although there is no specific language in the 1968 enabling legislation that permits stocking, proponents claim that continuation of stocking is implied through a reference to cooperative management between the NPS and the state of Washington (Louter 2003: http://nps.gov/noca/whitepaper.htm). While the current *NPS Management Policies* and practices prohibit stocking in areas designated as national parks, it allows stocking in areas designated as national recreation areas that have been historically stocked, provided the impacts of such stocking are acceptable (NPS 2001a, 4.4.3). The NPS recognizes that stocking is a part of the management legacy it inherited from the U.S. Forest Service (Louter 2003). Given these questions, the NPS seeks, as part of this planning effort, clarification from Congress on the NPS authority to enter into future agreements regarding stocking fish in the North Cascades Complex. Depending on the congressional response, the NPS may not be able to implement some alternatives (see the section in the "Alternatives" chapter titled "Implementing the Fishery Management Plan through Congressional Action").

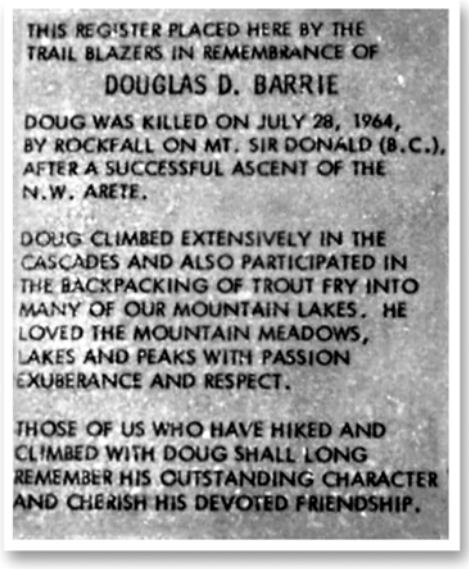
Members of the Trail Blazers stocking Doug's Tarn.

USER GROUPS' INVOLVEMENT IN NORTH CASCADES COMPLEX FISHERY MANAGEMENT

The Washington State Hi-Lakers are a diverse group of anglers "dedicated to the preservation of the high-lake environment and to the maintenance of a quality fishery that is compatible with the high lake environment" (http://groups.yahoo.com/group/hilakers/). The Hi-Lakers work with the WDFW to survey lake conditions and provide data to the department's biologists. The department's biologists, in turn, use this data to assist in managing the lakes of the North Cascades Complex. The Hi-Lakers' fishing reports have also served as

a data source for some of the information used to manage the mountain lakes fishery program in the North Cascades Complex.

Founded in 1933, Trail Blazers, Inc. is a 55-member volunteer group that also works with the WDFW to assist with managing lake fisheries across the state of Washington. The group's focus is on fish stocking and surveying activities. Over the years, the Trail Blazers have been involved in carrying and stocking fry, collecting data, building a lake and stream database, and providing funds for fish-related equipment. The Trail Blazers have stocking and survey records dating as far back as 1934. The Trail Blazers' database has also been useful in compiling much of the stocking and user information used for this plan/EIS. The database provides information on lake and stream identity, water chemistry, water biology, fish observations, fish stocking, and recreational use.



A memorial to a dedicated Trail Blazer.

Another notable group that has influenced the fishery management program is the North Cascades Conservation Council. Formed in 1957, the council's mission is to "to protect and preserve the North Cascades' scenic, scientific, recreational, educational, and wilderness values" (NCCC 2004). The group seeks to keep "government officials, environmental organizations, and the general public informed about issues affecting the Greater North Cascades Ecosystem." The 1991 Consent Decree (described in the "Need for Action" section above) was the result of a 1989 lawsuit brought on behalf of the council in the U.S. District Court, Western District of Washington.

Other important milestone information related to fish stocking in the North Cascades Complex is contained in appendix B.

SUMMARY OF EXISTING RESEARCH

After the 1988 Supplemental Agreement was finalized, the NPS initiated a long-term research effort through Oregon State University to evaluate the effects of fish stocking on native biota in mountain lakes. Later efforts included research by the USGS-Biological Resources Division. A scientific peer review panel of subject matter experts was established to evaluate the OSU research results and to ensure objectivity and scientific merit. Representatives from the NPS and WDFW were invited to attend all review panel meetings. The phase I research report was completed in March 1995 (Liss et al. 1995), the phase II report was completed in April 1999 (Liss et al. 1999), and the third and final phase was completed in July 2002 (Liss et al. 2002). The full text for the three reports is available at
http://www.nps.gov/noca/pphtml/relatedlinks.html.

In addition to the results of these contracted studies, this section summarizes relevant research completed in the region. The way this research was used in formulating the alternative is described in the "Alternatives" chapter in the section titled "Application of Research."

Taxa or taxon: A category of organisms. Any of the groups to which organisms are assigned according to the principles of taxonomy, including species, genus, family, order, class, and phylum.

The OSU studies, and later the USGS studies, were aimed at gaining an understanding of the aquatic ecosystems in mountain lakes in the North Cascades Complex and determining whether, or to what extent, different fishery management practices had altered those ecosystems. First, the researchers studied the lakes—the shape and depth, temperature, surrounding vegetation, location, geology, and other features. They then examined the aquatic life in each lake, including sensitive taxa at each of the "trophic levels" of the aquatic food web. Phytoplankton are very small, usually single-celled floating plants that make up one part of the base of the aquatic food web. Zooplankton are microscopic floating animals that include copepods and cladocerans. Certain types of copepods were found to be particularly affected by fishery management practices and so were researched in more depth. Macroinvertebrates (such as worms, snails, and amphipods) are larger animals than zooplankton in a lake ecosystem and live on the lake bottom. The top predator in fishless lakes in the North Cascades Complex is usually an amphibian and most commonly the long-toed salamander. These vertebrate animals feed on macroinvertebrates and larger zooplankton which, in turn, feed on phytoplankton. (A detailed and informative discussion about how aquatic systems work is presented in "Introduction to Lake Ecology" under the "Aquatic Resources" section in the "Affected Environment" chapter.) Fish can also be top predators, and when they are introduced to a naturally fishless lake, they eat some of the same foods as salamanders, including macroinvertebrates and larger zooplankton. Fish also consume larval salamanders themselves. Long-toed salamanders occur over a large area of the North Cascades Complex, and they are particularly sensitive to changes in fishery management practices; therefore, to understand impacts to the top predator in lake food webs, researchers focused their efforts on the long-toed salamander.

Trophic Levels: The various positions of a food web that are occupied by specific organisms, from the lowest-level organisms, such as phytoplankton, to top predators, such as amphibians or fish.

Lake Characteristics. The phase I (Liss et al. 1995) and phase II (Liss et al. 1999) reports examined different characteristics of mountain lakes. The researchers found that some characteristics were different depending on whether the lake was on the east or west side of the hydrologic divide (Cascade Crest) of the North Cascades Mountains. On the west-facing side, skies were generally cloudier, and the climate was more maritime, with temperatures less extreme in both winter and summer than on the east side of the divide. Conditions on the east side of the crest were consistent with a semiarid continental climate—summers were sunnier and hotter and winters colder than on the west side. A given vegetative type occurred at higher elevations on the east side than the west side; however, the date at which a given lake would normally "ice-out" or thaw in the spring or summer was still earlier for east-side lakes in a particular type of vegetation than those on the west side. Regardless of whether the lake was on the east or west side of the crest, both the date of ice-out and water temperature were related to the elevation of the lake, ice-out occurred later, and the average temperature was lower at lakes with higher elevations.

The water quality of lakes was found to be associated with elevation as well. As elevation decreased, pH, alkalinity, conductivity, and concentrations of total phosphorus and total Kjeldahl nitrogen (TKN) generally increased (there were some exceptions). East-side high-elevation lakes had significantly higher pH and alkalinity levels and concentrations of TKN and phosphorus than west-side high-elevation lakes. In addition to the climatic differences described above, the

authors indicated these changes were associated with increased biomass of terrestrial vegetation, soil depth and maturity, dissolved substances, and nutrient availability (Larson and Lomnicky et al. 1999). The majority of lakes studied in the North Cascades Complex had very low nutrient levels.

Total Kjeldahl Nitrogen (TKN): A measure of ammonia plus all organically derived nitrogen, and in combination with phosphorus concentrations, is a good indicator of a lake's productivity.

