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Endangered and Threatened Species: Proposed Threatened Status and Designated Critical Habitat for Ozette Lake, Washington Sockeye Salmon; Proposed Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 226 and 227

[Docket No. 980219043–8043–01; I.D. No. 011498A]

RIN 0648–AK52

Endangered and Threatened Species: Proposed Threatened Status and Designated Critical Habitat for Ozette Lake, Washington Sockeye Salmon

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS has completed a comprehensive status review of west coast sockeye salmon (*Oncorhynchus nerka*) populations in Washington, Oregon, and California and has identified six Evolutionarily Significant Units (ESUs) within this range, namely, Okanogan River, Lake Wenatchee, Quinault Lake, Ozette Lake, Baker River, and Lake Pleasant, all in the State of Washington. NMFS concluded that the Ozette Lake sockeye is likely to become endangered in the foreseeable future, but that the other ESUs, including Okanogan River, Lake Wenatchee, Quinault Lake, Baker River, and Lake Pleasant sockeye salmon, are not in danger of extinction, nor are they likely to become an endangered species within the foreseeable future, thus determining that these ESUs did not warrant listing under the ESA. NMFS is now issuing a proposed rule to list Ozette Lake sockeye as threatened under the Endangered Species Act (ESA). Ozette Lake sockeye spawn in Ozette Lake and its tributaries in Washington. NMFS is also proposing to add Baker River sockeye to the candidate species list because, while there is not sufficient information available at this time to indicate that Baker River sockeye warrant protection under the Endangered Species Act (ESA), NMFS has identified specific risk factors and concerns that require further consideration prior to making a final determination on the overall health of the ESU.

Only naturally spawned sockeye salmon are being proposed for listing. Critical habitat for this ESU is being proposed as the species' current freshwater and estuarine range and includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers.

NMFS is requesting public comments and input on the issues pertaining to this proposed rule and on integrated local/state/Federal conservation measures that might best achieve the purposes of the ESA relative to recovering the health of sockeye salmon populations and the ecosystems upon which they depend. Should the proposed listings be made final, protective regulations under the ESA would be put into effect, and a recovery plan would be adopted and implemented.

DATES: Comments must be received on or before June 8, 1998. The dates and locations of public hearings regarding this proposal will be published in a subsequent **Federal Register** notice.

ADDRESSES: Comments should be sent to: Garth Griffin, NMFS, Protected Resources Division, 525 NE Oregon St., Suite 500, Portland, OR 97232–2737.

FOR FURTHER INFORMATION CONTACT: Garth Griffin at (503) 231–2005, or Joe Blum at (301) 713–1401.

SUPPLEMENTARY INFORMATION:

Previous Federal ESA Actions Related to West Coast Sockeye and Petition Background

The ESA actions on sockeye salmon (*Oncorhynchus nerka*) in the Pacific Northwest are extensive. In April 1990, NMFS received a petition to list Snake River, Idaho, sockeye salmon as endangered under the ESA, and announced shortly thereafter that a status review would be conducted to determine if any Snake River basin sockeye should be proposed for listing under the ESA (55 FR 13181). Subsequently, NMFS found that the petition presented substantial scientific information indicating that the listing may be warranted (55 FR 22942), and, on April 5, 1991, it proposed to list Snake River sockeye as endangered under the ESA (56 FR 14055). Eight months later, NMFS finalized its proposed rule and listed Snake River sockeye salmon as an endangered species under the ESA (56 FR 58619, November 20, 1991). Critical habitat for Snake River sockeye salmon was designated on December 28, 1993 (58 FR 68543).

On September 12, 1994, NMFS announced its intention to conduct a more comprehensive status review for west coast sockeye salmon (*O. nerka*) in response to a petition filed by Professional Resource Organization-Salmon (PRO-Salmon) on March 14, 1994 (59 FR 46808). PRO-Salmon petitioned to list Baker River, Washington, sockeye as well as eight populations of other species of Pacific salmon under the ESA. In this notice, NMFS also requested information and data regarding the petitioned stocks, including west coast sockeye, in Idaho, Washington, Oregon, and California.

A NMFS Biological Review Team (BRT), consisted of staff from NMFS' Northwest Fisheries Science Center, completed a coast-wide status review for west coast sockeye salmon (Memorandum to W. Stelle from M. Schiewe, October 7, 1997, ''Status Review of Sockeye Salmon From Washington and Oregon''). Copies of the memorandum are available upon request (see **ADDRESSES**). Early drafts of the BRT review were distributed to state and tribal fisheries managers and peer reviewers who are experts in the field to ensure that NMFS' evaluation was accurate and complete. The review, summarized below, identifies six ESUs of sockeye salmon in Washington and describes the basis for the BRT's conclusions regarding the ESA status of each ESU. The BRT also provisionally identified three populations of sockeye salmon, Big Bear Creek in the Lake Washington Basin, riverine spawning populations in various Washington rivers, and the Deschutes River basin in Oregon, where insufficient information exists to (1) Define the ESU; (2) assess the abundance; or (3) analyze the risks facing the sockeye salmon population unit. Sockeye salmon do not presently occur in California, although they may have occured historically. Sockeye did occur historically in two Oregon basins, but presently only a remnant population of uncertain origin persists in the Deschutes River basin. A complete status review of west coast sockeye salmon will be published in a forthcoming NOAA Technical Memorandum.

The use of the term ''essential habitat'' within this document refers to critical habitat as defined by the ESA and should not be confused with the term Essential Fish Habitat (EFH) described and identified according to the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.*

Sockeye Salmon Life History

Sockeye salmon belong to the family Salmonidae and are one of seven species of Pacific salmonids in the genus *Oncorhynchus.* Sockeye salmon are anadromous, meaning they migrate from the ocean to spawn in fresh water. They are the third most abundant of the seven species of Pacific salmon, after pink and chum salmon. Unique in their appearance, the adult spawners typically turn bright red, with a green head, hence ''red'' salmon, as commonly called in Alaska. During the ocean and adult migratory phase sockeye often have a bluish back and silver sides, giving rise to another common name, ''bluebacks.'' The name ''sockeye'' is thought to have been a corruption of the various Indian tribes'' word ''sukkai.'' Sockeye salmon exhibit a wide variety of life history patterns that reflect varying dependency on the fresh water environment. With the exception of certain river-type and sea-type populations, the vast majority of sockeye salmon spawn in or near lakes, where the juveniles rear for 1 to 3 years prior to migrating to sea. For this reason, the major distribution and abundance of large sockeye salmon stocks are closely related to the location of rivers that have accessible lakes in their watersheds for juvenile rearing (Burgner, 1991). On the Pacific coast, sockeye salmon inhabit riverine, marine, and lake environments from the Columbia River and its tributaries north and west to the Kuskokwim River in western Alaska (Burgner, 1991). There are also *O. nerka* life forms that are non-anadromous, meaning that most members of the form spend their entire lives in freshwater. Non-anadromous *O. nerka* in the Pacific Northwest are known as kokanee. Occasionally, a proportion of the juveniles in an anadromous sockeye salmon population will remain in their rearing lake environment throughout life and will be observed on the spawning grounds together with their anadromous siblings. Ricker (1938) defined the terms ''residual sockeye'' and ''residuals'' to identify these resident, non-migratory progeny of anadromous sockeye salmon parents. Kokanee and residual or resident sockeye salmon are further discussed in the ''Status of Non-anadromous *O. nerka*'' section.

Among the Pacific salmon, sockeye salmon exhibit the greatest diversity in selection of spawning habitat and great variation in river entry timing and the duration of holding in lakes prior to spawning. The vast majority of sockeye salmon typically spawn in inlet or outlet tributaries of lakes or along the shoreline of lakes where upwelling of oxygenated water through gravel or sand occurs. However, they may also spawn in (1) suitable stream habitat between lakes, (2) along the nursery lakeshore on outwash fans of tributaries or where upwelling occurs along submerged beaches, and (3) along beaches where the gravel or rocky substrate is free of fine sediment and the eggs can be oxygenated by wind-driven water circulation. All of these spawning habitats may be used by these ''lake-type'' sockeye salmon.

Growth influences the duration of stay in the nursery lake and is influenced by intra- and interspecific competition, food supply, water temperature, thermal stratification, migratory movements to avoid predation, lake turbidity, and length of the growing season. Lake residence time usually increases the farther north a nursery lake is located. In Washington and British Columbia, lake residence is normally 1 or 2 years, whereas in Alaska some fish may remain 3 or, rarely, 4 years in the nursery lake, prior to smoltification (Burgner, 1991; Halupka et al., 1993).

Adaptation to a greater degree of utilization of lake environments for both adult spawning and juvenile rearing has resulted in the evolution of complex timing for incubation, fry emergence, spawning, and adult lake entry that often involves intricate patterns of adult and juvenile migration and orientation not seen in other *Oncorhynchus* species (Burgner, 1991).

Upon emergence from the substrate, sockeye salmon alevins exhibit a varied behavior that appears to reflect local adaptations to spawning and rearing habitat. For example, lake-type sockeye salmon juveniles move either downstream or upstream to rearing lakes. Periods of streambank holding are limited for most juvenile sockeye salmon, as emergents in streams above or between connecting lakes use the current to travel to the nursery lake. Predation on migrating sockeye salmon fry varies considerably with spawning location (lakeshore beach, creek, river, or spring area). Sockeye salmon fry mortality due to predation by other fish species and birds can be extensive during downstream and upstream migration to nursery lake habitat and is only partially reduced by the nocturnal migratory movement of some fry populations (Burgner, 1991). Juveniles emerging in streams downstream from a nursery lake can experience periods of particularly high predation compared with other juvenile sockeye. Juvenile sockeye salmon in lakes are visual predators, feeding on zooplankton and insect larvae (Foerster, 1968; Burgner, 1991). Smolt migration typically occurs between sunset and sunrise, beginning in late April and extending through early July, with southern stocks migrating the earliest.

Sockeye salmon also spawn in mainstem rivers without juvenile lake-rearing habitat (Foerster, 1968; Burgner, 1991). These are referred to as ''river-type'' and ''sea-type'' sockeye salmon. In areas where lake-rearing habitat is unavailable or inaccessible, sockeye salmon may utilize river and estuarine habitat for rearing or may forgo an extended freshwater rearing period and migrate to sea as underyearlings (Birtwell et al., 1987; Wood et al., 1987a; Heifitz et al., 1989; Murphy et al., 1988, 1989, and 1991; Lorenz and Eiler, 1989; Eiler et al., 1992; Levings et al., 1995; and Wood, 1995). Riverine spawners that rear in rivers for 1 or 2 years are termed ''river-type'' sockeye salmon. Riverine spawners that migrate as fry to sea or to lower river estuaries in the same year, following a brief freshwater rearing period of only a few months, are referred to as ''sea-type'' sockeye salmon. River-type and sea-type sockeye salmon are common in northern areas and may predominate over lake-type sockeye salmon in some river systems (Wood et al., 1987a; Eiler et al., 1988; Halupka et al., 1993; Wood, 1995).

Once in the ocean, sockeye salmon feed on copepods, euphausiids, amphipods, crustacean larvae, fish larvae, squid, and pteropods. The greatest increase in length is typically in the first year of ocean life, whereas the greatest increase in weight is during the second year. Northward migration of juveniles to the Gulf of Alaska occurs in a band relatively close to shore, and offshore movement of juveniles occurs in late autumn or winter. Among other Pacific salmon, sockeye salmon prefer cooler ocean conditions (Burgner, 1991). Lake- or river-type will spend from 1 to 4 years in the ocean before returning to freshwater to spawn.

Adult sockeye salmon home precisely to their natal stream or lake habitat (Hanamura, 1966; Quinn, 1985; and Quinn et al., 1987). Stream fidelity in sockeye salmon is thought to be adaptive, since this ensures that juveniles will encounter a suitable nursery lake. Wood (1995) inferred from protein electrophoresis data that river- and sea-type sockeye salmon have higher straying rates within river systems than lake-type sockeye salmon.

Consideration as a ''Species'' Under the ESA

To qualify for listing as a threatened or endangered species, the identified populations of sockeye salmon must be considered ''species'' under the ESA. The ESA defines a ''species'' to include ''any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.'' NMFS published a policy (56 FR 58612, November 20, 1991) describing how the agency will apply the ESA definition of ''species'' to anadromous salmonid species. This policy provides that a salmonid population will be considered distinct, and hence a species under the ESA, if it represents an ESU of the biological species. A population must satisfy two criteria to be considered an ESU: (1) It must be reproductively isolated from other conspecific population units, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute, but must be strong enough to permit evolutionarily important differences to accrue in different population units. The second criterion is met if the population contributes substantially to the ecological/genetic diversity of the species as a whole. Guidance on the application of this policy is contained in a scientific paper entitled ''Pacific Salmon (*Oncorhynchus* spp.) and the Definition of 'Species' Under the Endangered Species Act'' and a NOAA Technical Memorandum entitled ''Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon,'' which are available upon request (see **ADDRESSES**).

This **Federal Register** proposed rule summarizes biological and environmental information relevant to determining the nature and extent of sockeye salmon ESUs in the U.S. Pacific Northwest. The focus of this document is on populations in the contiguous United States; however, information from Asia, Alaska, and British Columbia was also considered to provide a broader context for interpreting results. Further, as ESU boundaries are based on biological and environmental information, they do not necessarily conform to state or national boundaries, such as the U.S./Canada border.

Status of Non-anadromous *O. nerka*

Within the range of west coast sockeye, there often exist populations of ''resident'' or ''residual'' non-anadromous sockeye salmon. Non-anadromous sockeye salmon are commonly referred to as ''kokanee'' and may also be called ''residual'' or ''resident sockeye salmon.'' Kokanee, for purposes of this proposed rule, are defined as the self-perpetuating, non-anadromous form of *O. nerka* that occurs in balanced sex-ratio populations and whose parents, for several generations back, have spent their whole lives in freshwater. Several native and introduced populations of kokanee within the geographic range of west coast sockeye salmon may be genetically distinct and reproductively isolated from one another and from other *O. nerka* populations. It has long been known that kokanee can produce anadromous fish. However, the number of outmigrants that successfully return as adults is typically quite low, as the sockeye salmon morphology appears to be absent on the kokanee spawning grounds in areas where there is relatively easy access to the ocean.

A portion of the juvenile anadromous sockeye salmon will occasionally remain in their lake rearing environment throughout life and will be observed on the spawning grounds together with their anadromous cohorts. These fish are defined as ''resident sockeye salmon'' to indicate that they are the progeny of anadromous sockeye salmon parents, spend their adult life in freshwater, but spawn together with their anadromous siblings.