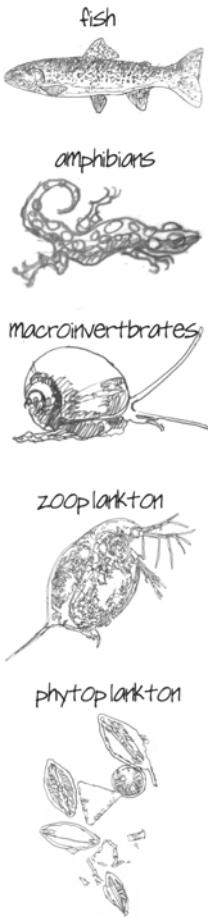
In terms of possible impacts to lake characteristics from fishery management practices, the literature indicates that removal of fish can result in increased water clarity, higher dissolved oxygen concentrations, reduced phosphorus cycling, and decreased ammonia concentrations (Hanson 1990; Sondergaard et al. 1990; Schindler et al. 2001). In contrast to the low-nutrient and relatively undisturbed conditions in mountain lakes analyzed in this plan/EIS, these prior studies were conducted in highly disturbed, nutrient-rich lakes containing high densities of fish. For example, researchers in the Sierra Nevada have demonstrated through modeling and paleolimnological (study of the organic and chemical history of lakes through analysis of bottom sediments) analyses that introduced fish in oligotrophic (nutrient poor) mountain lakes can nearly double the rate of phosphorus regeneration and exploit benthic (lake bottom) sources of phosphorus that would normally not be available to pelagic (open water) communities in the absence of fish. The increased availability of nutrients (such as phosphorus) made possible by stocked fish can stimulate primary productivity and fundamentally alter nutrient cycling (Schindler et al. 2001). The USGS research at the North Cascades Complex did not study the effect of fish on water quality or nutrient cycling. It instead focused on abiotic factors, such as characteristics of the drainage basin and elevation and their effects on water quality (Liss et al. 1995). It is unknown, but considered unlikely, that similar water-quality changes would be associated with the presence of fish or fish removal (Drake and Naiman 2000).

Abiotic Factors: The nonliving physical and chemical aspects of an organism's environment. Abiotic refers to such factors as light, temperature, elevation, and topography.

Phytoplankton. The concentration of phytoplankton in study area lakes generally increased with increasing concentrations of dissolved solids, TKN, total phosphorus (there were exceptions to this), and temperature. The density of phytoplankton generally increased as lake elevation decreased. Species richness was positively correlated with the concentration of total phosphorus that, with the exception of glacially turbid lakes, increased with decreasing elevation. The form in which nitrogen was available to phytoplankton (for example, as either dissolved or TKN) in a lake was an important variable in identifying species differences of the phytoplankton assemblages among lakes.

Phytoplankton surveys performed in mountain lakes in Mount Rainier National Park showed that, for the most part, the species of phytoplankton in individual lakes remained consistent from year to year (Larson and McIntire et al. 1999). Drake and Naiman (2000) compared fossil remains of one type of phytoplankton (diatom) in historically fishless lakes, lakes with stocked fish, and lakes where stocked fish were removed in Mount Rainier and found that in unstocked lakes, the array (variety and abundance of species) of diatoms had not changed significantly in the last 315 years. Changes had occurred in diatom arrays in lakes where fish were introduced and are still present today. For those lakes where the stocked fish had been removed, diatom arrays did not appear to have returned to the arrays similar to those found in fishless lakes. Changes in species arrays, resembling those observed in the Drake and Naiman (2000) study, have also been observed in other studies, such as Douglas et al. (1994). Several studies have

shown that removal of fish from lakes can result in decreased total numbers of phytoplankton (Hanson 1990; Sondergaard et al. 1990). It is difficult to quantify fish impact on nutrient cycling, especially in oligotrophic lentic (still or slow-moving water) systems, and the magnitude and variation of impact has not been fully explored (Schindler et al. 2001).



Zooplankton. Zooplankton include a wide variety of organisms such as rotifers and crustacean zooplankton. Rotifers are widely distributed in the lakes of the North Cascades Complex and may be the dominant zooplankton under certain conditions; however, they are small and seldom a significant portion of the diet of stocked fish in mountain lakes (Dawidowicz and Gliwicz 1983). The crustacean zooplankton community includes cladocerans and copepods. In the studies performed by Oregon State University and the U.S. Geological Survey (Liss et al. 2002), analysis of stomach contents indicated that salamanders primarily consumed cladoceran zooplankton (*Daphnia rosea*, in particular), and fish preferred large copepods of the genus *Diaptomus*. These are referred to in the reports and in the remainder of this plan/EIS as "diaptomid" copepods. Both salamanders and fish also ate other species of zooplankton and benthic macroinvertebrates.

Researchers found that crustacean zooplankton vary depending on lake characteristics, soils, vegetation, and elevation. The high-elevation west-side lakes, which on average had lower water temperatures, alkalinity, and nutrients, were dominated by *Diaptomus kenai (D. kenai*). Smaller, shallower lakes on the east side were populated primarily with the smaller copepod, *D. tyrrelli*, which was also found only in lakes with higher nutrient levels. *D. kenai* is widespread in lakes in the study area and is apparently able to tolerate a wide range of abiotic conditions. However, in lakes where the average water temperature was below 50ºF–54ºF (Fahrenheit), these and all other larger copepods were virtually absent regardless of whether fish were present (Liss et al. 2002). Although the smaller *D. tyrrelli* rarely occurs together with large copepods (such as *D. kenai*) in east-side lakes, they do occur together in lower-elevation west-side lakes. In these cases, the density of *D. tyrrelli* is depressed compared to lakes where it occurs without *D. kenai*, suggesting predation by the larger copepod on *D. tyrrelli* (Liss et al. 1995).

In lakes where abiotic conditions were favorable for large copepods (generally where temperatures were warmer than 54ºF), densities of copepods were much lower where the lake also supported reproducing fish populations. Reproducing fish populations are believed to exert a particularly great predation pressure because densities of reproducing fish can be high. In addition, the population produces a range of age and size classes, making a wider range of prey vulnerable. Researchers found no significant differences in the density of large copepods in lakes with low fish densities (such as in many stocked lakes) and in fishless lakes (Liss et al. 1998). Where both deep lakes and shallow lakes had reproducing fish populations, deep lakes (deeper than 32 feet) supported higher densities of large copepods than shallow lakes. The researchers theorized that this is because the zooplankton are able to migrate to deep water during the day and avoid predation. Researchers also found *D. tyrrelli* to be abundant in shallow lakes with high fish densities where larger diaptomids were either absent or low in abundance. This is an example of an indirect effect of stocking or of

reproducing fish populations (for instance, if the larger copepod is removed through predation by fish, the smaller species is able to increase its density). The OSU/USGS team came to several conclusions:

> Introduced fish can reduce or eliminate large, more visible diaptomid copepods from lakes if fish abundance is excessive.
>
> Impacts on large copepods vary with fish density, with the greatest effects occurring at high fish densities.
>
> Impacts on large copepods from fish introductions are greater in shallow lakes.
>
> A significant negative relationship between large diaptomid density and *D. tyrrelli* density exists when the species occur together; that is, it appears that larger copepods prey on the smaller *D. tyrrelli*.

These effects are similar to well-known and well-documented effects in other regions of the world. In other studies (Anderson 1972; Northcote et al. 1978), stocking fish at high densities was found to reduce the abundance of larger zooplankton species to undetectable levels using standard sampling methods. Fish stocked at high densities in British Columbian lakes were found to selectively prey upon a large planktonic larva (Chaoborus), reducing its abundance (Northcote et al. 1978). Two large species of zooplankton, *Diaptomus arcticus* and *Daphnia pulex*, were no longer captured in zooplankton samples in Snowflake Lake (Banff National Park, Canada) after the establishment of high densities of stocked fish (Anderson 1972). Similar effects of stocked fish on large zooplankton species have been observed in other mountain lakes, typically under conditions of high fish density (Crumb 1978; Divens et al. 2001; Donald et al. 1994; Leavitt et al. 1994).

Also similar to the OSU/USGS research, a study of *D. kenai* in a mountain lake in the Olympic Mountains of Washington found that it coexisted in mountain lakes with low densities of stocked salmonids more than 20 years after the fish were initially stocked (WESI 1993). Other studies have documented the coexistence of large diaptomids with low densities of stocked salmonids (Hoffman and Pilliod 1999; Bahls 1990; Anderson 1972; McNaught et al. 1999).

Salmonid: Member of the family of fish that includes trout, salmon, whitefish, and char.

The indirect effect of fish predation on large copepods in increasing the density of smaller species of zooplankton is also known to occur in other mountain lake communities outside the study area (Paul and Schindler 1994; Gliwicz and Rowan 1984). Earlier studies (Anderson 1972; Crumb 1978; Northcote et al. 1978) documented a shift in dominant zooplankton in mountain lakes from large to smaller species following the stocking of salmonids, although total zooplankton abundance was not affected. In mountain lakes that were temporarily stocked with nonreproducing salmonids, the majority of lakes sampled showed that populations of large zooplankton were significantly reduced; however, the population density increased in an apparent rebound after fish were gone or reduced in abundance (Nilsson and Pejler 1973; Divens et al. 2001).

Substrate: The nonliving material or base upon which plants or animals live and grow.

Macroinvertebrates. Macroinvertebrates are an important food source for salamanders and fish in mountain lakes in the study area, and these vertebrate predators can, in turn, affect densities of macroinvertebrate prey. For example, one study (Reimers 1958) found that brook trout under conditions of extreme fish density were able to deplete mayfly and caddisfly populations in a small, high-altitude lake in the eastern Sierra Nevada in California. Fish also induce changes in behavior of nearshore macroinvertebrates; for example, stoneflies select darker substrates and change their activity patterns during the day in the presence of fish (Feltmate and Williams 1989; Feltmate et al. 1992). In the study area, it appears that vertebrate predators may affect the distribution of 3 of 15 nearshore macroinvertebrates: the stonefly, mayfly, and caddisfly. The larval stonefly was far less abundant in lakes with vertebrate predators, though the role of fish predation in reducing its abundance could not be determined. The mayfly was found almost exclusively in lakes without salamanders or fish, but salamander predation, not fish predation, appeared to limit its distribution. Only the caddisfly appeared to be limited by fish predation (Liss et al. 1995).

pH: The measure of the alkalinity or acidity of a substance such as water or soil.

In the study area, the mean number of nearshore macroinvertebrate taxa inhabiting a lake was directly related to maximum temperature. The higher the maximum temperature, which is also associated with lower elevations, the higher the species richness of macroinvertebrates. Water chemistry, pH in particular, and the type of substrate were also important. In other studies (Bell 1991; Schell and Kerekes 1989), the level of successful emergence in aquatic insects and species richness of macroinvertebrates in lakes have all been shown to be positively correlated with pH. Generally, taxa associated with organic substrates are found in lower elevation lakes and those with inorganic substrates at higher elevations.

Researchers at lakes in the North Cascades Complex generally did not analyze the impact of fish or amphibian predators on macroinvertebrates, but other studies have examined responses of benthic macroinvertebrates to stocked fish (Divens et al. 2001). The effects were found to vary by macroinvertebrate species; however, most coexist with fish although their average size and abundance may decline (Olive 1953; Reimers 1958; Walters and Vincent 1973). As with zooplankton, larger macroinvertebrate species are more vulnerable, and higher densities of fish exert a more substantial impact on benthic macroinvertebrates (Bahls 1990; Reimers 1958; Hoffman and Pilliod 1999). Also, similar to copepods, the presence of refuge habitat (such as wood debris, talus, aquatic vegetation, and cobble along rocky shorelines) can substantially reduce the effects of fish predation on macroinvertebrates (Johnston 1973; Olive 1953). The presence of more terrestrial insects in high-lake ecosystems helps to buffer the impact of non-active fish on benthic macroinvertebrates (Divens et al. 2001) because it has been documented that fish will disproportionately favor terrestrial insects over benthic animals as food items (Norlin 1967).

Amphibians. The effects of stocked fish on the native amphibians of mountain lakes have been studied throughout the mountain west, including Alberta, Canada (Graham et al. 1999; Graham and Powell 1999; Huynh et al. 2002; Fukumoto 1995); Idaho (Pilliod and Peterson 2000; Pilliod and Peterson 2001); California (Jennings 1996; Knapp 1996; Knapp et al. 2001; Knapp and Matthews 1998; Knapp and Matthews 2000; Drost and Fellers 1996; Bradford and Tabatabai

1993); and Montana (Maxell 2000; Funk and Dunlap 1999). In Washington, these effects have been noted on amphibians in Olympic National Park (Adams et al. 2000; Bury et al. 2000) and Mount Rainier National Park (Larson and Hoffman 2002). Much of the available information on the effects on native biota from stocking fish in mountain lakes has been summarized by Divens et al. (2001).

Species of Concern: A species that might be in need of concentrated conservation actions, which can vary depending on the health of the species' population and degree and types of threats.

Although lakes in the study area are populated by four frog, one toad, one newt, and two salamander species, in this case researchers focused their efforts on determining the effects of fishery management practices on native vertebrates, specifically the long-toed salamander (*Ambystoma macrodactylum*), a species that is integral to the food web of fishless mountain lakes in the North Cascades Complex. Northwestern salamanders (*A. gracile*) also occur in some of the study area lakes on the slopes west of the hydrologic divide; however, they are not as vulnerable to predation by stocked or reproducing fish. Only long-toed salamanders occupy lakes on the east side. It is rare that the two salamander species occur together in a given area, but when they do, the long-toed salamander tends to occupy smaller, shallower lakes than the northwestern salamander. The long-toed salamander is also found in shallow pools in lake inlet and outlet streams that may not be accessible to fish and in small temporary ponds and seeps near lakes with fish. Northwestern salamanders have a variety of tools to defend themselves against fish predation, including nocturnal activity, noxious secretions, and larger larvae than long-toed salamanders (Liss et al. 1995). These same protective devices are known to exist in Northwestern salamander populations in Mount Rainier National Park (Funk and Dunlap 1999; Bury and Adams 2000; Bury et al. 2000; Stevens-Ayers 1997; Larson and Hoffman 2002; Hoffman et al. 2003).

Rough-skinned newts (*Taricha granulosa*) have usually been documented in the literature to coexist with stocked fish in mountain lakes. This is likely because the skin of both the larvae and adult rough-skinned newt contains a potent toxin (Nussbaum et al. 1983).

The frog species in the study area include Cascades frogs (*Rana cascadae*), Columbia spotted frogs (*Rana luteiventris*), northern red-legged frogs (*Rana aurora aurora*), and Pacific tree frogs (*Pseudacris regilla*). Western toads (*Bufo boreas*) have also been documented in the North Cascades Complex. Only a few populations of Cascades frogs have been reported in the North Cascades Complex (Bury and Adams 2000; Bury et al. 2000). In other parts of Washington, Cascades frogs do not occur in deeper lakes and ponds containing fish, suggesting they are vulnerable to predation. In these same areas, the species was common in shallower lakes and ponds where no fish were present. A few populations of Columbia spotted frogs, northern red-legged frogs, western toads, and Pacific tree frogs have been documented in the North Cascades Complex, but most populations are in lower lakes and beaver pond habitats in the lower valleys (Bury and Adams 2000; Bury et al. 2000). Populations of these species, along with rough-skinned newts, appear to be rare and highly fragmented in lakes and ponds within the North Cascades Complex, regardless of the presence of fish (Bury 2002). Cascades frogs, Columbia spotted frogs, northern red-legged frogs, and Western toads are all federal species of concern, which is an informal designation that means population sizes are decreasing, and they are being

monitored for possible listing as threatened or endangered in the future. The North Cascades Complex is near the edge of the range for Cascades frogs and Columbia spotted frogs (Bury and Adams 2000; Bury et al. 2000), so it is often very difficult, or even impossible, to attribute the absence of these amphibians to fish presence in some of the North Cascades Complex lakes.

The long-toed salamander is an amphibian known to be important to the ecology of mountain lakes in the study area and one sensitive to the presence of fish. It is an "indicator" species (for example, it is capable of showing early signs of change if fishery management practices change) and was the subject of several biotic research studies in the study area conducted by the OSU/USGS team. The larval stage of the long-toed salamander is the top vertebrate predator in high-elevation fishless lakes in the North Cascades Complex and an integral component of the aquatic food web (Tyler et al. 2002). One abiotic factor, the concentration of TKN (total Kjeldahl nitrogen), appears to be important in determining the density of long-toed salamanders in fishless lakes in the study area (Liss et al. 1995; Liss et al. 1998; Tyler et al. 2002). TKN concentration is a measure of ammonia plus all organically derived nitrogen, and in combination with phosphorus concentrations, is a good indicator of a lake's productivity or the amount of phytoplankton. Where phytoplankton densities are higher, cladoceran zooplankton, which are a primary prey source for long-toed salamanders (and the salamanders themselves), are also more abundant.

The density of long-toed salamanders in lakes where abiotic conditions could support them appears directly related to the fish population. As noted above, reproducing populations of fish in study area lakes tended to be denser than stocked (nonreproducing) populations, and they also have a wider variety of size and age classes, with the capacity to exert a more sustained and broad-ranging predation pressure on salamander larvae. Data collected from a sample of lakes in the study area showed the average density of long-toed salamanders in fishless lakes where TKN levels (0.045 mg/L [milligrams per liter] or higher) would sustain them is about 24 per 328 feet of shoreline. The average density of long-toed salamanders for all fishless lakes studied in the North Cascades Complex regardless of TKN levels is 13.2 per 328 feet of shoreline (Tyler et al. 1998a, 1998b). The average density of salamanders in study area lakes with nonreproducing fish is 3.47 per 328 feet of shoreline, and for lakes with reproducing fish, it is 0.1310 per 328 feet of shoreline. Researchers also found more larval salamanders under woody debris or rocks or engaging in other "hiding" behaviors when these refuges were available and fish were present (Tyler et al. 2002).