In considering the ESU status of resident forms of *O. nerka*, the key issue is the evaluation of the strength and duration of reproductive isolation between resident and anadromous forms. Many kokanee populations appear to have been strongly isolated from sympatric sockeye salmon populations for long periods of time. Since the two forms experience very different selective regimes over their life cycle, reproductive isolation provides an opportunity for adaptive divergence in sympatry. Kokanee populations that fall in this category will generally be considered not part of the sockeye salmon ESUs. On the other hand, resident fish appear to be much more closely integrated into some sockeye salmon populations.

ESU Determinations

The ESU determinations described here represent a synthesis of a large amount of diverse information. In general, the proposed geographic boundaries for each ESU are supported by several different types of evidence. However, the diverse data sets are not always entirely congruent, and the proposed boundaries are not necessarily the only ones possible. In some cases, environmental changes occur over a transitional zone rather than abruptly.

Major types of information considered important by the NMFS BRT in evaluating ecological/genetic diversity included the following: (1) Physical features, such as physiography, geology, hydrology, and oceanic and climatic conditions; (2) biological features, including vegetation, ichthyogeography, zoogeography, and ''ecoregions'' identified by the U.S. Environmental Protection Agency; (3) life history information, such as distributions, patterns and timing of spawning and migration (adult and juvenile), fecundity and egg size, and growth and age characteristics; and (4) genetic evidence for reproductive isolation between populations or groups of populations. Genetic data (from protein electrophoresis and DNA markers) were the primary evidence considered for the reproductive isolation criterion. This evidence was supplemented by inferences about barriers to migration created by natural geographic features. Based on the examination of the best available scientific and commercial information, including the biological effects of human activities, NMFS has identified six ESUs of west coast sockeye salmon in this region that can be considered ''species'' under the ESA. A brief description of the six ESUs follows:

The ESUs identified by NMFS are the Okanogan River, Lake Wenatchee, Quinault Lake, Ozette Lake, Baker River, and Lake Pleasant. All of these ESUs are in Washington. Information required to determine the ESU status of sockeye salmon in Big Bear Creek in the Lake Washington Basin was inadequate. Sockeye salmon were seen spawning in rivers without lake rearing habitat in Washington, and sockeye salmon returned to the Deschutes River in Oregon.

(1) Okanogan River

This ESU consists of sockeye salmon that return to Lake Osoyoos through the Okanogan River via the Columbia River and spawn primarily in the Canadian section of the Okanogan River above Lake Osoyoos. The BRT distinguished Okanogan River sockeye based on (1) the very different rearing conditions encountered by juvenile sockeye salmon in Lake Osoyoos, (2) the tendency for a large percentage of 3-year-old returns to the Okanogan population, (3) the apparent 1-month separation in juvenile run-timing between Okanogan and Wenatchee-origin fish, and (4) the adaption of Okanogan River sockeye salmon to much higher temperatures during adult migration in the Okanogan River. Protein electrophoretic data also indicate that this population is genetically distinct from other sockeye salmon currently in the Columbia River drainage (Winans et al., 1996; Wood et al., 1996; and Thorgaard et al., 1995).

Sockeye salmon returns to Lake Osoyoos were severely depleted by the early 1900s (Davidson, 1966; Fulton, 1970) with returns to the Okanogan River in 1935, 1936 and 1937 amounting to 264, 895 and 2,162 sockeye salmon respectively (Washington Department of Fisheries (WDF) et al., 1938). The construction of Grand Coulee Dam, which completely blocked the passage of sockeye salmon to the upper Columbia River basin, had a major impact on sockeye salmon in the Okanogan River. To compensate for the loss of habitat resulting from the total blockage of up-river fish passage by Grand Coulee Dam, the Federal government initiated the Grand Coulee Fish Maintenance Project (GCFMP) in 1939 to maintain fish runs in the Columbia River above Rock Island Dam. Between 1939 and 1943 all sockeye salmon adults returning to Rock Island Dam were trapped and transported to either Lake Wenatchee or Lake Osoyoos, or to one of three national fish hatcheries (Leavenworth, Entiat, or Winthrop) for artificial propagation (Fish and Hanavan, 1948; Mullan, 1986). After 1944, all sockeye salmon passing Rock Island Dam and returning to the Wenatchee and Okanogan Rivers were essentially the progeny of relocated stock. Mullan (1986) showed that between 1944 and 1948, hatchery-reared sockeye salmon constituted 5 to 98 percent of the total run. By the mid-1960s, the contribution of hatchery fish as a percentage of all returning adult sockeye salmon had decreased to about 10 to 22 percent, about one-third of what it had been in the 1940s.

Releases from the GCFMP were thought to contribute to re-establishing healthy sockeye salmon populations in the Wenatchee and Okanogan River Basins (Chapman et al., 1995), as well as producing small populations in the Methow and Entiat Rivers, which previous to the GCFMP apparently did not have sockeye salmon populations (Mullan, 1986; Chapman et al., 1995).

The overall effect of the GCFMP on the current composition of sockeye salmon in this ESU is difficult to determine. Electrophoresis analysis of the current Okanogan River sockeye salmon reveals little affinity with any of the stocks of sockeye salmon introduced by that project or with kokanee currently residing in Lower Arrow Lake above Grand Coulee Dam. Artificial propagation efforts at the GCFMP hatcheries were abandoned in the 1960s due to ''low benefits to costs and catastrophic losses from Infectious Hemopoietic Necrosis [IHN]'' (Mullan, 1986).

Kokanee are reported to occur in Lake Osoyoos, and one known plant of 195,000 kokanee from an unknown source stock occurred in this lake in the years 1919–1920. Kokanee-sized fish, or residuals with a reportedly olive drab or ''typically dark'' coloration, respectively, have been observed spawning with sockeye in the Okanogan River. Genetic samples of kokanee-sized fish from Lake Osoyoos have not been obtained. However, kokanee from Okanogan Lake, above Vaseux Dam and Vaseux Lake on the Okanogan River, are genetically quite distinct from Okanogan River sockeye salmon (Wood et al., 1994; Thorgaard et al, 1995; Utter, 1995; Robison, 1995; and Winans et al., 1996).

The BRT concluded that, if ''kokanee-sized'' *O. nerka* observed spawning with sockeye salmon on the Okanogan River are identified as resident sockeye salmon, they are to be considered part of this sockeye salmon ESU. Based on the large genetic difference between Okanagan Lake kokanee and Okanogan River sockeye salmon, the BRT decided that Okanagan Lake kokanee are not part of the Okanogan sockeye salmon ESU (Note—The accepted spelling in Canada is Okanagan, and in the United States it is Okanogan. In this document Okanagan will be used when referring to geographic features in Canada and Okanogan when referring to geographic features in the U.S.) The BRT felt that spawning aggregations of sockeye that are occasionally observed downstream from Lake Osoyoos and below Enloe Dam on the Similkameen River are most likely wanderers from the Okanogan River population and are, therefore, to be considered part of this ESU.

(2) Lake Wenatchee

This ESU consists of sockeye salmon that return to Lake Wenatchee through the Wenatchee River via the Columbia River and spawn primarily in tributaries above Lake Wenatchee (the White River, Napeequa River, and Little Wenatchee River). Virtually all allozyme data indicate that, of the populations examined, the Lake Wenatchee sockeye salmon population is genetically very distinctive. The following constitute the genetic, environmental, and life history information in distinguishing this ESU: (1) Very different environmental conditions encountered by sockeye salmon in Lake Wenatchee compared with those in Lake Osoyoos, (2) the near absence of 3-year-old sockeye returns to Lake Wenatchee, and (3) the apparent 1-month separation in juvenile run-timing between Okanogan and Wenatchee-origin fish. Sockeye salmon in Lake Wenatchee were severely depleted by the early 1900s (Bryant and Parkhurst, 1950; Davidson 1966; and Fulton, 1970), with returns counted over Tumwater Dam on the Wenatchee River in 1935, 1936, and 1937 amounting to 889, 29 and 65 fish, respectively (WDF et al., 1938).

The overall effect of the GCFMP, described above, on the current make-up of sockeye salmon in this ESU is difficult to determine. The redistribution and long-term propagation of mixed Arrow Lakes, Okanogan, and Wenatchee stocks of sockeye salmon originally captured at Rock Island Dam, as well as introductions of Quinault Lake sockeye salmon stocks, may have altered the genetic make-up of indigenous sockeye salmon in the Lake Wenatchee system, particularly considering the low estimated returns of native sockeye salmon to Lake Wenatchee immediately prior to the beginning of the GCFMP. However, electrophoretic analysis of current Lake Wenatchee sockeye salmon reveals little affinity among Okanogan River sockeye salmon, Quinault Lake sockeye salmon or kokanee from Lower Arrow Lake.

Spawning aggregations of sockeye salmon that appear in the Entiat and Methow Rivers and in Icicle Creek (a tributary of the Wenatchee River) were presumed by the BRT to be non-native and the result of transplants carried on during the GCFMP. Both the Methow and Entiat Rivers had no history of sockeye salmon runs prior to stocking (WDF et al., 1938; Mullan, 1986). Leavenworth National Fish Hatchery is located on Icicle Creek, and, between 1942 and 1969, more than 1.5 million sockeye salmon juveniles (of mixed Columbia, Entiat, Methow Rivers heritage) were liberated from this facility into Icicle Creek (Mullan, 1986; Chapman et al., 1995).

Kokanee-sized fish with a reportedly olive drab coloration have been observed spawning with sockeye salmon in the White, Napeequa, and Little Wenatchee Rivers (LaVoy, 1995). More than 23 million Lake Whatcom kokanee were released in Lake Wenatchee between 1934 and 1983; however, the current genetic make-up of the Lake Wenatchee sockeye salmon population reveals little or no affinity with Lake Whatcom kokanee. Genetic samples of kokanee-sized fish from Lake Wenatchee have not been obtained.

The BRT concluded that, if ''kokanee-sized'' *O. nerka* observed spawning with sockeye salmon on the White and Little Wenatchee Rivers are identified as resident sockeye salmon, they are to be considered part of the Lake Wenatchee sockeye salmon ESU.

(3) Quinault Lake

This ESU consists of sockeye salmon that return to Quinault Lake and spawn in the mainstem of the upper Quinault River, in tributaries of the upper Quinault River, and in a few small tributaries of Quinault Lake itself. The BRT felt that Quinault Lake sockeye salmon deserved separate ESU status based on the unique life history characteristics and the degree of genetic differentiation from other sockeye salmon populations.

The distinctive early river-entry timing, protracted adult-run timing, long 3- to 10-month lake-residence period prior to spawning, unusually long spawn timing, and genetic differences from other coastal Washington sockeye salmon were important factors in identifying this ESU. In addition, the relative absence of red skin pigmentation and the presence of an olive-green spawning coloration by the majority of the Quinault stock appear to be unique among major sockeye salmon stocks in Washington (Storm et al., 1990; Boyer, Jr., 1995), although at least two sockeye salmon stocks in British Columbia appear more green than red at spawning (Wood, 1996). The rather large genetic difference between U.S. and Vancouver Island sockeye salmon, together with the apparently unique life-history characters of Quinault Lake sockeye salmon persuaded the BRT to exclude Vancouver Island stocks from this ESU.

Kokanee-sized *O. nerka* have not been identified within the Quinault River Basin.

(4) Ozette Lake

This ESU consists of sockeye salmon that return to Ozette Lake through the Ozette River and currently spawn primarily in lakeshore upwelling areas in Ozette Lake (particularly at Allen's Bay and Olsen's Beach). Minor spawning may occur below Ozette Lake in the Ozette River or in Coal Creek, a tributary of the Ozette River. Sockeye salmon do not presently spawn in tributary streams to Ozette Lake, although they may have spawned there historically. Genetics, environment, and life history were the primary factors in distinguishing this ESU. The BRT determined that Ozette Lake sockeye salmon were a separate ESU based on the degree of genetic differentiation from other sockeye salmon populations and on life history characteristics.

Ozette Lake sockeye salmon are genetically distinct from all other sockeye salmon stocks in the Northwest. Sockeye salmon stocks from west coast Vancouver Island were excluded from this ESU partly because of the large genetic difference between the two. On the other hand, Ozette Lake kokanee proved to be the most genetically distinct *O. nerka* stock examined in the contiguous United States. However, Ozette Lake kokanee were closely allied to several sockeye salmon stocks on Vancouver Island.

Kokanee are very numerous in Ozette Lake and spawn in inlet tributaries, whereas sockeye salmon spawn on lakeshore upwelling beaches. Sockeye have not been observed on the inlet spawning grounds of kokanee in Ozette Lake, although there are no physical barriers to prevent their entry into these tributaries. On the other hand, kokanee-sized *O. nerka* are observed together with sockeye salmon on the sockeye salmon spawning beaches at Allen's Bay and Olsen's Beach. One recorded plant of over 100,000 kokanee from an unknown source stock occurred in 1940, and anecdotal references of another kokanee plant in 1958 were found.

Based on the very large genetic difference between Ozette Lake kokanee that spawn in tributaries and Ozette Lake sockeye salmon that spawn on shoreline beaches, the BRT excluded Ozette Lake kokanee from this sockeye salmon ESU. In addition, the BRT concluded that, if ''kokanee-sized'' *O. nerka* observed spawning with sockeye salmon on sockeye salmon spawning beaches in Ozette Lake are identified as resident sockeye salmon, they are to be considered as part of the Ozette Lake sockeye salmon ESU.

(5) Baker River

This ESU consists of sockeye salmon that return to the barrier dam and fish trap on the lower Baker River after migrating through the Skagit River. They are trucked to one of three artificial spawning beaches above either one or two dams on the Baker River and are held in these enclosures until spawning.

The BRT felt that Baker River sockeye salmon are a separate ESU based on genetic, life-history, and environmental characteristics. Baker River sockeye salmon are genetically distinct from sockeye salmon populations that spawn in the lower Fraser River and are genetically distinct from all other native populations of Washington sockeye salmon. Prior to inundation behind Upper Baker Dam, Baker Lake was a typical cold, oligotrophic, well-oxygenated, glacially turbid sockeye salmon nursery lake, in contrast to other sockeye salmon systems under review, with the exception of Lake Wenatchee.

The Birdsview Hatchery population on Grandy Creek in the Skagit River Basin was established from Baker Lake sockeye salmon together with a probable mixture of Quinault Lake stock and an unknown Fraser River stock. This stock was the ultimate source for the apparently successful transplants of sockeye salmon to the Lake Washington/Lake Sammamish system in the mid-1930s to early 1940s (Royal and Seymour, 1940; Kolb, 1971).