The OSU/USGS team also compared the density of long-toed salamanders in fishless lakes, lakes with reproducing populations of fish, and lakes with nonreproducing populations of fish that had high, medium, or low concentrations of TKN. They found no difference in the density of salamanders when TKN levels were low (less than 0.045 mg/L), which is probably because salamanders require a certain TKN concentration before they can occupy a habitat. At medium levels of TKN (between 0.055 mg/L and 0.09 mg/L), they did find a significant difference in the density of long-toed salamanders in fishless lakes compared to those lakes with reproducing populations, but not between fishless lakes and those with nonreproducing populations of fish (normally fewer fish). In

lakes where TKN levels were high (above 0.09 mg/L), however, researchers found the density of salamanders at fishless lakes compared to those with nonreproducing populations of fish to be significantly different (Liss et al. 1998; Tyler et al. 2002). One way to interpret this information is to say that lakes with very high TKN levels can support very high densities of long-toed salamanders. When even low levels of fish are introduced into these lakes, they can reduce these salamander densities enough that it is statistically noticeable.

Researchers also noted that these denser or larger populations of salamanders may be particularly important in the study area because they are less vulnerable to extinction from unpredictable events and can serve as important sources of colonists to reestablish extinct local populations (Tyler et al. 2002). These core populations and the satellite colonies that draw from them are called metapopulations.

Metapopulation: Geographically separate populations of the same species that are connected by infrequent, but critical, interbreeding.

Although studies of long-toed salamanders and stocked fish in other areas in the region were not as complex, they did support the conclusions reached by the OSU/USGS team that fish can affect the density of salamander populations. For example, surveys in Olympic National Park found few or no long-toed salamanders in lakes containing fish, but many populations in shallow ponds and lakes without fish (Bury and Adams 2000; Bury et al. 2000; Adams et al. 2000). The authors, as did researchers in the study area, concluded that long-toed salamanders may be able to regionally coexist with fish by using temporary wetlands and other fishless habitat as breeding sites (Bury and Adams 2000; Bury et al. 2000).

Overall, the OSU/USGS team concluded that lakes with relatively high TKN concentrations (about 0.55 mg/L or greater), and those with warmer temperatures (greater than about 54ºF), were favored by native biota such as phytoplankton, large copepods, and long-toed salamanders. The aquatic life in these “more productive” lakes could therefore be at highest risk of impact from high densities of reproducing fish and may benefit most from fish removal. For additional information on the OSU/USGS research, see the section titled “Application of Research” in the “Alternatives” chapter.

SCOPING PROCESS AND PUBLIC PARTICIPATION

Public scoping began on January 16, 2003, with the publication of a notice of intent in the *Federal Register*. Four public scoping meetings were held in March of 2003 in these Washington State communities: Sedro-Woolley, March 18; Wenatchee, March 20; Bellevue, March 25; and Seattle, March 27. Approximately 72 people attended the four meetings, and 190 comments were received. In response to public input and issues expressed during the scoping process, the interdisciplinary planning team reworked the preliminary alternatives to those analyzed in this plan/EIS.

ISSUES AND IMPACT TOPICS

Issues are problems, opportunities, and concerns regarding the current and potential future management concepts for managing aquatic resources, impacts of anglers, and sport-fishing opportunities in the 91 mountain lakes that are included in this plan/EIS. The issues were identified by the NPS, WDFW, other agencies, and the public throughout the scoping process. The impact topics are a more refined set of concerns that were analyzed for each of the management alternatives. The impact topics were derived from issues, and in the "Environmental Consequences" chapter, the impact topics were used to examine the extent to which a problem would be made better or worse by the actions of a particular alternative. A summary of the agency and public scoping activities is available in the "Consultation and Coordination" chapter.

AQUATIC ORGANISMS

As described above in the "Summary of Existing Research" section, impacts on aquatic organisms in a lake food web take the form of impacts on individual components of each trophic level. Phytoplankton, zooplankton, macroinvertebrates, and fish are all components of the food web (for an informative description of the food web, see the "Affected Environment" chapter). The specific problems that might occur from fishery management practices are described in the following paragraphs:

Plankton. Under some alternatives, certain lakes may continue to be stocked or would continue to host reproducing fish. Other alternatives may involve removing fish. Fish, especially dense reproducing populations, consume zooplankton and may reduce the numbers, and possibly the presence, of some planktonic species in lakes. Waste products from fish may change the nutrient balance of a lake, which may create a favorable condition for some organisms, causing increases in their numbers. As noted above in the "Summary of Existing Research" section, fish may feed on larger zooplankton, which can in turn allow smaller herbivorous zooplankton to flourish with resulting impacts on phytoplankton and lake productivity and chemistry. The presence of reproducing fish, therefore, could result in a change in the abundance of various organisms

and a change in the food web as to which organisms are dominant. Because many other factors affect the numbers and interactions of organisms, the change caused by fish may be outside the range of natural variation over time within the lake or in similar lakes. These effects may be notable among planktonic organisms.

Natural Variation: The changes that occur naturally in an ecosystem (includes physical characteristics, plants, and animals) over time without human disturbance.

Macroinvertebrates. Macroinvertebrates (such as aquatic insects, worms, and snails) consume phytoplankton and zooplankton, as well as periphyton (microscopic algae growing on a lake substrate such as rocks or sediment or on larger plant surfaces), detritus (dead plant and animal material that drifts to the bottom of a lake if it is not consumed), and aquatic plants. Macroinvertebrates are eaten by top predators (including salamanders and fish) in a lake system. Fishery management practices, especially those resulting in high densities of fish over a long period of time, can reduce or eliminate some species of macroinvertebrates, with resulting impacts on salamanders, plankton, detritus, and nutrient concentrations and on the fish population itself. In addition to these generic effects on aquatic food webs, there is a particular interest in a blind amphipod that is found in two mountain lakes in the North Cascades Complex. Although this amphipod could be unique and rare in the North Cascades Complex, neither the U.S. Fish and Wildlife Service nor the WDFW has plans to designate or list this species.

Amphibians. As noted above, salamanders are the natural top vertebrate predator in many of the mountain lakes in the study area. When these lakes are stocked with fish, the number of salamanders drops, presumably because fish eat salamander larvae. Long-toed salamanders, which historically occupied several naturally fishless lakes on the east side of the study area and some lakes on the west side, are particularly vulnerable to predation from stocked fish because they do not have the variety of tools (such as noxious secretions or larger larvae) to defend themselves as do Northwestern salamanders. When salamanders are eliminated or greatly reduced by fish, the aquatic food web is also changed. For example, the type of zooplankton that salamanders normally consume would increase, especially compared to the type of zooplankton that fish consume.

Fish. Stocked fish also can affect native fish species. Hatchery-raised fish of most species are genetically different and usually weaker and less able to survive harsh environmental conditions than native species. If fish escape from lakes into streams that are occupied by native fish of the same species, interbreeding may adversely affect the adaptive characteristics of the native population. Interbreeding can also occur between some fish species (brook and bull trout, for example), eliminating the purity of a native fish species, subspecies, or evolutionarily significant unit of fish. In the extreme, this could result in the localized elimination of that species or subspecies in a lake, park, or region. Escaping fish may also prey on native fish species and compete with native fish for food or habitat.

OTHER WILDLIFE

Fish-eating (piscivorous) wildlife have benefited from stocked fish at a number of lakes in the North Cascades Complex. Mergansers (*Lophodytes cucullatus*, *Mergus merganser*, and *M. serrator*), ospreys (*Pandion haliaetus*), bald eagles

(*Haliaeetus leucocephalus*), belted kingfishers (*Ceryle alcyon*), common loons (*Gavia immer*), and river otters (*Lutra canadensis*) have been observed at mountain lakes. Also, if there is an opportunity, carnivores such as black bears (*Euarctos americanus*), Cascade red foxes (*Vulpes fulva cascadensis*), wolves (*Canis lupus*), raccoons (*Procyon lotor*), mink (*Mustela vison*), and coyotes (*Canis latrans*) will feed on spawning fish in shallow tributary streams in the North Cascades Complex, but they do not depend on stocked fish as a primary food source. If fish are removed, or the density decreased, individuals of these species will either find alternative food sources or relocate to another habitat. In the extreme, if habitat is not available, individuals may be eliminated.

Anglers and other recreationists, as well as stocking or fish removal activities, may temporarily disturb wildlife through the presence of humans and noise.

SPECIAL STATUS SPECIES

Plants. No plants with formal federal special status would be affected by management actions, but several species with state special status or considered sensitive or rare do grow in the study area and may be inadvertently trampled by recreationists, including anglers.

Fish. The genetic integrity and ability to reproduce in bull trout may be affected if stocked brook trout escape from lakes and move to downstream drainages occupied by bull trout. It is also possible that stocked fish migrating from lakes to downstream drainages containing Chinook or Coho salmon might compete with and adversely affect these species. Westslope cutthroat trout are native to stream basins on the east side of the Cascade Crest where they have been replaced or adversely affected through competition and hybridization with stocked rainbow trout dispersing downstream.