Numerous reports indicate that residual or resident sockeye salmon began appearing in Baker Lake and Lake Shannon Reservoir following the installation of Lower Baker Dam in 1925 (Ward, 1929, 1930, 1932; Ricker, 1940; and Kemmerich, 1945). A spring-time recreational kokanee fishery exists in Baker Lake, although substantial aggregations of spawning kokanee have yet to be identified. The BRT found no historical records of kokanee stocking in Baker Lake. However, approximately 40 to 100 kokanee-sized *O. nerka* spawn each year in the outlet channel that drains the two upper sockeye salmon spawning beaches at Baker Lake.

(6) Lake Pleasant

A majority of the BRT concluded that Lake Pleasant sockeye salmon constituted a separate ESU, while a minority thought that insufficient information exists to accurately describe this ESU. Allozyme data for Lake Pleasant sockeye salmon indicate genetic distinctiveness from other sockeye salmon populations. Sockeye salmon in this population enter the Quillayute River in May through September and hold in the Sol Duc River before entering Lake Pleasant, usually in early November, when sufficient water depth is available in Lake Creek. Spawning occurs on beaches from late November to early January. Kemmerich (1945) indicated that native sockeye occurred in Lake Pleasant prior to 1932 and that they were of an ''individual size comparable with the size of the fish of the Lake Quinault and Columbia River runs;'' however, sockeye salmon currently in Lake Pleasant are said to be small, no bigger than 2 to 3 pounds (0.9 to 1.4 kg) (Haymes, 1995). Adult male and female Lake Pleasant sockeye have an average fork length of 460 mm or less for all ages combined, which is the smallest body size of any anadromous *O. nerka* population in the Pacific Northwest. In addition, in some brood years, a majority of Lake Pleasant sockeye salmon spend 2 years in freshwater prior to migrating to sea. More than 500,000 sockeye salmon fry from Baker Lake and the Birdsview Hatchery in the Skagit River Basin were released in Lake Pleasant in the 1930s; however, electrophoretic analysis of current Lake Pleasant sockeye salmon reveals little genetic affinity with Baker Lake sockeye salmon. It is assumed that the poisoning of Lake Pleasant during ''lake rehabilitation'' activities in the 1950s and 1960s may have impacted one or two broodyears of sockeye salmon in Lake Pleasant. Sockeye salmon escapement to Lake Pleasant was between 760 and 1,500 fish in the early 1960s, indicating that ''lake rehabilitation'' failed to eliminate sockeye salmon from this system. Although kokanee-sized *O. nerka* spawn together with sockeye salmon on the beaches in Lake Pleasant, the BRT found only anecdotal references to kokanee being stocked in Lake Pleasant during the 1930s.

The BRT concluded that, if ''kokanee-sized'' *O. nerka* observed spawning with sockeye salmon on sockeye salmon spawning beaches in Lake Pleasant are identified as resident sockeye salmon, they are to be considered part of the Lake Pleasant sockeye salmon ESU.

Other Sockeye Salmon Populations

(1) Big Bear Creek

The BRT did not describe the population of sockeye salmon that currently spawn in Big Bear Creek and its two tributaries, Cottage Lake and Evans Creeks. The BRT agreed that the available evidence does not clearly resolve this issue. In spite of various uncertainties, about half of the BRT felt that the current sockeye salmon population in Big Bear and Cottage Lake Creeks is a separate ESU that represents either an indigenous Lake Washington/Lake Sammamish sockeye salmon population or a native kokanee population that has naturally re-established anadromy. About half the BRT members felt that the available information was insufficient to describe the population of sockeye salmon in Big Bear Creek as an ESU. This issue is particularly difficult due to the equivocal nature of historical accounts concerning the presence and distribution of sockeye salmon within the Lake Washington/Lake Sammamish Basin.

Genetically, Big Bear and Cottage Lake Creek sockeye salmon are quite distinct from other stocks of sockeye salmon in the Lake Washington/Lake Sammamish Basin; they are genetically more similar to Okanogan River sockeye salmon than they are to any other sockeye salmon population examined. It was acknowledged that the genetic distinctiveness of the current Big Bear Creek/Cottage Lake Creek sockeye salmon, as revealed through analysis of allozyme data, could have resulted from genetic change following the recorded return of 2 adults in October 1940 after a transplant of Baker Lake stock sockeye salmon in 1937, or it could be indicative of a native population of *O. nerka* indigenous to the Lake Washington/Lake Sammamish Basin.

A native kokanee population once spawned in Big Bear Creek and its tributaries, although it is uncertain whether a remnant of this native stock still exists in this drainage. Big Bear Creek was once the largest producer of kokanee for artificial propagation in Washington, although relatively few kokanee currently spawn there. Currently a small number of kokanee-sized *O. nerka* spawn in Big Bear Creek together with sockeye salmon. The spawn timing of kokanee in Big Bear Creek is currently much later than the only remaining recognized native kokanee stock in the Lake Washington Basin (early entry Issaquah Creek kokanee). There were over 35 million Lake Whatcom kokanee fry released in Big Bear Creek between 1917 and 1969, and what effect this stocking program had on the native kokanee is open to speculation. In addition, potential genetic interactions of these introduced kokanee with sockeye salmon are unknown.

Based on the available data, the BRT determined that the Bear Creek sockeye salmon population unit did not meet the criteria necessary to be defined as an ESU.

(2) Riverine-Spawning Sockeye Salmon

Spawning ground survey data of the Washington Department of Fish and Wildlife and numerous anecdotal references dating back to the turn of the century indicate that riverine spawning aggregations of sockeye salmon exist in certain rivers within Washington that lack lake-rearing habitat. Consistent riverine spawning aggregations of sockeye salmon have been documented over a period of decades in the North and South Fork Nooksack, Skagit, Sauk, North Fork Stillaguamish, Samish (Hendrick, 1995), and Green Rivers. Riverine-spawning sockeye salmon have also been reported in the Nisqually, Skokomish, Dungeness, Calawah, Hoh, Queets, and Clearwater Rivers, and are occasionally seen in small numbers in a number of other rivers and streams in Washington.

Protein electrophoretic data for riverine-spawners from the Nooksack, upper Skagit, and Sauk Rivers indicate that these aggregations are genetically similar to one another and genetically distinct from other sockeye salmon in Washington.

The BRT considered five scenarios that might explain river spawning aggregations of sockeye salmon in Washington representing (1) multiple U.S. populations, (2) one U. S. population, (3) strays from U. S. lake-type sockeye, (4) strays from British Columbia lake-type sockeye salmon, and (5) strays from river-type populations in British Columbia. Genetic data for river-spawning sockeye salmon in the Nooksack, Skagit, and Sauk Rivers do not support scenario (3). The disjunct timing and geographic distance between individual aggregations of riverine-spawning sockeye salmon suggest that more than one process may be responsible for the occurrence of these aggregations.

The small size of the spawning aggregations of sockeye salmon periodically reported in rivers without lake-rearing habitat in Washington raises the question of historical population size and persistence of Pacific salmon over evolutionarily significant time scales. Because many populations of Pacific salmon show large temporal fluctuations in abundance, Waples (1991) argued in the NMFS ''Definition of Species'' paper that there must be some size below which a spawning population is unlikely to persist in isolation for a long period of time. The fact that small spawning aggregations are regularly observed may reflect a dynamic process of extinction, straying, and recolonization. Such small populations are unlikely to be ESU's, although a collection of them might be.

However, Waples went on to say that ''[i]n making this evaluation, the possibility should be considered that small populations observed at present are still in existence precisely because they evolved mechanisms for persisting at low abundance.'' (Waples, 1991)

The BRT acknowledged the evolutionary importance of existing river/sea-type sockeye in British Columbia and Alaska but felt that the evidence was insufficient to determine whether sockeye salmon seen in rivers without lake rearing habitat in Washington were distinct populations. Whether riverine-spawning sockeye in Washington can be defined as an ESU remains an open question.

(3) Deschutes River (Oregon)

The BRT concluded that sockeye salmon that historically migrated up the Deschutes River via the Columbia River to spawn in Suttle Lake were a separate ESU, but it is uncertain whether remnants of this ESU exist. Fish passage into and out of Suttle Lake was blocked sometime around 1930. Currently, sockeye adults that are consistently seen each year in the Deschutes River below the regulatory dam downstream from Pelton Dam may be derived from (1) a self-sustaining population of sockeye that spawn below Pelton Dam on the Deschutes River, (2) strays from elsewhere in the Columbia River, or (3) outmigration of smolts from populations of ''kokanee-sized'' *O. nerka* that exist above the Pelton/Round Butte Dam complex. Two kokanee populations are present above the dams, one population resides in Suttle Lake and spawns in the lake inlet stream (Link Creek), and a second population resides in Lake Billy Chinook, behind Round Butte Dam, and spawns in the upper Metolius River. Both kokanee populations have a distinctive blue-black body coloration that distinguishes them from hatchery kokanee that are released in Lake Simtustus and in other Deschutes River Basin lakes.

Allozyme data for Deschutes River sockeye salmon does not exist; however, mtDNA data (Brannon, 1996), suggests the possibility that Lake Billy Chinook kokanee and Deschutes River sockeye salmon are related. Protein electrophoretic data indicate that kokanee in Suttle Lake and in Lake Billy Chinook cluster together genetically (NMFS unpublished data). Over 1.2 million sockeye salmon were planted in the Metolius River and its tributaries before 1962, and a significant portion of the adult sockeye salmon returns recorded at the Pelton Dam fish trap, starting in 1956, may have been descended from these plantings.

The majority of the BRT concluded that a remnant component of this historical run cannot be identified with any certainty. A minority of the BRT felt that the extensive transplant history of non-native sockeye salmon into this basin explains the continued occurrence of anadromous *O. nerka* in the Deschutes River Basin and, as the descendants of transplants, these sockeye salmon are not an ESA issue. The majority of the BRT agreed that the possibility exists that recent sockeye salmon in the Deschutes River may result from some remnant migrants of residualized sockeye salmon or kokanee. Whether Deschutes River sockeye salmon can be described as an ESU remains an open question.

Status of Sockeye Salmon ESUs

The ESA defines the term ‘‘endangered species’’ as ‘‘any species which is in danger of extinction throughout all or a significant portion of its range.’’ The term ‘‘threatened species’’ is defined as ‘‘any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.’’ 16 U.S.C. § 1532 NMFS considers a variety of information in evaluating the level of risk faced by an ESU. Important considerations include (1) absolute numbers of fish and their spatial and temporal distributions, (2) current abundance in relation to historical abundance and carrying capacity of the habitat, (3) trends in abundance, based on indices such as dam or redd counts or on estimates of spawner-recruit ratios, (4) natural and human-influenced factors that cause variability in survival and abundance, (5) possible threats to genetic integrity (e.g., selective fisheries and interactions between hatchery and natural fish), and (6) recent events (e.g., a drought or a change in management) that have predictable short-term consequences for abundance of the ESU. Additional risk factors, such as disease prevalence or changes in life-history traits, may also be considered in evaluating risk to populations.

Previous Assessments

In considering the status of the ESUs, NMFS evaluated both qualitative and quantitative information.

Qualitative evaluations: These evaluations included aspects of several of the risk considerations outlined above, as well as recent, published assessments of population status by agencies or conservation groups of the status of west coast sockeye salmon stocks (Nehlsen et al., 1991; WDF et al., 1993). Nehlsen et al. (1991) considered salmonid stocks throughout Washington, Idaho, Oregon, and California and enumerated stocks found to be extinct or at risk of extinction. Stocks that do not appear in their summary were either not at risk of extinction or not classifiable due to insufficient information. They classified stocks as extinct, possibly extinct, at high risk of extinction, at moderate risk of extinction, or of special concern. They considered it likely that stocks at high risk of extinction have reached the threshold for classification as endangered under the ESA. Stocks were placed in this category if they had declined from historical levels and were continuing to decline, or had spawning escapements less than two hundred. Stocks were classified as at moderate risk of extinction if they had declined from historic levels but presently appear to be stable at a level above two hundred spawners. They felt that stocks in this category had reached the threshold for threatened under the ESA. They classified stocks as of special concern if a relatively minor disturbance could threaten them, insufficient data were available for them, they were influenced by large releases of hatchery fish, or they possessed some unique character. For sockeye salmon, they classified twenty-two stocks as follows: sixteen extinct, one possibly extinct, two high risk, one moderate risk, and two special concern.

WDF et al. (1993) categorized all salmon and steelhead stocks in Washington on the basis of stock origin (‘‘native,’’ ‘‘non-native,’’ ‘‘mixed,’’ or ‘‘unknown’’), production type (‘‘wild,’’ ‘‘composite,’’ or ‘‘unknown’’), and status (‘‘healthy,’’ ‘‘depressed,’’ ‘‘critical,’’ or ‘‘unknown’’). Status categories were defined as healthy: ‘‘experiencing production levels consistent with its available habitat and within the natural variations in survival for the stock;’’ depressed: ‘‘production is below expected levels . . . but above the level where permanent damage to the stock is likely;’’ and critical: ‘‘experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred.’’ Of the nine sockeye salmon stocks identified, three (Quinault, Wenatchee, and Okanogan) were classified as healthy, four (Cedar, Lake Washington and Sammamish Tributaries, Lake Washington Beach, and Ozette) as depressed, one (Baker) as critical, and one (Lake Pleasant) as unknown.

There are problems in applying results of these studies to ESA evaluations. One problem is the definition of categories used to classify stock status. Nehlsen et al. (1991) used categories intended to relate to ESA ‘‘threatened’’ or ‘‘endangered’’ status; however they applied their own interpretations of these terms to individual stocks, not to ESUs as defined here. WDF et al. (1993) used general terms describing status of stocks that cannot be directly related to the considerations important in ESA evaluations. For example, the WDF et al. (1993) definition of healthy could conceivably include a stock that is at substantial extinction risk due to loss of habitat, hatchery fish interactions, and/or environmental variation, although this does not appear to be the case for any west coast sockeye salmon stocks. Another problem is the selection of stocks or populations to include in the review. Nehlsen et al. (1991) did not evaluate, or even identify, stocks not perceived to be at risk, so it is difficult to determine the proportion of stocks they considered to be at risk in any given area. There is also disagreement regarding status of some stocks; for example, the Idaho Department of Fish and Game (IDFG) (1996) disagrees with Nehlsen et al’s (1991) classification of Alturas and Stanley Lakes’ populations as extinct.