Amphibians. Cascades frogs, Columbia spotted frogs, and northern red-legged frogs are species that occupy lake habitat and may be subject to predation by fish. Although tailed frogs and western toads also occupy habitat in the study area, either they do not occupy the same habitat as stocked fish, or they are not subject to predation by trout.

Other Vertebrates. Noise from fish stocking or treatment activities to remove fish may result in disturbance or displacement of individuals from several federal species with special status. These include American peregrine falcon, California wolverine, Canada lynx, gray wolf, grizzly bear, Pacific fisher, marbled murrelet, Northern spotted owl, and Yuma myotis (bat). Bald eagles and Harlequin ducks may experience some changes to their food base (fish for eagles, aquatic invertebrates for ducks) from management decisions.

VEGETATION

Shoreline vegetation around lakes (riparian zones) may be sensitive to trampling by recreationists, and in particular, those attempting to fish, hike, or ride horses around the lakeshore. Vegetation can also be trampled or lost through fishery

management actions, the creation of social trails, or by cross-country travel to reach more remote lakes.

In addition to the direct loss of vegetation, trampling can result in changes to soil such as compaction, erosion, and sedimentation. These changes in habitat can keep vegetation from regrowing, particularly in more severe environments (such as the alpine zone) where natural recovery can be quite slow. Erosion and sedimentation can cause increases in turbidity or concentrations of organic matter and nutrients in a naturally nutrient-poor lake environment.

Social Trails: These trails are not part of the formal network of managed trails; rather, they are informal routes that access a variety of backcountry destinations and create visible patterns of human use.

Cultural Resources

The areas surrounding or in the vicinity of many lakes in the study area have not been surveyed, but because prehistoric cultures are known to have occupied the areas, they could contain buried archeological resources or historic resources. The use of these areas, especially lakeshores, by anglers, campers, and other recreationists can remove vegetation, increase soil erosion, and increase the chance of exposing these resources to weathering, theft, or vandalism.

Visitor Use and Experience

Recreational Use. Changes in the fishery management program could disrupt anglers who may have been fishing at certain lakes for several years, or even several generations. Changes in the fishery management program could also affect non-anglers.

Social Values. Stocking fish in remote lakes, most of which are in wilderness, is a practice favored by some and considered undesirable and inappropriate by others. Anglers may have a more utilitarian approach to stocking, whereas conservation groups and conservationists are associated with naturalistic, ecology-based, or social values. While many anglers are also conservationists, there is a distinction between those who value the stocking of lakes for their enjoyment in contrast to those who value the conservation and protection of natural processes.

Wilderness Values. Approximately 93% of the North Cascades Complex lies within designated wilderness. Wilderness extends beyond the border of the North Cascades Complex, encompassing a region of designated wilderness that exceeds 2 million acres. This figure does not include much of the wild, remote Canadian land that borders the park. Some conservation groups and conservationists particularly object to stocking because it is an unnatural practice involving human manipulation of an ecosystem in a national park and a wilderness area. Trails, trampling of vegetation around a lakeshore, or occasional noise associated with stocking practices may be particularly offensive as evidence of human activity in violation of the wilderness values of a primitive and natural experience.

HUMAN HEALTH

Chemicals may be the only feasible way to remove stocked or reproducing fish from some larger, naturally fishless lakes. The NPS proposes to use antimycin to remove fish (antimycin has limited impacts on nontarget species). The required dosage of antimycin would be very small, and the only pathway for human exposure would be through consumption of treated fish, which is unlikely. Nonetheless, there are public concerns regarding human exposure to antimycin through the consumption of treated fish.

Research has shown that fish stocked in these remote high-elevation lakes have been exposed to methyl-mercury and persistent organic pollutants (POPs) deposited from the atmosphere. There is potential for human consumption of methyl-mercury and POP-contaminated fish and, therefore, some level of concern for human exposure to these chemicals through fish consumption.

SOCIOECONOMIC RESOURCES

Some businesses in the region may directly depend on anglers purchasing equipment, food, lodging, and guide services. Changes in the fishery management program could reduce the number of anglers who fish in the North Cascades Complex, thus reducing both direct and indirect economic benefits associated with them.

NORTH CASCADES COMPLEX MANAGEMENT AND OPERATION

Changes in the fishery management program would require NPS involvement to carry out management actions such as monitoring, lake treatments, and restocking. Monitoring and management by NPS and WDFW, in some cases, would require extensive effort and staffing, with resulting changes to the agencies' budgets.

In the past, lakes have been stocked without approval from the NPS and/or WDFW, and in some instances, lakes have been illegally stocked following costly fish removal efforts (for example, Tipsoo Lake at Mount Rainier National Park). In the future, unsanctioned stocking could undo costly fish removal efforts, significantly undermine fishery management activities, and cause a variety of unacceptable ecological impacts.

ISSUES DISMISSED FROM FURTHER CONSIDERATION

MINORITY AND LOW-INCOME POPULATIONS (ENVIRONMENTAL JUSTICE)

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. This topic is dismissed from further consideration for the following reasons:

Visitors to the North Cascades Complex are not disproportionately minority or low-income.

Minority or low-income populations would not be disproportionately affected by changes in fishery management.

FLOODPLAINS

Management actions for fish would have no effect on floodplains.

SPECIAL STATUS SPECIES

Although many wildlife and plant species that are listed as threatened, endangered, or otherwise of special concern do occur in the North Cascades Complex, not all of them occur in habitat included in the study area. The full list of species that occur in the region is included in appendix C. Several special status species in the study area are being analyzed as part of this plan/EIS (refer to the "Issues and Impact Topics" section in this chapter).

VISITOR SAFETY

No impacts on visitor safety or to those park operations that maintain visitor safety, such as search and rescue, are expected to occur from changes in the fishery management program.

PRIME AND UNIQUE AGRICULTURAL LANDS

No prime or unique farmlands exist in the North Cascades Complex, and no actions would affect agricultural soils.

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

The following laws, policies, and plans by the NPS, WDFW, or agencies with neighboring land or relevant management authority are described in this section to show the constraints this plan/EIS must operate under and the goals and policies that it must meet. These goals and constraints are summarized in the beginning of this chapter but described in more depth in the following sections.

GUIDING LAWS AND POLICIES

NPS ORGANIC ACT OF 1916

By enacting the *NPS Organic Act of 1916*, Congress directed the U.S. Department of the Interior and the NPS to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of future generations" (16 United States Code [USC] 1). The *Redwood National Park Expansion Act of 1978* reiterates this mandate by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Despite these mandates, the *Organic Act* and its amendments afford the NPS latitude when making resource decisions. By these acts, Congress "empowered [the NPS] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 [9th Cir. 1996]).

Yet, courts have consistently interpreted the *Organic Act* and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan*, 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." *The National Rifle Association of America v. Potter*, 628 F. Supp. 903, 909 (D.D.C. 1986) states, "In the *Organic Act* Congress speaks of but a single purpose, namely, conservation." The *NPS Management Policies* (NPS 2001a) also recognize that resource conservation takes precedence over visitor recreation. The policy dictates, "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant."

Because conservation remains predominant, the NPS seeks to avoid or minimize adverse impacts on park resources and values; however, the NPS has discretion to allow negative impacts when necessary to fulfill park purposes (NPS 2001a, 1.4.3).

While some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS 2001a, 1.4.3). The *Organic Act* prohibits actions that impair park resources unless a law directly and specifically allows for the acts (16 USC 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2001a, 1.4.4). To determine impairment, the NPS must evaluate "the particular resources and values that would be affected, the severity, duration, and timing of the impact, the direct and indirect effects of the impact, and the cumulative effects of the impact in question and other impacts" (NPS 2001a, 1.4.4). This plan/EIS, therefore, assesses the effects of the management alternatives on park resources and values and determines if these effects would cause impairment.

NPS Management Policies require an analysis of potential effects to determine whether or not actions would impair park resources (NPS 2001a). The fundamental purpose of the national park system is to conserve park resources and values for the use and enjoyment of future generations. NPS managers have the discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. That discretion to allow certain impacts within the park is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible manager, would harm the integrity of park resources or values. An impact on any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major adverse effect on a resource or value whose conservation is

> necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
>
> key to the natural or cultural integrity of the park
>
> identified as a goal in the park's general management plan or other relevant NPS planning documents

NPS Management Policies (2001)

Several sections from the *NPS Management Policies* (NPS 2001a) are relevant to fishery management in the North Cascades Complex, as described below.