Quantitative evaluations: This type of evaluation included comparisons of current and historical abundance of west coast sockeye salmon, calculation of recent trends in escapement, and evaluation of the proportion of natural spawning attributable to hatchery fish. Historical abundance information for these ESUs is largely anecdotal, although estimates based on commercial harvest are available for some coastal populations (Rounsefell and Kelez, 1938). Time series data were available for many populations, but data extent and quality varied among ESUs. NMFS compiled and analyzed this information to provide several summary statistics of natural spawning abundance, including (where available) recent total spawning run size and escapement, percent annual change in total escapement, recent naturally produced spawning run size and escapement, and average percentage of natural spawners that were of hatchery origin. Information on harvest and stock abundance was compiled from a variety of state, Federal, and tribal agency records (Foy et al., 1995a, b). Additional data were provided directly to NMFS by state and tribal agencies and private organizations. NMFS believes these records to be complete in terms of long-term adult abundance for sockeye salmon in the region covered. Principal data sources were adult counts at dams or weirs and spawner surveys.

Computed statistics: To represent current run size or escapement where recent data were available, NMFS computed the geometric mean of the most recent 5 years reported (or fewer years if the data series is shorter than 5 years), while trying to use only estimates that reflect the total abundance for an entire river basin or tributary, avoiding index counts or dam counts that represent only a small portion of available habitat.

Where adequate data were available, trends in total escapement (or run size if escapement data were not available) were calculated for all data sets with more than 7 years of data, based on total escapement or an escapement index (such as fish per mile from a stream survey). Separate trends were estimated for each full data series and for the 1985–1994 period within each data series. As an indication of overall trend in individual sockeye salmon populations, NMFS calculated average (over the available data series) percent annual change in adult spawner indices within each river basin. No attempt was made to account for the influence of hatchery produced fish on these estimates, so the estimated trends include the progeny of natural spawning hatchery fish.

The following summaries draw on these quantitative and qualitative assessments to describe NMFS' conclusions regarding the status of each steelhead ESU. Aspects of several of these risk considerations are common to all sockeye salmon ESUs. These are discussed in general below for each ESU, and more specific discussion can be found in the status review. After evaluating patterns of abundance and other risk factors for sockeye salmon from these ESUs, the BRT reached the following conclusions.

Risk Assessment Conclusions

NMFS has determined that, if recent conditions continue into the future, one ESU (Ozette Lake) is likely to become endangered, and three ESUs (Okanogan River, Lake Wenatchee, and Quinault Lake) may not come under significant danger of becoming extinct or endangered. For the sixth ESU (Lake Pleasant), there was insufficient information to reach a conclusion regarding risk of extinction. NMFS also proposes to add Baker River sockeye to the list of candidate species in order to further review its status and the efficacy of existing conservation efforts.

Consideration was also given to the status of the three sockeye salmon population units which had not been defined as ESUs. For one of these (riverine-spawning sockeye salmon in Washington) there was insufficient information to reach any conclusions regarding risk of extinction. For the other two population units (Bear Creek and Deschutes River sockeye salmon), NMFS concluded that Bear Creek sockeye salmon were not in danger of extinction nor likely to become endangered within the foreseeable future, but NMFS concluded that the anadromous component of the Deschutes River sockeye salmon population unit is clearly in danger of extinction if not already extinct.

The following paragraphs summarize the conclusions for each ESU or other population unit. These conclusions are tempered by uncertainties in certain critical information. For several units, there are kokanee (either native or introduced) populations using the same water bodies as sockeye salmon; potential interbreeding and ecological interactions could affect population dynamics and (in the case of non-native kokanee) genetic integrity of the sockeye salmon populations. With few exceptions, adult abundance data do not represent direct counts of adults destined to a single spawning area, so estimates of total population abundance and trends in abundance must be interpreted with some caution.

(1) Okanogan River

The major abundance data series for Okanogan River sockeye salmon consist of spawner surveys conducted in the Okanogan River above Lake Osoyoos since the late 1940s, counts of adults passing Wells Dam since 1967, and records of tribal harvest (Colville and Okanogan) since the late 1940s. Longer term data were available for dams lower on the Columbia River (notably Rock Island Dam counts starting in 1933), but these counts represent a combination of this ESU with the Wenatchee population and other historical ESUs from the upper Columbia River above Grand Coulee Dam.

Blockage and disruption of freshwater habitat pose some risk for this ESU. Adult passage is blocked by dams above Lake Osoyoos, prohibiting access to former habitat in Vaseux, Skaha, and Okanagan Lakes (Chapman et al., 1995). (However, it is not known whether sockeye salmon in these upper lakes belonged to the same ESU as those in Lake Osoyoos.) Other problems in the Okanogan River include inadequately screened water diversions and high summer water temperatures (Chapman et al., 1995) and channelization of spawning habitat in Canada. Mullan (1986) stated that hydroelectric dams accounted for the general decline of sockeye salmon in the mainstem Columbia River, while Chapman et al. (1995) suggested that hydropower dams have "probably" reduced runs of sockeye salmon to the Columbia River, particularly to Lake Osoyoos.

The most recent 5-year average annual escapement for this ESU was about 11,000 adults, based on 1992–1996 counts at Wells Dam. No historical abundance estimates specific to this ESU are available. However, analyses conducted in the late 1930s indicated that less than 15 percent of the total sockeye run in the upper Columbia River went into Lakes Osoyoos and Wenatchee (Chapman et al., 1995). At that time, the total run to Rock Island Dam averaged about 15,000, suggesting a combined total of less than 2,250 adults returning to the Okanogan River and Lake Wenatchee ESUs. Thus, abundance for the Okanogan River ESU during the late 1930s was clearly substantially lower than recent abundance. Trend estimates for this stock differ depending on the data series used, but the recent (1986–1995) trend has been steeply downward (declining at 2 to 20 percent per year); however, this trend is heavily influenced by high abundance in 1985 and low points in 1990, 1994, and 1995, which may reflect environmental fluctuations. The long-term trend (since 1960) for this stock has been relatively flat (−3 to +2 percent annual change).

For the entire Columbia River basin, there has been a considerable decline in sockeye salmon abundance since the turn of the century. Columbia River commercial sockeye salmon landings that commonly exceeded 1,000,000 pounds in the late 1800s and early 1900s had been reduced to about 150,000 pounds by the late 1980s (Technical Advisory Committee (TAC), 1991). Since 1988, harvest has been fewer than 3,500 fish each year. The TAC (1991) attributes this decline to habitat degradation and blockage, overharvest, hydroelectric development, and nursery lake management practices. The two remaining productive stocks (Okanogan and Wenatchee) occupy less than 4 percent of historical nursery lake habitat in the upper Columbia River basin.

Both Okanogan and Wenatchee runs have been highly variable over time. For harvest purposes, these two ESUs are managed as a single unit, with an escapement goal of 65,000 adults returning to Priest Rapids Dam (TAC, 1991). This goal has been achieved only ten times since 1970 and has been met in 2 years between 1992 and 1996. Examination of the historical trend in total sockeye salmon escapement to the upper Columbia River shows very low abundance (averaging less than 20,000 annually) during the 1930s and early 1940s, followed by an increase to well over 100,000 per year in the mid-1950s. Since the mid-1940s, abundance has fluctuated widely, with noticeable low points reached in 1949, 1961–62, 1978, and 1994. The escapement of about 9,000 fish to Priest Rapids Dam in 1995 was the lowest since 1945, but 1996 escapement (preliminary estimate, Fish Passage Center 1996) was considerably higher, although still far below the goal. Escapement to Wells Dam (i.e., this ESU) was at its lowest recorded value in 1994, but increased in both 1995 and 1996.

Past and present artificial propagation of sockeye salmon poses some risk to the genetic integrity of this ESU. The GCFMP interbred fish from this ESU with those from adjacent basins for several years, with unknown impacts on the genetic composition of this ESU. Current artificial propagation efforts use local stocks and are designed to maintain genetic diversity, but there is some risk of genetic change resulting from domestication. There is only one record of introduction of sockeye salmon from outside the Columbia River Basin into this ESU: 395,420 mixed Quinault Lake/Rock Island Dam stock released in 1942 (Mullan, 1986). Records of kokanee transplants are most likely incomplete.

In previous assessments of this stock, Nehlsen et al. (1991) considered Okanogan River sockeye salmon to be of special concern because of ‘‘present or threatened destruction, modification, or curtailment of its habitat or range,’’ including mainstem passage, flow, and predation problems, whereas WDF et al. (1993) classified this stock as of native origin, wild production, and healthy status, but WDFW (1996) suggested that this ‘‘native’’ classification will be changed to ‘‘mixed’’ in the future.

Low abundance, downward trends and wide fluctuations in abundance, land use practices, and variable ocean productivity were perceived as resulting in low to moderate or increasing risk for this ESU. Other major concerns regarding health of this ESU were restriction and channelization of spawning habitat in Canada, hydro system impediments to migration, and high water temperature problems in the lower Okanogan River.

Positive indicators for the ESU were escapement above 10,000, which is probably a substantial fraction of historical abundance, and the limited amount of recent hatchery production within the ESU. Recent changes in hydro system management (increases in flow and spill in the mainstem Columbia River) and harvest management (restrictions in commercial harvest to protect Snake River sockeye salmon) were regarded as beneficial to the status of this ESU. NMFS concluded unanimously that the Okanogan River sockeye salmon ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. However, the very low returns in the three most recent years suggest that the status of this ESU bears close monitoring and its status should be reconsidered if abundance remains low.

(2) Lake Wenatchee

The major abundance data series for Wenatchee River sockeye salmon consist of spawner surveys conducted in the Little Wenatchee River and the White River since the late 1940s, counts of adults passing Tumwater Dam (sporadic counts 1935 to present), and reconstructions based on adult passage counts at Priest Rapids, Rock Island, and Rocky Reach Dams (early 1960s to present). Longer term data are available for dams lower on the Columbia River (notably Rock Island Dam counts starting in 1933), but these counts represent a combination of this ESU with the Okanogan River ESU and other historical potential ESUs from the upper Columbia River above Grand Coulee Dam.

There are no substantial blockages of sockeye salmon habitat in the Wenatchee basin, and habitat condition in the basin is generally regarded as good, although production is limited by the oligotrophic nature of Lake Wenatchee (Chapman et al., 1995). Mullan (1986) and Chapman et al. (1995) concluded that the main freshwater habitat problem presently facing this ESU is hydropower dams in the mainstem Columbia River, which have probably reduced the runs of sockeye salmon.

The most recent 5-year average annual escapement for this ESU was about 19,000 adults, based on the 1992–1996 difference in adult passage counts at Priest Rapids and Rocky Reach Dams. No historical abundance estimates specific to this ESU are available. However, as discussed above for the Okanogan River ESU, abundance of the Lake Wenatchee ESU during the late 1930s was clearly substantially lower than recent abundance. The recent (1986–1995) trend in abundance has been downward (declining at 10 percent per year), but this trend is heavily influenced by 2 years of very low abundance in 1994 and 1995. The long-term (1961–1996) trend for this stock is flat. Escapement to this ESU in 1995 (counts at Priest Rapids Dam minus those at Rocky Reach Dam) was the lowest since counting began in 1962, but 1996 escapement was somewhat higher. Other risk factors common to this ESU and other Columbia River Basin sockeye salmon populations were discussed under the Okanogan River ESU above.

Past and present artificial propagation of sockeye salmon poses some risk to the genetic integrity of this ESU. As for the Okanogan River ESU, the GCFMP interbred fish from this ESU with those from adjacent basins for several years and introduced many sockeye salmon descended from Quinault Lake stock (Mullan 1986), with unknown impacts on the genetic composition of this ESU. Current artificial propagation efforts use local stocks and are designed to maintain natural genetic diversity, but there is some risk of genetic change resulting from domestication. Hatchery-raised kokanee have been released in Lake Wenatchee, including native Lake Wenatchee stock and non-native Lake Whatcom stock (Mullan, 1986). The effect of Lake Whatcom kokanee introductions on the genetic integrity of this ESU is unknown.

Previous assessments of this ESU are similar to those for the Okanogan River ESU. Nehlsen et al. (1991) considered Wenatchee River sockeye salmon to be of special concern because of ‘‘present or threatened destruction, modification, or curtailment of its habitat or range,’’ including mainstem passage, flow, and predation problems. WDF et al. (1993) classified this stock as of mixed origin, wild production, and healthy status. Huntington et al. (1996) identified this stock as ''healthy—Level I,'' indicating that current abundance is high relative to what would be expected without human impacts.

Low abundance, downward trends and wide fluctuations in abundance, and variable ocean productivity were perceived as resulting in low to moderate risk for the ESU. Other major concerns regarding the health of this ESU were the effects of hatchery production, hydro system impediments to migration, and potential interbreeding with non-native kokanee on genetic integrity of the unit.

Positive indicators for the ESU were escapement above 10,000 and the limited amount of recent hatchery production within the ESU. Recent changes in hydro system management (increases in flow and spill in the mainstem Columbia River) and harvest management (restrictions in commercial harvest to protect Snake River sockeye salmon) were regarded as beneficial to the status of this ESU. Based on this information, NMFS concluded that the Lake Wenatchee sockeye salmon ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. However, on the basis of extremely low abundance in the 3 most recent years, NMFS concluded that this ESU bears close monitoring and its status should be reconsidered if abundance remains low.

(3) Quinault Lake

The major abundance data series for Quinault River sockeye salmon consists of escapement estimates derived from hydroacoustic surveys conducted in Quinault Lake since the mid-1970s, supplemented with earlier estimates (beginning in 1967) based on spawner surveys. The most recent (1991–1995) 5-year average annual escapement for this ESU was about 32,000 adults, with a run size of about 39,000. Approximate historical estimates indicate escapements ranging between 20,000 and 250,000 in the early 1920s, and run sizes ranging between 50,000 and 500,000 in the early 1900s (Rounsefell and Kelez, 1938). Comparison of these estimates indicates that recent abundance is probably near the lower end of the historical abundance range for this ESU.

This ESU has been substantially affected by habitat problems, notably those resulting from forest management activities in the upper watershed outside Olympic National Park. Early inhabitants of the area described the upper Quinault River as flowing between narrow, heavily wooded banks, but, by the 1920s, the river was in a wide valley with frequent course changes and much siltation and scouring of gravels during winter and spring freshets (Davidson and Barnaby, 1936; Quinault Indian Nation (QIN), 1981); resultant loss of spawning habitat in the Quinault River above Quinault Lake has continued to recent times (QIN, 1981).

While stock abundance has fluctuated considerably over time (recent escapements ranging from a low of 7,500 in 1970 to 69,000 in 1968), overall trend has been relatively flat. For the full data series (1967–1995), abundance has increased by an average of about 1 percent per year; for the 1986–1995 period, abundance declined by about 3 percent per year.

Artificial propagation of sockeye salmon in the Quinault River basin has a long history. Releases have been primarily native Quinault Lake stock, although Alaskan sockeye salmon eggs were brought into the system prior to 1920. The genetic effects of this introduction are unknown. Since 1973, all releases have been of local stock, but there is some risk of genetic change resulting from unnatural selective pressures.