NPS Management Policies instruct park units to

> maintain as part of the natural ecosystems of parks all native plants and animals by minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2001a, 4.4.1)

> re-establish natural functions and processes in human-disturbed components of natural systems in parks (unless otherwise directed by Congress) (NPS 2001a, 4.1.5). (Human disturbances include the introduction of exotic species and the disruption of natural processes. Using the best available technology and within its staff, funding and other resource constraints, park units are to restore the biological and physical components of these systems.)
>
> seek to return human-disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated" (NPS 2001a, 4.1.5).

As noted above, sport fishing is generally allowed in NPS units unless specifically prohibited, providing it "does not jeopardize natural aquatic ecosystems or riparian zones" (NPS 2001a, 8.2.2.5). At least one-third of the areas administered by the NPS have substantial fish resources and fishery activities. Sport fishing has been permitted in national parks since the establishment of Yellowstone National Park in 1872. Sport fishing is managed under 36 *Code of Federal Regulations* (CFR) 2.3, which states in part, "fishing shall be in accordance with the laws and regulation of the State . . . *Non-conflicting* State laws are adopted as part of these regulations." The NPS is allowed to restrict fishing activities wherever needed to achieve its own management objectives.

In contrast to sport fishing, the practice of stocking fish is generally prohibited in park units. Stocking cannot "impair park natural resources or processes," and it must take place only in national recreation areas or preserves that have historically been stocked (only the same species that has historically been stocked may continue to be stocked) (NPS 2001a, 4.4.3). Exotic species cannot displace native species (if displacement can be prevented), and parks are to manage "up to and including eradication" if control is feasible and the exotic species interferes with native species, natural habitats, or disrupts the integrity of the native species (NPS 2001a, 4.4.4.2). If an exotic species is introduced or maintained to meet specific NPS management needs, all "feasible and prudent measures to minimize the risk of harm" to native biota or invasion of habitat by the exotic species must be taken, and the exotic species must "be known to be historically significant, to have existed in the park during the park's period of historical significance, or to have been commonly used in the local area at that time" (NPS 2001a, 4.4.4.1). Because stocking in the North Cascades Complex has not met all of these conditions, a policy waiver from the director of the NPS has been required to continue stocking (see the "History of Fish Management in North Cascades Mountain Lakes" section in this chapter). For more information, see "Appendix D: Related Regulations, Policies, Laws, and Legislation."

Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making and Handbook

NPS *Director's Order 12* and Handbook (NPS 2001b) lay the groundwork for how the NPS complies with the *National Environmental Policy Act* (NEPA). *Director's Order 12* and Handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects.

NPS *Director's Order 12* requires that impacts on park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. *Director's Order 12* also requires that an analysis of impairment of park resources and values be made as part of the NEPA document.

North Cascades National Park Service Complex Enabling Legislation (Public Law 90-544)

Each NPS unit is guided by the *Organic Act*, *NPS Management Policies*, the *National Environmental Policy Act*, and other laws and policies, but each unit also has more specific guidance provided by its own enabling legislation; statements of mission, purpose, and significance; and broad planning documents such as a general management plan and strategic plan. These documents, and how they relate to the North Cascades Complex, are summarized in the following sections.

The North Cascades National Park was established in 1968 by an act of Congress (PL 90-544) "in order to preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snowfields, glaciers, alpine meadows, and other unique natural features in the North Cascade Mountains of the State of Washington" (82 Stat. 926).

The Ross Lake National Recreation Area was created "in order to provide for the public outdoor recreation use and enjoyment of portions of the Skagit River and Ross, Diablo, and Gorge Lakes, together with the surrounding lands, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment of such lands and waters" (82 Stat. 927).

The Lake Chelan National Recreation Area was created "in order to provide for the public outdoor recreation use and enjoyment of portions of the Stehekin River and Lake Chelan, together with the surrounding lands, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment of such lands and waters."

The following key administrative provisions of the 1968 legislation related to this current planning effort are:

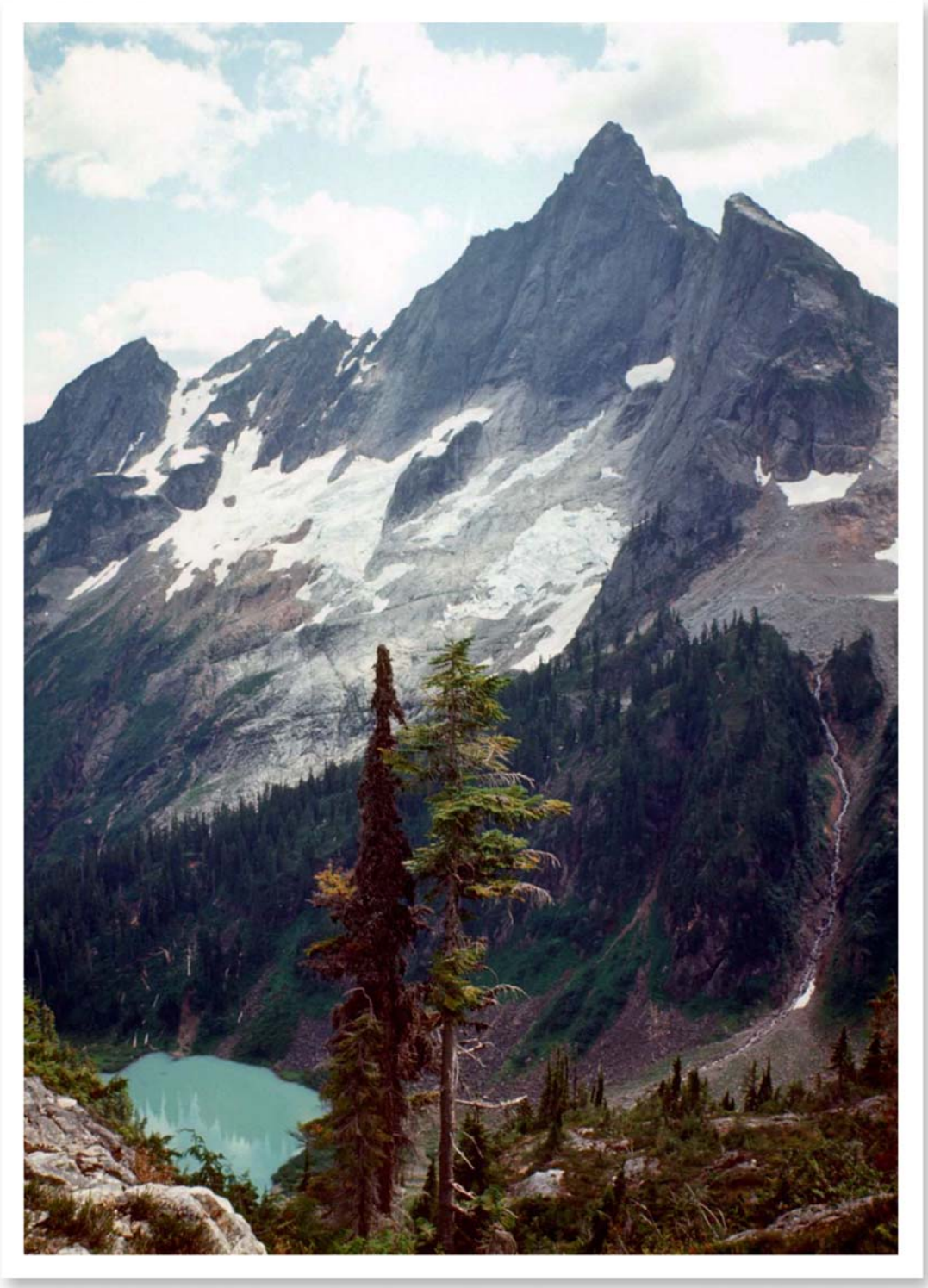
> The Secretary of the Interior shall administer the recreation areas in a manner which in his judgment will best provide for (1) public outdoor recreation benefits, (2) conservation of scenic, scientific, historic, and other values contributing to public enjoyment, and (3) such management, utilization, and disposal of renewable natural resources and the continuation of such existing uses and developments as will promote or are compatible with, or do not significantly impair, public recreation and conservation of the scenic, scientific, historic, or other values contributing to public enjoyment.
>
> The Secretary shall permit hunting and fishing on lands and waters under his jurisdiction within the boundaries of the recreation areas in accordance with applicable laws of the United States and of the State of Washington, except that the Secretary may designate zones where, and establish periods when, no hunting or fishing shall be permitted for reasons of public safety, administration, fish and wildlife management, or public use and enjoyment. Except in emergencies, any regulations of the Secretary pursuant to this section shall be put into effect only after consultation with the Department of Game [now the WDFW] of the State of Washington.

PURPOSE AND SIGNIFICANCE OF NORTH CASCADES NATIONAL PARK SERVICE COMPLEX

The purpose and significance of the North Cascades Complex comes from its enabling legislation and *NPS Management Policies*. The North Cascades Complex's enabling legislation, mission, and its purpose and significance provide a framework for addressing mountain lakes fishery management within the North Cascades Complex. The purpose, need, objectives, and range of alternatives presented in this plan/EIS are grounded in the North Cascades Complex's purpose and mission.