In previous assessments, Nehlsen et al. (1991) did not identify Quinault Lake sockeye salmon as at risk, and WDF et al. (1993) classified this stock as of native origin, wild production, and healthy status.

All risk factors were perceived as very low or low for this ESU. However, NMFS had two concerns about the overall health of this ESU. The ESU is presently near the lower end of its historical abundance range, a fact that may be largely attributed to severe habitat degradation in the upper river that contributes to poor spawning habitat quality and possible impacts on juvenile rearing habitat in Quinault Lake. The influence of hatchery production on genetic integrity is also a potential concern for the ESU.

On the positive side, NMFS noted that recent escapement averaged above 30,000; harvest management has been responsive to stock status; and recent restrictions in logging to protect terrestrial species should have a beneficial effect on habitat conditions. The NMFS concluded unanimously that the Quinault Lake sockeye salmon ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future.

(4) Ozette Lake

The major abundance data series for Ozette River sockeye salmon consist of escapement estimates derived from counts at a weir located at the outlet of Ozette Lake. Counting has occurred in most years since 1977 (Dlugokenski et al., 1981; WDF et al., 1993). The most recent (1992–1996) 5-year average annual escapement for this ESU was about 700. Historical estimates indicate run sizes of a few thousand sockeye salmon in 1926 (Rounsefell and Kelez, 1938), with a peak recorded harvest of nearly 18,000 in 1949 (WDF, 1974). Subsequently, commercial harvest declined steeply to only a few hundred fish in the mid-1960s and was ended in 1974. A small ceremonial and subsistence fishery continued up until 1981 (Dlugokenski et al., 1981); there has been no direct fishery on this stock since 1982 (WDF et al., 1993). Assuming that Ozette River harvest consisted of sockeye salmon destined to spawn in this system, comparison of these estimates indicates that recent abundance is substantially below the historical abundance range for this ESU.

A recent National Park Service Technical Report (Jacobs et al., 1996) reported the conclusions of a review panel concerning the status and management of sockeye salmon in Ozette Lake. The panel was unanimous in expressing great concern about the future of this population, but was unable to identify a single set of factors contributing to the population decline. The panel concluded that declines were likely the result of a contribution of factors, possibly including introduced species, predation, loss of tributary populations, decline in quality of beach-spawning habitat, temporarily unfavorable oceanic conditions, excessive historical harvests, and introduced diseases. They felt that intra- and inter-specific competition was unlikely as a contributing factor.

Harvest of sockeye salmon in the Ozette River fluctuated considerably over time, which would indicate similar fluctuations in spawner abundance if harvest rates were fairly constant. Based on the full weir-count series (1977–1995), abundance has decreased by an average of about 3 percent per year; for the 1986–1995 period, the decrease averaged 10 percent per year. However, in recent years the stock has exhibited dominance by a single brood cycle returning every 4 years (1984, 1988, 1992, 1996), and this dominant cycle has remained stable between 1,700 and 2,200 adults; declines are apparent only in the smaller returns during off-cycle years.

Artificial propagation has not been extensive in this basin, but many of the releases have been non-indigenous stocks. Genetic effects of these introductions are unknown. Recent hatchery production in Ozette Lake has been primarily from local stock, with the exception of 120,000 Quinault Lake sockeye salmon juveniles released in 1983. The release of 14,398 kokanee/ sockeye salmon hybrids in 1991–1992 (Makah Fisheries Management Department, 1995; Nuclear Regulatory Commission, 1995) may have had deleterious effects on genetic integrity of the ESU because Ozette Lake kokanee are genetically dissimilar to Ozette Lake sockeye salmon.

In previous assessments, Nehlsen et al. (1991) identified Ozette sockeye salmon as at moderate risk of extinction, citing logging and overfishing in the 1940s and 1950s as major causes of the decline. WDF et al. (1993) classified this stock as of native origin, wild production, and depressed status.

Perceived risks ranged from low to moderate for genetic integrity and variable ocean productivity, from low to moderate and increasing for downward trends and population fluctuations, and from moderate to increasing for abundance considerations. Current escapements averaging below 1,000 adults per year imply a moderate degree of risk from small-population genetic and demographic variability, with little room for further declines before abundances would be critically low. Other concerns include siltation of beach spawning habitat, very low abundance compared to harvest in the 1950s, and potential genetic effects of present hatchery production and past interbreeding with genetically dissimilar kokanee. NMFS concluded that the Ozette Lake sockeye salmon ESU is not presently in danger of extinction, but, if present conditions continue into the future, it is likely to become so in the foreseeable future.

(5) Baker River

The major abundance data series for Baker River sockeye salmon consist of escapement estimates derived from counts of adults arriving at a trap below Lower Baker Dam beginning in 1926. The most recent 5-year average annual escapement for this ESU was about 2,700 adults. Historical estimates indicate escapements to average 20,000 near the turn of the century, with a pre-dam low of 5,000 in 1916 (Rounsefell and Kelez, 1938), although WDFW data suggest that the 20,000 figure is a peak value, not an average (Sprague, 1996a). Comparison of these estimates indicates that recent average abundance is probably near the lower end of the historical abundance range for this ESU. However escapement in 1994 (16,000 fish) was near the turn-of-the-century average.

Currently, spawning is restricted to artificial spawning ''beaches'' at the upper end of Baker Lake (in operation since 1957) and just below Upper Baker Dam (beach constructed in 1990). Spawning on the beaches is natural, and fry are released to rear in Baker Lake. Before 1925, sockeye salmon had free access to Baker Lake and its tributaries. Lower Baker Dam (constructed 1925) created Lake Shannon and blocked access to this area, but passage structures were provided. Upper Baker Dam, completed in 1959, increased the size of Baker Lake, inundating most natural spawning habitat; this was mitigated by construction of artificial spawning beaches. In most years, all returning adults are trapped below Lower Baker Dam and transported to the artificial beaches, with no spawning occurring in natural habitat (WDF et al., 1993). The only recent exception to this was in 1994, when the large number of returning adults exceeded artificial habitat capacity, and excess spawners were allowed to enter Baker Lake and its tributaries (Ames, 1995). At the time of this report, no quantitative reports regarding offspring resulting from this spawning ''experiment'' are available (WDFW 1996).

The artificial nature of spawning habitat, the use of net-pens for juvenile rearing, and reliance on artificial upstream and downstream transportation pose a certain degree of risk to the ESU. These human interventions in the life cycle have undoubtedly changed selective pressures on the population from those under which it evolved its presumably unique characteristics, and thus pose some risk to the long-term evolutionary potential of the ESU. There have been continuing potential problems with siltation at the newer (lower) spawning beach (WDF et al., 1993), and recent proposals to close the two upper beaches in favor of production at the lower beach would thus be likely to increase the risk of spawning failure in some years. The future use of the upper beaches is uncertain (WDFW, 1996). Problems with operations of downstream smolt bypass systems have been documented, and there may be limitations to juvenile sockeye production due to lake productivity and interactions with other salmonids (WDF et al., 1993). Infectious haematopoietic necrosis (IHN) has also been a recent problem for this stock (Sprague, 1995).

Artificial production in this ESU began in 1896 with a state hatchery on Baker Lake; hatchery efforts at Baker Lake ended in 1933, by which time the hatchery was being operated by the U.S. Bureau of Fisheries. Current propagation efforts rely primarily on the spawning beaches and net-pen rearing. Lake Whatcom kokanee were recently introduced to Lake Shannon (Knutzen, 1995). Genetic consequences of these releases and rearing programs are unknown, but there is some risk of genetic change resulting from unnatural selective pressures.

In previous assessments, Nehlsen et al. (1991) identified Baker River sockeye salmon as at high risk of extinction, and WDF et al. (1993) classified this stock as of native origin, artificial production, and critical status.

NMFS had several concerns about the overall health of this ESU, focusing on high fluctuations in abundance, lack of natural spawning habitat, and the vulnerability of spawning beaches to water quality problems. Large fluctuations in abundance were a substantial concern. It is also likely that this stock would go extinct if present human intervention were halted and problems related to that intervention pose some risk to the population. In particular, NMFS concluded that the proposed change in management to concentrate spawning in a single spawning beach could substantially increase risk to the population related to abundance and habitat capacity and to water quality and disease. NMFS concluded that the Baker sockeye salmon ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future if present conditions continue. However, because of lack of natural spawning habitat and the vulnerability of the entire population to problems in artificial habitats, NMFS concluded that this ESU bears close monitoring and its status should be reconsidered if abundance remains low. Therefore, NMFS proposes to add the Baker River Sockeye ESU to the list of candidate species.

(6) Lake Pleasant

Although no recent complete escapement estimates are available for this stock, NMFS recently received some spawner-survey data for the period 1987 to 1996 (Mosley, 1995; Tierney, 1997). Peak spawner counts ranged from a low of 90 (1991—a year with limited sampling) to highs above 2,000 (1987 and 1992). Abundance fluctuated widely during this period, with a slight negative trend overall.

Complete counts at a trapping station on Lake Creek in the early 1960s showed escapements of sockeye salmon ranging from 763 to 1,485 fish, and 65,000 sockeye salmon smolts were reported to have outmigrated in 1958 (Crutchfield et al. 1965). This stock supports small sport and tribal commercial fisheries, with probably fewer than 100 fish caught per year in each fishery (WDF et al., 1993). Sockeye salmon from Grandy Creek stock were released in 1933 and 1937; no sockeye salmon have been introduced since then.

In previous assessments, Nehlsen et al. (1991) did not identify Lake Pleasant sockeye salmon as at risk, and WDF et al. (1993) classified this stock as of native origin, wild production, and unknown status.

Although escapement monitoring data are sparse, escapements (represented by peak spawner counts) in the late 1980s and 1990s appear roughly comparable to habitat capacity for this small lake. Some concerns were expressed regarding potential urbanization of habitat and effects of sport harvest during the migration delay in the Sol Duc River. It was noted that recent restrictions in logging to protect terrestrial species should have a beneficial effect on habitat conditions, although little or no old growth forest is present in the watershed.

NMFS concluded that there was insufficient information to adequately assess extinction risk for the Lake Pleasant ESU.

Analyses of Biological Information for Other Population Units

While the units discussed below are not presently considered to constitute ESUs, NMFS briefly examined available information regarding population status and extinction risk. Three other sockeye salmon stocks (Cedar River, Issaquah Creek, and Lake Washington beach spawners) are apparently introduced from outside the Lake Washington drainage and have not been included in a recognized ESU at this time.

(1) Big Bear Creek

Abundance data for Big Bear Creek sockeye salmon are derived from spawner surveys conducted by WDFW from 1982 to the present (WDF et al., 1993; Ames, 1996). The most recent (1991–1995) 5-year average annual escapement for this unit was about 11,400 adults. No historical estimates are available, but comparing habitat areas in these basins with other sockeye salmon populations suggests that current production is probably a substantial proportion of freshwater habitat capacity. Habitat in this basin is subject to effects of urbanization.

Stock abundance has fluctuated considerably over time, with recent escapements ranging from a low of 1,800 in 1989 to 39,700 in 1994. There has been little overall trend in this unit; for the full data series (1982–1995), abundance has decreased by an average of about 7 percent per year; for the 1986–1995 period, abundance decreased by about 4 percent per year. 1995 escapement was the second lowest on record, but 1994 was the highest.

Releases of non-native sockeye salmon in this area have occurred on Big Bear and North Creeks (tributaries of the Sammamish River), using Grandy Creek stock from the Skagit River and Cultus Lake stock from British Columbia, respectively. There have been extensive introductions of kokanee in this area, a substantial proportion of which were from Lake Whatcom. Genetic interactions of these kokanee with sockeye salmon are unknown.

In previous assessments, Nehlsen et al. (1991) did not identify this stock as at risk, and WDF et al. (1993) classified this stock as of unknown origin, wild production, and depressed status.

NMFS felt that the extreme fluctuations in recent abundances and potential effects of urbanization in the watershed suggest that the status of this populations bears close monitoring. Recent average abundance has been relatively high, with escapement between 10,000 and 20,000. Recent development of a county growth management plan was seen as a possible benefit to freshwater habitat for this population. NMFS concluded that, if the Big Bear Creek sockeye salmon were determined to be an ESU, it would not be presently in danger of extinction, nor is it likely to become endangered in the foreseeable future if present conditions continue.

(2) Riverine Spawning Sockeye Salmon

Beyond WDFW Salmon Spawning Ground Survey Data (Egan, 1977, 1995, 1997) and anecdotal reports of small numbers of sockeye salmon observed regularly spawning in some of the Puget Sound and coastal Washington rivers with no access to lake rearing habitat, NMFS has no information on overall abundance or trends for these stocks. Thus, there was insufficient information to reach any conclusion regarding the status of this sockeye salmon population unit.

(3) Deschutes River (Oregon)

Counts of sockeye salmon adults reaching Pelton Dam on the Deschutes River have been made during most years since the mid-1950s. The most recent (1990–1994) 5-year average annual escapement was only 9 adults. No accurate estimates of historical abundance are available for this unit, but a substantial run is known to have spawned in Suttle Lake prior to construction of a dam in the 1930s, and is believed to have continued to spawn in the Metolius River after that time (Columbia Basin Fish and Wildlife Authority (CBFWA), 1990; Olsen et al., 1994; and Oregon Department of Fish and Wildlife, 1995a). Since construction of Pelton Dam, abundance has reached peaks of about 300 fish in several years (1962, 1963, 1973, 1976—Fish Commission of Oregon, 1967, O'Connor et al., 1993). NMFS has made no evaluation of abundance of kokanee in the Deschutes River basin, which may be part of the same evolutionary unit as sockeye salmon in this basin. Sockeye salmon derived from the GCFMP were introduced into Suttle Lake and the Metolius River between 1937 and 1961.

Sockeye salmon stock abundance has fluctuated considerably over time (recent escapements ranging from a low of 1 in 1993 to 340 in 1963), but there has been a substantial decline over the years for which data are available. For the full data series (1957–1994), abundance decreased by an average of about 3 percent per year; for the 1985–1994 period, abundance declined by about 13 percent per year. Nehlsen et al. (1991) identified Deschutes River sockeye as at high risk of extinction.

NMFS concluded that, if anadromous sockeye salmon recently seen in the lower Deschutes River are remnants of the historical Deschutes River ESU, then the ESU clearly is in danger of extinction due to extremely low population abundance. If there is an ESU that includes sockeye salmon and native kokanee above Round Butte Dam, further evaluation of the kokanee stock and its relationship to the sockeye salmon would need to be completed before any conclusions regarding extinction risk could be made. If these sockeye salmon originated from stocks outside the Deschutes River Basin, they are not subject to protection under the ESA. NMFS will need additional information pertaining to the origin of this sockeye salmon population unit to make a conclusion in this case.