The mission statement of the North Cascades Complex is that it "is dedicated to conserving, unimpaired, the natural and cultural resources and values of North Cascades National Park, Ross Lake National Recreation Area and Lake Chelan National Recreation Area for the enjoyment, education, and inspiration of this and future generations. The North Cascades Complex also shares responsibility for advancing a great variety of national and international programs designed to extend the benefits of natural and cultural resource conservation and outdoor recreation."

"To preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snowfields, glaciers, alpine meadows, and other unique natural features, biological processes, and cultural resources in the North Cascades" (Strategic Plan for North Cascades National Park Service Complex).



The purpose of the North Cascades Complex as stated in the *Strategic Plan* (NPS 2000a) is as follows:

> To preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snowfields, glaciers, alpine meadows, and other unique natural features, biological processes, and cultural resources in the North Cascades.
>
> To provide outdoor recreation use and enjoyment for the public, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment within Ross Lake and Lake Chelan National Recreation Areas.
>
> To preserve and protect the lands legislatively designated as the Stephen T. Mather Wilderness for use and enjoyment of the public in a manner that will leave them unimpaired for future use and enjoyment as wilderness.

The significance of the North Cascades Complex as stated in the *Strategic Plan* (NPS 2000a) is as follows:

> The North Cascades Complex contains more glaciers than any other national park in the United States outside Alaska. The North Cascades ecosystem has over half the glaciers in the lower 48 states. These glaciers are an important source of water for salmon, other wildlife, plants, and people in the Puget Sound region.
>
> The 9,000-plus feet of vertical relief, and the great contrast between climates east and west of the Cascade Crest, provide habitat for one of the greatest diversities in North America and for varied fauna including rare and sensitive species.
>
> The variety of waters (lakes and rivers) and topography provides a large and expanding nearby population with a wide array of recreational opportunities, from boating and camping to climbing and backpacking.
>
> The North Cascades Complex, which adjoins public lands preserved in Canada, is the core of one of the largest protected wild areas in the United States, a substantial portion of it is designated Wilderness.
>
> The North Cascades Complex contains structures or sites that are on the National Register of Historic Places and others that are eligible for listing on the National Register, 3 historic districts, and over 250 archeological sites. The North Cascades Complex was once home to at least four tribes whose descendants now live nearby and includes, within its boundaries, three contemporary communities.

PLANNING DOCUMENTS FOR NORTH CASCADES NATIONAL PARK SERVICE COMPLEX

GENERAL MANAGEMENT PLAN

The *North Cascades National Park Service Complex General Management Plan* (NPS 1988b) includes management guidance for North Cascades National Park and Ross Lake and Lake Chelan National Recreation Areas, and that management guidance is relevant to the objectives of this plan/EIS. For natural resources in the North Cascades Complex, the *General Management Plan* stresses increasing knowledge and understanding of the interrelationships of natural processes, preserving and restoring natural resources as part of a regional ecosystem, and providing research opportunities in "as natural a system as possible." For the national recreation areas, the policy statements are similar regarding natural resources, calling on the NPS to conserve scenic and primary natural resources, but also to balance ecological processes with recreational activities. For the Ross Lake National Recreation Area, the *General Management Plan* states that this balance should be maintained to provide "the closest natural resource condition consistent with recreational use and existing power development." For the Lake Chelan National Recreation Area, the *General Management Plan* says "to conserve the scenic and the natural resources and to balance ecological relationships and processes with recreational activities in order to maintain the closest natural resource condition consistent with recreational use and the Stehekin community."

The *General Management Plan* speaks of the need for cooperation with agencies, residents, organizations, and the public to ensure land use in and adjacent to North Cascades Complex is compatible with park purposes to the greatest extent possible, to develop resource management programs, and to develop plans and programs to deal with any other problems of mutual concern.

STRATEGIC PLAN

The *Strategic Plan for the North Cascades National Park Service Complex* (NPS 2000a) includes goals for preserving park resources that are consistent with the goals and objectives of this plan/EIS.

Mission Goal I.a. states that

> Natural and cultural resources and associated values of the North Cascades National Park Service Complex are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.

Mission Goal I.b. states that

> The National Park Service at the North Cascades National Park Service Complex contributes to knowledge about natural and

cultural resources and their associated values, management decisions about resources and visitors are based on adequate scholarly and scientific information.

Subgoals on species inventories and species abundance and distribution are furthered by the information contained in this plan/EIS.

RESOURCE MANAGEMENT PLAN

The *Resource Management Plan for North Cascades National Park Service Complex* (NPS 1999a) is an internal North Cascades Complex document that elaborates on the resource conditions and management strategies set in the *General Management Plan* (1988b) described above. The primary purpose of the *Resource Management Plan* is to develop a program to achieve the mission related to natural and cultural resource stewardship. The *Resource Management Plan* contains individual project statements that describe the existing resource conditions and how they differ from the desired conditions. The plan then outlines a strategy for addressing each resource issue. With regard to fish stocking of natural lakes, the plan describes the following tasks:

conducting fish impact evaluation

refining risk criteria to native biota

preparing a fishery management plan and NEPA review (in accordance with the 1991 Consent Decree described earlier in this chapter)

implementing the plan including monitoring and mitigation

MANAGEMENT IN WILDERNESS

WASHINGTON PARKS WILDERNESS ACT AND THE WILDERNESS ACT OF 1964

The federal *Washington Parks Wilderness Act* signed into law by Congress on November 16, 1988 (100 PL 668, 1988), created approximately 634,614 acres of wilderness and approximately 5,226 acres of potential wilderness within the North Cascades Complex, which is now known as the Stephen T. Mather Wilderness. This designation encompassed over 93% of the North Cascades Complex.

In designating these areas as wilderness, Congress extended all of the protections and mandates of the *Wilderness Act of 1964* (16 USC 1131 et seq.). The *Wilderness Act* established a national wilderness preservation system, "administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness" (16 USC 1131). The *Wilderness Act* defines

wilderness as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." An area of wilderness is further defined to mean "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation, (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value" (16 USC 1131).

With regard to designated wilderness, section 6.4.3 of the *NPS Management Policies* (NPS 2001a) states, "Recreational uses in National Park Service wilderness areas will be of a nature that enables the areas to retain their primeval character and influence, protect and preserve natural conditions, leave the imprint of man's work substantially unnoticeable, provide outstanding opportunities for solitude or primitive and unconfined types of recreation, and preserve wilderness in unimpaired condition."

Lands in the study area that are also in designated wilderness are more restricted in the kinds of uses that can take place because of the *Wilderness Act* requirements. These restrictions include the tools the park is able to use to conduct fishery management practices. For more information, see "Appendix D: Related Regulations, Policies, Laws, and Legislation."

Wilderness Management Plan

The *Wilderness Management Plan* (NPS 1989) outlines how the NPS will manage wilderness in the North Cascades Complex according to a "limits of acceptable change" approach. The plan governs use of the wilderness by all visitors, including anglers, but does not address fishery management. The *Wilderness Management Plan* divides the park and recreation areas into four opportunity classes (backcountry use zones): Day Use, Trailed/Established Camp, Cross Country I, and Cross Country II. Within these zones, limits are set on use numbers, and thresholds are established for impacts. These use numbers are maintained through the requirement of a permit for backcountry camping.

Related Legislation and Policies

Washington State Environmental Policy Act (SEPA)

The state of Washington has a *State Environmental Policy Act* (SEPA), enacted in 1971, that parallels the *National Environmental Policy Act*. While the *National Environmental Policy Act* applies to federal agencies and actions, the *Washington State Environmental Policy Act* applies to state and local agency actions that may have a significant effect on the quality of the environment (unless those actions

are defined as exempt by the state). Some undertakings require both federal and state or local actions and, therefore, are subject to both the *National Environmental Policy Act* and *State Environmental Policy Act*. This plan/EIS has been prepared as a NEPA document and may subsequently be adopted by the state of Washington prior to its taking action on this document.

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE GOALS, POLICIES, AND OBJECTIVES

The WDFW manages fish resources throughout the state, including those in the North Cascades Complex and surrounding public lands administered by the U.S. Department of Agricultural-U.S. Forest Service (National Forests System lands and wilderness areas). The goals, policies, and objectives of the WDFW guide that management (WDFW 1995). The WDFW's high lakes fishery management program applies to all of the lakes in the lands surrounding the North Cascades Complex (for a discussion of the history of this program, see WDFW 2001). Inside the North Cascades Complex, authority for fish management is shared with the park.

STATEWIDE FISH POLICY

The Washington Fish and Wildlife Commission is the supervising authority for the WDFW. The department's goals, policies, and objectives were published on February 2, 1995 (WDFW 1995).