Existing Protective Efforts

Under section 4(b)(1)(A) of the ESA, the Secretary of Commerce is required to make listing determinations solely on the basis of the best scientific and commercial data available and after taking into account state or local efforts being made to protect a species. Under section 4(a)(1)(D) of the ESA, the Secretary must also evaluate, among other things, existing regulatory mechanisms. During the status review for west coast steelhead and for other salmonids, NMFS reviewed protective efforts ranging in scope from regional strategies to local watershed initiatives. NMFS has summarized some of the major efforts in a document entitled ''Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead under the Endangered Species Act.'' (NMFS, 1996). Many of these efforts have also significant potential for promoting the conservation of west coast sockeye salmon. This document is available upon request (see **ADDRESSES**). Some of the principal efforts within the range of sockeye salmon populations reviewed in this proposed rule, and those that specifically affect Ozette Lake sockeye salmon, are described briefly in this section.

Northwest Forest Plan

The Northwest Forest Plan (NFP) is a Federal interagency cooperative program, signed and implemented in April 1994 and documented in the Record of Decision for Amendments to U.S. Forest Service (USFS) and in Bureau of Land Management (BLM) Planning Documents Within the Range of the Spotted Owl. The NFP represents a coordinated ecosystem management strategy for Federal lands administered by the USFS and BLM within the range of the Northern spotted owl (which overlaps to some extent with the range of sockeye salmon). The NFP region-wide management direction either amended or was incorporated into approximately 26 land and resource management plans (LRMPs) and two regional guides.

The most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy (ACS), a regional scale aquatic ecosystem conservation strategy that includes the following: (1) Special land allocations, such as key watersheds, riparian reserves, and late-successional reserves, to provide aquatic habitat refugia; (2) special requirements for project planning and design in the form of standards and guidelines; and (3) new watershed analysis, watershed restoration, and monitoring processes. These ACS components collectively ensure that Federal land management actions achieve a set of nine ACS objectives, which include salmon habitat conservation. In recognition of over 300 ''at-risk'' Pacific salmonid stocks within the NFP area (Nehlsen *et al*,. 1991), the ACS was developed by aquatic scientists, with NMFS participation, to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The ACS strives to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and to restore currently degraded habitats. The approach seeks to prevent further degradation and to restore habitat on Federal lands over broad landscapes.

Washington Wild Stock Restoration Initiative

In 1991, the Washington treaty tribes, Washington Department of Fisheries, and Washington Department of Wildlife created this initiative to address wild stock status and recovery. The first step in this initiative was to develop an inventory of the status of all salmon and steelhead stocks which was completed in 1993 with publication of the Salmon and Steelhead Stock Inventory report. Based on this report, the state and tribes have identified several salmon stocks in ''critical'' condition and have prioritized the development of recovery and management plans for them. The final stage of implementing the policy will be plans to monitor and evaluate the success of individual recovery efforts.

Washington Wild Salmonid Policy

The Washington State Legislature passed a bill in June of 1993, (ESHB 1309) which required WDFW, in conjunction with Indian tribes, to develop wild salmonid policies that ''ensure that department actions and programs are consistent with the goals of rebuilding wild stock populations to levels that permit commercial and recreational fishing opportunities.'' The joint policy will provide broad management principles and guidelines for habitat protection, escapement objectives, harvest management, genetic conservation, and other management issues related to both anadromous and resident salmonids. The joint policy will be used as the basis to review and modify current management goals, objectives, and strategies related to wild stocks. A final Environmental Impact Statement, which analyzes the environmental effects of the proposed policy, has been adopted by the Washington Fish and Wildlife Commission, and WDFW is scheduled to consider final action on the policy in the near future. Once the policy is adopted, full reviews of hatchery and harvest programs are planned to ensure consistency with the policy.

Baker River Committee

This ad hoc group of co-managers and private utilities was formed in 1985 in response to record low returns of adult sockeye returning to Baker River. The committee's mandate is to arrest the precipitous decline in coho and sockeye salmon populations in the Baker River system. Their goal is to restore these populations, as well as to successfully restore steelhead populations in the Baker River watershed. Members of the committee include state, Federal, tribal and private land managers, fisheries agencies and licensees. The committee has implemented conservation measures that have likely contributed to the highest adult and juvenile abundance since the period before the dams were constructed in this watershed.

Harvest Restrictions

The peak harvest of sockeye salmon in the Ozette Lake area was 18,000 fish in 1949 (WDF 1974). Commercial harvest ended in 1974, and since 1982, there has not been any directed harvest on Ozette lake sockeye salmon.

NMFS concludes that the existing protective efforts described above are inadequate to alter the proposed status determination for the Lake Ozette sockeye salmon ESU. However, during the period between publication of this proposed rule and of a final rule, NMFS will continue to solicit information regarding protective efforts (see Public Comments Solicited) and will work with Federal, state, and tribal fisheries managers to evaluate the efficacy of the various salmonid conservation efforts. If, during this process, NMFS determines existing protective efforts are likely to affect the status of Ozette Lake sockeye salmon, NMFS may modify this listing proposal.

Summary of Factors Affecting the Species

Species may be determined to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the ESA. NMFS has determined that all of these factors have played a role in the decline of west coast sockeye salmon, in particular the destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors. The following discussion summarizes findings regarding factors for decline across the range of west coast sockeye. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific ESUs. For example, impacts from hydropower development are more pervasive for ESUs in the upper Columbia River Basin than for some coastal ESUs. For a detailed review of factors affecting all Pacific salmonids, please refer to the NMFS report: Factors For Decline: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act, August, 1996 (see **ADDRESSES**).

Sockeye salmon on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90 percent of the historical riparian habitat has been eliminated. Further, it has been estimated that, during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded. Washington and Oregon's wetlands are estimated to have diminished by one-third. Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast sockeye salmon.

Sockeye salmon have supported important commercial fisheries through much of their range (recreational fisheries are also significant in parts of their range). Harvest restrictions to protect sockeye in the Columbia River Basin have reduced harvest rates for these sockeye. Sockeye salmon from the Washington coast and Puget Sound are harvested in Puget Sound and nearshore fisheries targeting larger sockeye populations originating in British Columbia.

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous river and lake systems, thereby increasing the level of predation experienced by salmonids. Predation by marine mammals is also of concern in areas experiencing dwindling sockeye run sizes.

Natural climatic conditions have served to exacerbate the problems associated with degraded and altered riverine and estuarine habitats. Persistent drought conditions have reduced the already limited spawning, rearing, and migration habitat. Further, climatic conditions appear to have resulted in decreased ocean productivity which, during more productive periods, may help (to a small degree) offset degraded freshwater habitat conditions.

In an attempt to mitigate the loss of habitat, extensive hatchery programs have been implemented throughout the range of sockeye on the West Coast. While some of these programs have been successful in providing fishing opportunities, the impacts of these programs on native, naturally reproducing stocks are not well understood. Competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly reduce the production and survival of naturally spawned sockeye. Furthermore, collection of native sockeye for hatchery broodstock purposes may result in additional negative impacts to small or dwindling natural populations. In limited cases, artificial propagation can play an important role in sockeye recovery, and some hatchery populations may be deemed essential for the recovery of threatened or endangered sockeye ESUs. In addition, alternative uses of supplementation, such as for the creation of terminal fisheries, must be fully explored to try to limit negative impacts to remaining natural populations. This use must be tempered with the understanding that protecting naturally spawned sockeye and their habitats is critical to maintaining healthy, fully functioning ecosystems.

Specific Factors for Decline Affecting Ozette Lake Sockeye

Three studies have been undertaken to evaluate habitat-related factors limiting production of sockeye salmon in Ozette Lake. The U. S. Fish and Wildlife Service conducted studies of the decline in this stock during the 1970s, culminating in a report describing limiting factors and outlining a restoration plan (Dlugokenski et al., 1981). This report noted that this population formerly spawned in tributaries but presently uses only the lakeshore, and that food supply, competition, and predation in the lake are probably not limiting, but that siltation has caused cementing of spawning gravels in tributaries. Dlugokenski et al. (1981) suspected that sedimentation, resulting primarily from logging and associated road building coupled with log truck traffic on weak siltstone roadbeds, has led to decreased hatching success of sockeye salmon in tributary creeks and creek outwash fans in Ozette Lake. The authors concluded (p. 43) that ''a combination of overfishing and habitat degradation have reduced the sockeye population to its current level of less than 1,000 fish.''

More recently, Blum (1988) conducted an assessment of the same problems and concluded that ''the absence of tributary spawners is the paramount problem explaining why sockeye runs have not increased following the cessation of terminal-area fishing in 1973.'' He cited three main problems related to road-building and logging that limit spawning habitat: increased magnitude and frequency of peak flows, stream-bed scouring, and degraded water quality. He also noted that ''the logging of the watershed was so extensive that stream spawning and rearing conditions are still questionable, despite having 35 years to recover.''

Finally, Beauchamp et al. (1995) examined patterns of prey, predator, and competitor abundance in Ozette Lake as potential limiting factors for juvenile production of sockeye salmon and kokanee. They concluded that competition is unlikely to limit production but that predation could be a limiting factor; however, data on piscivore abundance were lacking, so the authors could not evaluate predation impact accurately.

A total of 13 species of fish occur in Ozette Lake. Dlugokenski et al. (1981) and Blum (1984) listed potential competitors with sockeye salmon juveniles in Ozette Lake, including kokanee, red sided shiner, northern squawfish, yellow perch, and peamouth. Potential predators listed by these same authors included cutthroat trout, northern squawfish, and prickly sculpin. Beauchamp et al. (1995) showed that competition is unlikely to limit the sockeye salmon population in Ozette Lake; however, predation on juvenile sockeye salmon, which was 25 times greater by individual cutthroat trout than by individual squawfish, may be limiting, although total predator abundance has yet to be assessed.

Harbor seals migrate up the Ozette River into Ozette Lake and have been seen feeding on adult sockeye salmon off the spawning beaches in Ozette Lake. The numbers of seals and of salmon taken by each seal is unknown. Seal predation on sockeye salmon at the river mouth and during the salmon's migration up the Ozette River may also be occurring. The upriver migration of harbor seals to feed on adult sockeye occurs commonly in British Columbia, occurring 100 miles upriver on the Fraser River at Harrison Lake and up to 200 miles inland on the Skeena River (Foerster, 1968). Sockeye migrate up to Ozette Lake in less than 48 hours, and the majority of the adults travel at night (Jacobs et al., 1996). Given the precarious state of west coast sockeye salmon stocks, including Ozette Lake, any marine mammal predation may have a significant effect on particular stocks, and these effects need to be more fully understood.

Outside that portion in Olympic National Park, virtually the entire watershed of Ozette Lake has been logged (Blum, 1988). A combination of past overfishing and spawning habitat degradation associated with timber harvest and road building, have been cited as major causes of this stock's decline (Bortleson and Dion, 1979; Dlugokenski et al., 1981; Blum, 1988; and WDF et al., 1993). McHenry et al. (1994) found that fine sediments (<0.85 mm) averaged 18.7 percent in Ozette Lake tributaries (although these levels may be partly attributable to the occurrence of sandstones, siltstones, and mudstones in this basin) and that fine sediment levels were consistently higher in logged watersheds than in unlogged watersheds on the Olympic Peninsula, as a whole.

Currently, spawning is restricted to submerged beaches where upwelling occurs along the lakeshore or to tributary outwash fans (Dlugokenski et al., 1981; WDF et al., 1993). Spawning has been variously reported to occur from mid-to late-November to early February (WDF et al., 1993) and from late November to early April (Dlugokenski et al., 1981). Dlugokenski et al. (1981) suggested that discreet sub-populations may be present in the lake, as evidenced by disjunct spawning times between beach spawners in different parts of the lake.

During low water levels in summer, much of the beach habitat may become exposed (Bortleson and Dion, 1979). The exotic plant, reed canary grass, has been encroaching on sockeye spawning beaches in Ozette Lake, particularly on the shoreline north of Umbrella Creek, where sockeye spawning has not occurred for several years. This plant survives overwinter submergence in up to 3 feet of water and may possibly provide cover for predators of sockeye salmon fry (Meyer, 1996). Suitable lakeshore spawning habitat for sockeye salmon is reported to be extremely limited in Ozette Lake (Blum, 1984; Pauley et al., 1989).

High water temperatures in Ozette Lake and River and low water flows in the summer may create a thermal block to migration and influence timing of sockeye migration (LaRiviere, 1991). Water temperatures in late-July and August in the Ozette River near the lake outlet have exceeded the temperature range over which sockeye are known to migrate (Meyer, 1996).

Proposed Determination

The ESA defines an endangered species as any species in danger of extinction throughout all or a significant portion of its range, and a threatened species as any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Section 4(b)(1) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species.

Based on results from its coast-wide assessment, NMFS has determined that there are six ESUs of sockeye salmon that constitute ''species'' under the ESA (Snake River, Idaho sockeye salmon were previously listed as an endangered species under the ESA). NMFS has determined that the Ozette Lake, Washington, sockeye salmon is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and, therefore, should be added to the list of threatened and endangered species as a threatened species. The geographic boundaries for this ESU are described under ''ESU Determinations.''

In the Ozette Lake ESU, only naturally spawned sockeye are being proposed for listing. Prior to the final listing determination, NMFS will examine the relationship between hatchery and natural populations of sockeye in this ESU and assess whether any hatchery populations are essential for its recovery. This may result in the inclusion of specific hatchery populations as part of a listed ESU in NMFS' final determination.

In addition, NMFS is proposing to list only anadromous life forms of *O. nerka* at this time due to uncertainties regarding the relationship between resident kokanee or residual sockeye salmon and sockeye. Prior to the final listing determination, NMFS will seek additional information on this issue and work with the U.S. Fish and Wildlife Service and fisheries co-managers to better define the relationship between resident and anadromous *O. nerka* in the ESU proposed for listing.

Additionally, NMFS proposes to add the Baker River Sockeye ESU to the list of candidate species because, while there is not sufficient information available at this time to indicate that Baker River sockeye warrant protection under the ESA, NMFS has identified specific risk factors and concerns that require further consideration prior to making a final determination on the overall health of the ESU. NMFS believes it is important to highlight candidate species so that Federal and state agencies, Native American tribes, and the private sector are aware of which species could benefit from proactive conservation efforts.

Prohibitions and Protective Regulations

Section 4(d) of the ESA requires NMFS to issue protective regulations that it finds necessary and advisable to provide for the conservation of a threatened species. Section 9(a) of the ESA prohibits violations of protective regulations for threatened species promulgated under section 4(d). The 4(d) protective regulations may prohibit, with respect to the threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. NMFS intends to have final 4(d) protective regulations in effect at the time of a final listing determination on the Ozette Lake sockeye salmon ESU. The process for completing the 4(d) rule will provide the opportunity for public comment on the proposed protective regulations.

In the case of threatened species, NMFS also has flexibility under section 4(d) to tailor the protective regulations based on the contents of available conservation measures. Even though existing conservation efforts and plans are not sufficient to preclude the need for listing at this time, they are nevertheless valuable for improving watershed health and restoring fishery resources. In those cases where well-developed and reliable conservation plans exist, NMFS may choose to incorporate them into the recovery planning process, starting with the protective regulations. NMFS has already adopted 4(d) protective regulations that exempt a limited range of activities from section 9 take prohibitions. For example, the interim 4(d) rule for Southern Oregon/Northern California coho salmon (62 FR 38479, July 18, 1997) exempts habitat restoration activities conducted in accordance with approved plans and fisheries conducted in accordance with an approved state management plan. In the future, 4(d) rules may contain limited take prohibitions applicable to activities such as forestry, agriculture, and road construction when such activities are conducted in accordance with approved conservation plans.

These are all examples where NMFS may apply modified section 9 prohibitions in light of the protections provided in a strong conservation plan. There may be other circumstances as well in which NMFS would use the flexibility of section 4(d). For example, in some cases there may be a healthy population of salmon or steelhead within an overall ESU that is listed. In such a case, it may not be necessary to apply the full range of prohibitions available in section 9. NMFS intends to use the flexibility of the ESA to respond appropriately to the biological condition of each ESU and to the strength of efforts to protect them.

Section 7(a)(4) of the ESA requires that Federal agencies confer with NMFS on any actions likely to jeopardize the continued existence of a species proposed for listing and on actions likely to result in the destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) of the ESA requires Federal agencies to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with NMFS (see Activities that May Affect Critical Habitat).

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's ''taking'' prohibitions (see regulations at 50 CFR 222.22 through 222.24). Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) conducting research that involves a directed take of listed species.

NMFS has issued section 10(a)(1)(A) research or enhancement permits for other listed species (e.g., Snake River chinook salmon and Sacramento River winter-run chinook salmon) for a number of activities, including trapping and tagging, electroshocking to determine population presence and abundance, removal of fish from irrigation ditches, and collection of adult fish for artificial propagation programs. NMFS is aware of several sampling efforts for chum salmon in the proposed ESUs, including efforts by Federal and state fishery management agencies. These and other research efforts could provide critical information regarding sockeye salmon distribution and population abundance.

Section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities performing activities that may incidentally take listed species. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the operation and release of artificially propagated fish by state or privately operated and funded hatcheries, state or university research on species other than sockeye salmon, not receiving Federal authorization or funding, the implementation of state fishing regulations, and timber harvest activities on non-Federal lands.

Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the ESA include recognition, recovery actions, Federal agency consultation requirements, and prohibitions on taking. Recognition through listing promotes public awareness and conservation actions by Federal, state, tribal, and local agencies, private organizations, and individuals.

Several conservation efforts are underway that may reverse the decline of west coast sockeye salmon and other salmonids (see Existing Protective Efforts). NMFS is encouraged by these significant efforts, which could provide all stakeholders with an approach to achieving the purposes of the ESA—protecting and restoring native fish populations and the ecosystems upon which they depend—that is less regulatory. NMFS will continue to encourage and support these initiatives as important components of recovery planning for sockeye salmon and other salmonids. Based on information presented in this proposed rule, general conservation measures that could be implemented to help conserve the species are listed here. This list does not constitute NMFS' interpretation of a recovery plan under section 4(f) of the ESA.

1. Measures could be taken to promote land management practices that protect and restore sockeye habitat. Land management practices affecting sockeye habitat include timber harvest, road building, agriculture, livestock grazing, and urban development.

2. Evaluation of existing harvest regulations could identify any changes necessary to protect sockeye populations.

3. Artificial propagation programs could be modified to minimize impacts upon native populations of sockeye.

4. Water diversions could have adequate headgate and staff gauge structures installed to control and monitor water usage accurately. Water rights could be enforced to prevent irrigators from exceeding the amount of water to which they are legally entitled.

5. Irrigation diversions affecting downstream migrating sockeye could be screened. A thorough review of the impact of irrigation diversions on sockeye could be conducted.

NMFS recognizes that, to be successful, protective regulations and recovery programs for sockeye will need to be developed in the context of conserving aquatic ecosystem health. NMFS intends that Federal lands and Federal activities play a primary role in preserving listed populations and the ecosystems upon which they depend. However, throughout the range of the ESU proposed for listing, sockeye habitat occurs and can be affected by activities on state, tribal or private land. Agricultural, timber, and urban management activities on nonfederal land could and should be conducted in a manner that avoids adverse effects to sockeye habitat.

NMFS encourages nonfederal landowners to assess the impacts of their actions on potentially threatened or endangered salmonids. In particular, NMFS encourages the formulation of watershed partnerships to promote conservation in accordance with ecosystem principles. These partnerships will be successful only if state, tribal, and local governments, landowner representatives, and Federal and nonfederal biologists participate and share the goal of restoring sockeye to the watersheds.

Definition of Critical Habitat

Critical habitat is defined in section 3(5)(A) of the ESA as ''(i) the specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species . . . upon a determination by the Secretary that such areas are essential for the conservation of the species.'' The term ''conservation,'' as defined in section 3(3) of the ESA, means ''. . . to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.''

In designating critical habitat, NMFS considers the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of this species (See 50 CFR 424.12(b)). In addition to these factors, NMFS focuses within the designated area on the known physical and biological features (primary constituent elements) that are essential to the conservation of the species and may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation (See 50 CFR 424.12(b)).

Consideration of Economic and Other Factors

The economic and other impacts of a critical habitat designation have been considered and evaluated in this proposed rulemaking. NMFS identified present and anticipated activities that may adversely modify the area(s) being considered or be affected by a designation. An area may be excluded from a critical habitat designation if NMFS determines that the overall benefits of exclusion outweigh the benefits of designation, unless the exclusion will result in the extinction of the species (See 16 U.S.C. 1533(b)(2)).

The impacts considered in this analysis are only those incremental impacts specifically resulting from a critical habitat designation, above the economic and other impacts attributable to listing the species, or resulting from other authorities. Since listing a species under the ESA provides significant protection to a species' habitat, in many cases, the economic and other impacts resulting from the critical habitat designation, over and above the impacts of the listing itself, are minimal (see Significance of Designating Critical Habitat section of this proposed rule). In general, the designation of critical habitat highlights geographical areas of concern and reinforces the substantive protection resulting from the listing itself.

Impacts attributable to listing include those resulting from the ''take'' prohibitions contained in section 9 of the ESA and associated regulations. ''Take,'' as defined in the ESA means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (See 16 U.S.C. 1532(19)). Harm can occur through destruction or modification of habitat (whether or not designated as critical) that significantly impairs essential behaviors, including breeding, feeding, rearing or migration.

Significance of Designating Critical Habitat

The designation of critical habitat does not, in and of itself, restrict human activities within an area or mandate any specific management or recovery actions. A critical habitat designation contributes to species conservation primarily by identifying important areas and by describing the features within those areas that are essential to the species, thus alerting public and private entities to the area's importance. Under the ESA, the only regulatory impact of a critical habitat designation is through the provisions of section 7. Section 7 applies only to actions with Federal involvement (e.g., authorized, funded, or conducted by a Federal agency) and does not affect exclusively state or private activities.

Under the section 7 provisions, a designation of critical habitat would require Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to destroy or adversely modify designated critical habitat. Activities that destroy or adversely modify critical habitat are defined as those actions that ''appreciably diminish the value of critical habitat for both the survival and recovery'' of the species (See 50 CFR 402.02). Regardless of a critical habitat designation, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of the listed species. Activities that jeopardize a species are defined as those actions that ''reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery'' of the species (See 50 CFR 402.02). Using these definitions, activities that would destroy or adversely modify critical habitat would also be likely to jeopardize the species. Therefore, the protection provided by a critical habitat designation generally duplicates the protection provided under the section 7 jeopardy provision. Critical habitat may provide additional benefits to a species in cases where areas outside the species' current range have been designated. When actions may affect these areas, Federal agencies are required to consult with NMFS under section 7 (see 50 CFR 402.14(a)), which may not have been recognized but for the critical habitat designation.

A designation of critical habitat provides a clear indication to Federal agencies as to when section 7 consultation is required, particularly in cases where the action would not result in immediate mortality, injury, or harm to individuals of a listed species (e.g., an action occurring within the critical area when a migratory species is not present). The critical habitat designation, describing the essential features of the habitat, also assists in determining which activities conducted outside the designated area are subject to section 7, i.e., activities that may affect essential features of the designated area.

A critical habitat designation will also assist Federal agencies in planning future actions, since the designation establishes, in advance, those habitats that will be given special consideration in section 7 consultations. With a designation of critical habitat, potential conflicts between Federal actions and endangered or threatened species can be identified and possibly avoided early in the agency's planning process.

Another indirect benefit of a critical habitat designation is that it helps focus Federal, state, and private conservation and management efforts in such areas. Management efforts may address special considerations needed in critical habitat areas, including conservation regulations to restrict private as well as Federal activities. The economic and other impacts of these actions would be considered at the time of those proposed regulations and, therefore, are not considered in the critical habitat designation process. Other Federal, state, and local management programs, such as zoning or wetlands and riparian lands protection, may also provide special protection for critical habitat areas.

Process for Designating Critical Habitat

Developing a proposed critical habitat designation involves three main considerations. First, the biological needs of the species are evaluated and essential habitat areas and features are identified. If alternative areas exist that would provide for the conservation of the species, such alternatives are also identified. Second, the need for special management considerations or protection of the area(s) or features are evaluated. Finally, the probable economic and other impacts of designating these essential areas as ''critical habitat'' are evaluated. The final critical habitat designation, considering comments on the proposal and impacts assessment, is typically published within 1 year of the proposed rule. Final critical habitat designations may be revised, using the same process, as new information becomes available.

Critical Habitat of Sockeye Salmon Proposed for Listing

As described in the section Sockeye Salmon Life History, the current geographic range of sockeye salmon includes vast areas of the North Pacific ocean, near shore marine zone, and extensive estuarine and riverine areas. Any attempt to describe the current distribution of sockeye salmon must take into account the fact that extant populations and densities are a small fraction of historical levels.

Within the range of Ozette Lake sockeye salmon, their life cycle can be separated into five essential habitat types: (1) Juvenile summer and winter rearing areas; (2) Juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Areas (1) and (5) are often located in lakeshore areas, while areas (2) and (4) include these areas as well as small tributaries, mainstem reaches and estuarine zones. Growth and development to adulthood occurs primarily in near- and offshore marine waters (area (3)), although final maturation takes place in freshwater tributaries when the adults return to spawn. Within these areas, essential features of sockeye salmon critical habitat include adequate: (1) Substrate; (2) water quality; (3) water quantity; (4) water temperature; (5) water velocity; (6) cover/shelter; (7) food; (8) riparian vegetation; (9) space; and (10) safe passage conditions. Given the large geographic range occupied by Ozette Lake sockeye salmon and the diverse habitat types used by the various life stages, it is not practical to describe specific values or conditions for each of these essential habitat features. However, good summaries of these environmental parameters and freshwater factors that have contributed to the decline of this and other salmonids can be found in reviews by the California Department of Fish and Game (1965), CACSST (1988), Brown and Moyle (1991), Bjornn and Reiser (1991), Nehlsen et al. (1991), Higgins et al. (1992), the California State Lands Commission (1993), Botkin et al. (1995), NMFS (1996) and Spence et al. (1996).

NMFS believes that the current freshwater and estuarine range of the species encompasses all essential habitat features and is adequate to ensure the species' conservation. Therefore, designation of habitat areas outside the species' current range is not necessary. Habitat quality in this current range is intrinsically related to the quality of upland areas and inaccessible headwater or intermittent streams which provide key habitat elements (e.g., large woody debris, gravel, water quality) crucial for sockeye salmon in downstream reaches and lake areas. NMFS recognizes that estuarine habitats are critical for sockeye salmon and has included them in this designation. Marine habitats (i.e., oceanic or near shore areas seaward of the mouth of coastal rivers) are also vital to the species, and ocean conditions are believed to have a major influence on sockeye salmon survival. However, no need appears to exist for special management consideration or protection of this habitat. Therefore, NMFS is not proposing to designate critical habitat in marine areas at this time. If additional information becomes available that supports the inclusion of such areas, NMFS may revise this designation.

Based on consideration of the best available information regarding the species' current distribution, NMFS believes that the preferred approach to identifying critical habitat is to designate all areas (and their adjacent riparian zones) accessible to the species within the range of Ozette Lake sockeye. NMFS believes that adopting a more inclusive, watershed-based description of critical habitat is appropriate because it (1) recognizes the species' use of diverse habitats and underscores the need to account for all of the habitat types supporting the species' freshwater and estuarine life stages, (2) takes into account the natural variability in habitat use that makes precise mapping difficult, and (3) reinforces the important linkage between aquatic areas and adjacent riparian/upslope areas.

An array of management issues encompass these habitats, and special management considerations will need to be made, especially on lands and streams under Federal ownership. While marine areas are also a critical link in this cycle, NMFS does not believe that special management considerations are needed to conserve the habitat features in these areas. Hence, only the freshwater and estuarine areas are being proposed for critical habitat at this time.

Need for Special Management Considerations or Protection

In order to assure that the essential areas and features are maintained or restored, special management may be needed. Activities that may require special management considerations for freshwater and estuarine life stages of Ozette Lake sockeye include, but are not limited to (1) land management, (2) timber harvest, (3) point and non-point water pollution, (4) livestock grazing, (5) habitat restoration, (6) irrigation water withdrawals and returns, (7) mining, (8) road construction, (9) dam operation and maintenance, (10) recreational activities, and (11) dredge and fill activities. Not all of these activities are necessarily of current concern within the Ozette Lake watershed; however, they indicate the potential types of activities that will require consultation in the future. No special management considerations have been identified for Ozette Lake sockeye while they are residing in the ocean environment.

Activities That May Affect Critical Habitat

A wide range of activities may affect the essential habitat requirements of Ozette Lake sockeye. These activities may include water and land management actions of Federal agencies (i.e., National Park Service, U.S. Army Corps of Engineers, the Federal Highway Administration, and the Bureau of Indian Affairs) and related or similar actions of other federally regulated projects and lands by the Bureau of Indian Affairs; road building activities authorized by the Federal Highway Administration or Bureau of Indian Affairs; and dredge and fill, mining, and bank stabilization activities authorized or conducted by the U.S. Army Corps of Engineers. These activities may also include mining and road building activities authorized by Washington State.