The WDFW's mission is sound stewardship of fish and wildlife. Goals in pursuit of this mission include "Maximizing fishing, hunting, and nonconsumptive recreational opportunities compatible with healthy, diverse fish and wildlife populations," and "Maximizing recreational opportunity for fish and wildlife constituents consistent with the preservation, protection, and perpetuation of the fish and wildlife resources." Goals specific to fish management include "providing for significant recreation opportunities through artificial propagation programs" and "maximize[ing] fish and recreation opportunities."

One of the objectives under the goal of maximizing sport fishing opportunities is to implement "balanced management strategies that provide for a variety of recreational activities including unique fishing opportunities and optimum harvest." A related objective directs the department to "maintain maximum recreation through population manipulations with the use of stocked fish, partial treatments with rotenone, and other strategies in appropriate waters."

STATEWIDE FISHING REGULATIONS

Fishing in the North Cascades Complex is governed by Washington State fishing regulations. A state fishing license is required for all persons 15 years or older, and licenses must be carried when fishing, including in the North Cascades Complex. The legal fishing methods and gear are described in the regulations (hook and line only), and using live bait, chemical irritants, or multiple fishing

rods is prohibited. Lakes are open to fishing for most species all year. Daily harvest limits are generally five fish, but specific lakes may have a limit of two fish. Some waters have size limits, and special gear limitations are imposed on some waters.

Washington State fishing regulations control catch limit, size, and fishing method for each species. Special rules for individual rivers specify the location, season, catch limit, size, and other unique regulations for the individual river. A summary of the 2004 Washington State freshwater fishing regulations is contained in appendix D (for the complete pamphlet, visit the WDFW website at http://www.wa.gov/wdfw/fish/regs/fishregs.htm).

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

U.S. FOREST SERVICE

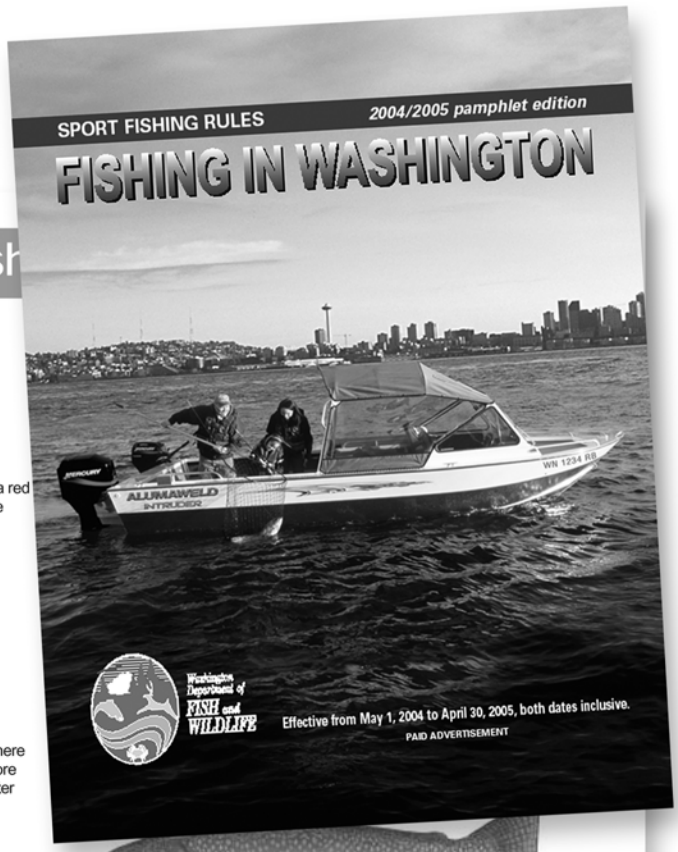
Three national forests are in the region of the North Cascades Complex: Okanogan, Wenatchee, and Mt. Baker-Snoqualmie. While this plan/EIS only covers a study area within the boundaries of lands managed by the NPS, anglers are able to fish in lakes in the neighboring forests and wilderness areas. Should the selected alternative include the removal of stocked or reproducing fish from some of the lakes in the study area, mountain lakes on U.S. Forest Service lands or in Canada are likely to experience increases in use.

U.S. FISH AND WILDLIFE SERVICE

Some fish-bearing lakes in the North Cascades Complex and the surrounding areas drain to waters supporting fish populations currently listed under the *Endangered Species Act*. Pursuant to the Act, management plans for mountain lakes fisheries on federal lands are expected to be consistent with recovery planning goals for listed species. One listed species considered at risk in the study area is the bull trout (*Salvelinus confluentus*). Currently, recovery plans related to the *Endangered Species Act* have been completed in draft form by the U.S. Fish and Wildlife Service for the Puget Sound and Upper Columbia River Recovery Units for the threatened bull trout. Chinook salmon, another listed species, may also be at risk, although the recovery plan for this species is still in development.

NATIONAL MARINE FISHERIES SERVICE

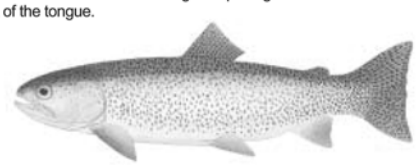
The recovery plan for Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) is currently under development and will be completed by the National Oceanic and Atmospheric Administration Fisheries (National Marine Fisheries Service). This is because Chinook are an anadromous species, meaning they spend some portion of their lives at sea.



Selected Wash

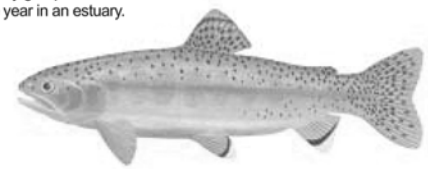
Rainbow Trout

Body color is variable and may be silvery in lakes and reservoirs. It has a red to pink streak on its side and irregular spotting. There are no teeth on the back of the tongue.



Cutthroat Trout (Coastal Variety)

Body color is variable. The maxillary (upper jaw bone) usually extends beyond the margin of the eye. The hyoid teeth are behind the tongue. There may be a red or orange slash on the underside of the jaw. Spotting is more closely grouped toward the tail. Sea-run coastal cutthroat return in fall after one year in an estuary.

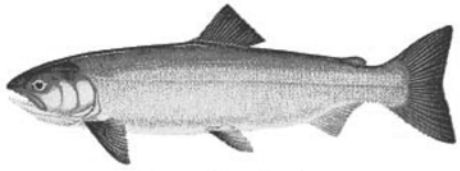


Golden Trout

Coloration is brilliant and distinct with a green back and gold-toned sides. There are a few spots below mid-point of the body and white tips on the dorsal, anal and pelvic fins. Parr marks show on the side of the body.

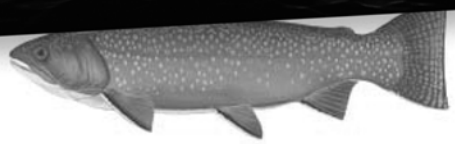
Lake Trout (Mackinaw)

Dark gray or gray green above with a light gray to white belly. Colored spots are absent, fins have small white borders, and the tail is forked. It inhabits large, deep lakes.



Kokanee (Silver Trout)

Its back is greenish blue to silver with faint speckling. The sides and belly are silvery with no distinct spotting. When kokanee spawn in fall, their sides turn red to scarlet. The inside of the mouth is white, not black as in some salmon.



Brook Trout

Dark green or blue with white belly, its upper body and dorsal fin have wormlike markings. Its sides have yellow and pink spots with blue rings. The lower fins are white-tipped and the tail is square.

Dolly Varden/Bull Trout

This fish is olive green to brown above and on the sides with no wormlike markings. There are cream or crimson spots. The tail is slightly forked. Dolly Varden are a sea-run version, more silvery in color, and spend one year in an estuary. Bull trout are found in Eastern and Western Washington.

Whitefish

Coloration is light grayish-blue on black with silvery sides and a dull, whitish belly. It has large scales, and a small mouth without teeth.

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LOCAL PLANS AND POLICIES

Although portions of the North Cascades Complex lie within Whatcom, Skagit, and Chelan Counties, the counties do not have planning jurisdiction over these federally managed lands. Any long-range planning efforts of small, unincorporated communities (such as Stehekin and Newhalem) that are within the boundaries of the North Cascades Complex are coordinated between the appropriate county and the NPS.

TRIBAL GOVERNMENT INTERESTS

Based on discussions with various tribes affiliated with the North Cascades Complex, there is no indication that Native Americans stocked fish in mountain lakes, although several tribal members suggested it could have been possible. While the mountain lakes fishery is an artifact of contemporary culture, the lakes themselves are very important to various tribes, as documented in the archeological record and in consultation with the tribes. These consultations currently indicate that tribal government interests will be protected provided there is no ground disturbance from management actions. The "Consultation and Coordination" chapter (see the "Native American Tribes" section under "Agency Consultation") lists the tribes that have been consulted.