The Federal agencies that will most likely be affected by this critical habitat designation include the National Park Service, U.S. Army Corps of Engineers, Bureau of Indian Affairs, and the Federal Highway Administration. This designation will provide clear notification to these agencies, private entities, and to the public of critical habitat designated for Ozette Lake sockeye and the boundaries of the habitat and protection provided for that habitat by the section 7 consultation process. This designation will also assist these agencies and others in evaluating the potential effects of their activities on Ozette Lake sockeye and their critical habitat and in determining when consultation with NMFS is appropriate.

Expected Economic Impacts

The economic impacts to be considered in a critical habitat designation are the incremental effects of critical habitat designation above the economic impacts attributable to listing or to authorities other than the ESA (see Consideration of Economic and Other Factors section of this proposed rule). Incremental impacts result from special management activities in areas outside the present distribution of the listed species that have been determined to be essential to the conservation of the species. However, NMFS has determined that the species' present freshwater and estuarine range contains sufficient habitat for conservation of the species. Therefore, the economic impacts associated with this critical habitat designation are expected to be minimal.

The U.S. Forest Service, National Park Service, and Army Corps of Engineers may manage areas of proposed critical habitat for the Ozette Lake sockeye. The Corps of Engineers and other Federal agencies that may be involved with funding or permits for projects in critical habitat areas may also be affected by this designation. Because NMFS believes that virtually all ''adverse modification'' determinations pertaining to critical habitat would also result in ''jeopardy'' conclusions, designation of critical habitat is not expected to result in significant incremental restrictions on Federal agency activities. Critical habitat designation will, therefore, result in few if any additional economic effects beyond those that may have been caused by listing and by other statutes. Additionally, previously completed biological opinions would not require reinitiation to reconsider any critical habitat designated in this rulemaking.

NMFS Policies on Endangered and Threatened Fish and Wildlife

On July 1, 1994, NMFS, jointly with the U.S. Fish and Wildlife Service, published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270) and a policy to identify, to the maximum extent possible, those activities that would or would not constitute a violation of section 9 of the ESA (59 FR 34272).

Role of Peer Review

The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. Prior to a final listing, NMFS will solicit the expert opinions of at least three qualified specialists, concurrent with the public comment period. Independent peer reviewers will be selected from the academic and scientific community, tribal and other native American groups, Federal and state agencies, and the private sector.

Identification of those activities that would constitute a violation of Section 9 of the ESA: The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. NMFS will identify, to the extent known at the time of the final rule, specific activities that will not be considered likely to result in violation of section 9, as well as activities that will be considered likely to result in violation. For those activities whose likelihood of violation is uncertain, a contact will be identified in the final listing document to assist the public in determining whether a particular activity would constitute a prohibited act under section 9.

Public Comments Solicited

To ensure that the final action resulting from this proposal will be as accurate and effective as possible, NMFS is soliciting comments and suggestions from the public, Indian tribes, other governmental agencies, the scientific community, industry, and any other interested parties. Public hearings will be held at locations within the range of the proposed ESU (see Public Hearings).

In particular, NMFS is requesting information regarding the following: (1) The relationship between sockeye salmon and kokanee, specifically whether kokanee and sockeye salmon populations in the same ESU should be considered a single ESU; (2) biological or other relevant data concerning any threat to Ozette Lake sockeye salmon, kokanee, or to Lake Pleasant sockeye salmon for which a risk assessment was not conclusive; (3) the range, distribution, and population size of sockeye salmon and kokanee in the sockeye salmon population not identified as ESUs (Bear Creek, WA, riverine-spawning sockeye salmon in WA, and Deschutes River, OR); (4) current or planned activities in the Ozette Lake area and their possible impact on Ozette Lake sockeye; (5) homing and straying of natural and hatchery fish; (6) efforts being made to protect naturally spawned populations of Ozette Lake sockeye salmon and kokanee; (7) suggestions for specific regulations under section 4(d) of the ESA that should apply to the Ozette Lake ESU, which is proposed for listing as a threatened species; and (8) information on the stability of Baker River sockeye salmon populations and the effectiveness of ongoing or planned conservation measures aimed at reducing vulnerability of this population and its habitats. Suggested regulations may address activities, plans, or guidelines that, despite their potential to result in the incidental take of listed fish, will ultimately promote the conservation and recovery of threatened sockeye.

NMFS is also requesting quantitative evaluations describing the quality and extent of freshwater and marine habitats for juvenile and adult sockeye in Ozette Lake as well as information on areas that may qualify as critical habitat for the proposed ESU. Areas that include the physical and biological features essential to the recovery of the species should be identified. NMFS recognizes that there are areas within the proposed boundaries of the ESU that historically constituted sockeye habitat but may not be currently occupied by sockeye. NMFS is requesting information about any presence of sockeye in these currently unoccupied areas and the possibility that these habitats be considered essential to the recovery of the species or be excluded from designation. Essential features include, but are not limited to: (1) Habitat for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for reproduction and rearing of offspring; and (5) habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of the species.

For areas potentially qualifying as critical habitat, NMFS is requesting information describing (1) the activities that affect the area or could be affected by the designation, and (2) the economic costs and benefits of additional requirements of management measures likely to result from the designation. The economic cost to be considered in the critical habitat designation under the ESA is the probable economic impact ''of the [critical habitat] designation upon proposed or ongoing activities'' (50 CFR 424.19). NMFS must consider the incremental costs that are specifically resulting from a critical habitat designation and that are above the economic effects attributable to listing the species. Economic effects attributable to listing include actions resulting from section 7 consultations under the ESA to avoid jeopardy to the species and from the taking prohibitions under section 9 of the ESA. Comments concerning economic impacts should distinguish the costs of listing from the incremental costs that can be directly attributed to the designation of specific areas as critical habitat.

NMFS will review all public comments and any additional information regarding the status of the sockeye salmon ESUs as requested in this section and, as required under the ESA, will complete a final rule within 1 year of this proposed rule. The availability of new information may cause NMFS to reassess the status of sockeye ESUs.

Joint Commerce-Interior ESA implementing regulations state that the Secretary shall promptly hold at least one public hearing if any person so requests within 45 days of publication of a proposed regulation to list a species or to designate critical habitat. (See 50 CFR 424.16(c)(3)). In a forthcoming **Federal Register** notice, NMFS will announce the dates and locations of public hearings on this proposed rule to provide the opportunity for the public to give comments and to permit an exchange of information and opinion among interested parties. NMFS encourages the public's involvement in ESA matters.

References

A complete list of all references cited herein is available upon request (see ADDRESSES).

Compliance With Existing Statutes

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus,* 675 F. 2d 825 (6th Cir. 1981), NMFS has categorically excluded all ESA listing actions from environmental assessment requirements of the National Environmental Policy Act under NOAA Administrative Order 216–6.

In addition, NMFS has determined that Environmental Assessments and Environmental Impact Statements, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared for this critical habitat designation made pursuant to the ESA. See *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied, 116 S.Ct. 698 (1996).

Classification

The Assistant Administrator for Fisheries, NOAA, has determined that this rule is not significant for purposes of E.O. 12866.

Since NMFS is designating the current range of the listed species as critical habitat, this designation will not impose any additional requirements or economic effects upon small entities, beyond those which may accrue from section 7 of the ESA. Section 7 requires Federal agencies to ensure that any action they carry out, authorize, or fund is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat (ESA 7(a)(2)). The consultation requirements of section 7 are nondiscretionary and are effective at the time of species' listing. Therefore, Federal agencies must consult with NMFS and ensure that their actions do not jeopardize a listed species, regardless of whether critical habitat is designated.

In the future, should NMFS determine that designation of habitat areas outside the species' current range is necessary for conservation and recovery, NMFS will analyze the incremental costs of that action and assess its potential impacts on small entities, as required by the Regulatory Flexibility Act. Until that time, a more detailed analysis would be premature and would not reflect the true economic impacts of the proposed action on local businesses, organizations, and governments.

Accordingly, the Assistant General Counsel for Legislation and Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that the proposed rule, if adopted, would not have a significant economic impact of a substantial number of small entities, as described in the Regulatory Flexibility Act.

This rule does not contain a collection-of-information requirement for purposes of the Paperwork Reduction Act.

The Assistant Administrator has determined that the proposed designation is consistent to the maximum extent practicable with the approved Coastal Zone Management Program of the state of Washington. This determination will be submitted for review by the responsible state agencies under section 307 of the Coastal Zone Management Act.

At this time NMFS is not promulgating protective regulations pursuant to ESA section 4(d). In the future, prior to finalizing its 4(d) regulations for these threatened ESUs, NMFS will comply with all relevant NEPA and RFA requirements.

List of Subjects

50 CFR Part 226

Endangered and threatened species, Incorporation by reference.

50 CFR Part 227

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

Dated: February 26, 1998.

Rolland A. Schmitten,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR parts 226 and 227 are proposed to be amended as follows:

PART 226—DESIGNATED CRITICAL HABITAT

1. The authority citation for part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

2. Section 226.27 is added to subpart C to read as follows:

§ 226.27 Ozette Lake sockeye salmon (Oncorhynchus nerka).

Critical habitat is designated to include all lake areas and river reaches accessible to listed sockeye salmon in Ozette Lake, located in Clallam County, Washington. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine, riverine, and lake areas in the watersheds draining into and out of Ozette Lake. Accessible areas are those within the historical range of the ESU that can still be occupied by any life stage of sockeye salmon. Inaccessible areas are those above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Adjacent riparian zones are defined as those areas within a horizontal distance of 300 ft (91.4 m) from the normal line of high water of a stream channel, adjacent off-channel habitat (600 ft or 182.8 m, when both sides of the channel are included), or lake. Figure 14 identifies the general geographic extent of Ozette Lake and larger rivers and streams within the area designated as critical habitat for Ozette Lake sockeye salmon. Note that Figure 14 does not constitute the definition of critical habitat but, instead, is provided as a general reference to guide Federal agencies and interested parties in locating the boundaries of critical habitat for listed Ozette Lake sockeye salmon.

3. Figure 14 is added to part 226 to read as follows:

Figure 14 to Part 226—Critical Habitat for Ozette Lake Sockeye Salmon

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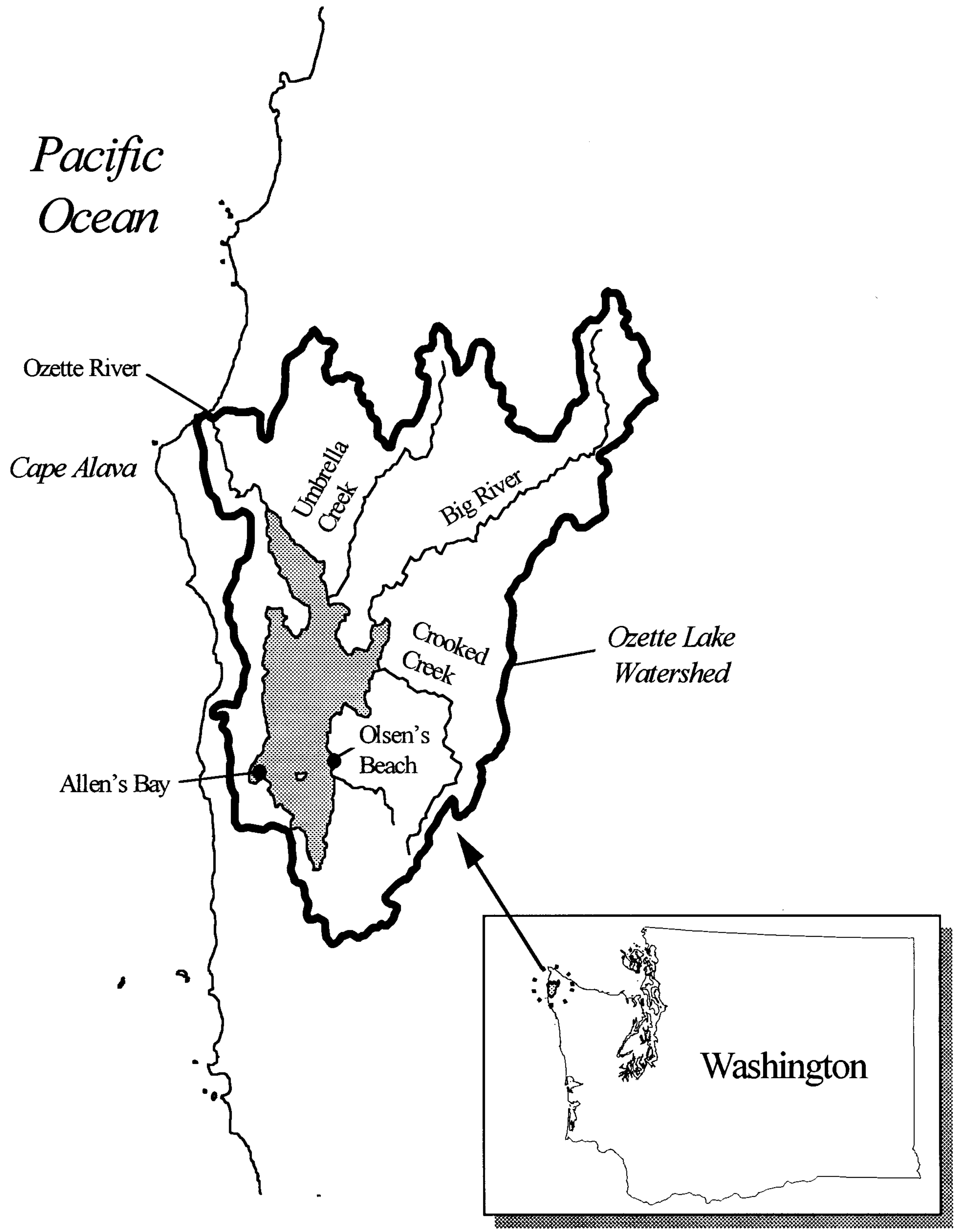

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PART 227—THREATENED FISH AND WILDLIFE

4. The authority citation for part 227 is revised to read as follows:

Authority: 16 U.S.C. 1361 and 1531–1543.

5. In § 227.4, paragraph (o) is added to read as follows:

§ 227.4 Enumeration of threatened species.

* * * * *

(o) Ozette Lake sockeye salmon (Oncorhynchus nerka). Includes all naturally spawned populations of sockeye salmon (and their progeny) in Ozette Lake and its tributaries, Washington.

[FR Doc. 98–5471 Filed 3–9–98; 8:45 am]

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