one, which involve channel allotments. See 47 CFR 1.1204(b) for rules governing permissible *ex parte* contacts.

For information regarding proper filing procedures for comments, see 47 CFR 1.415 and 1.420.

List of Subjects in 47 CFR Part 73

Radio broadcasting.

Federal Communications Commission.

Andrew J. Rhodes,

Acting Chief, Allocations Branch, Policy and Rules Division, Mass Media Bureau.

[FR Doc. 91-8069 Filed 4-4-91; 8:45 am]

BILLING CODE 6712-01-M

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AB

Endangered and Threatened Wildlife and Plants; Notice of Public Hearing and Extension of Public Comment Period on Proposed Endangered Status for Plant Limnanthes floccosa ssp. californica (Butte County meadowfoam)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; notice of public hearing and extension of public comment period.

SUMMARY: The U.S. Fish and Wildlife Service (Service), under the Endangered Species Act of 1973, as amended (Act), gives notice that a public hearing will be held on the proposed endangered status for a plant, *Limnanthes floccosa* ssp. *californica*. The hearing will allow all interested parties to submit oral or written comments on the proposal. In addition, the Service extends the public comment period from April 16, 1991, to May 6, 1991. The proposed rule was published February 15, 1991, at 56 FR 6345.

DATES: The public hearing will be held from 6 p.m. to 9 p.m. on Thursday, April 25, 1991, in Chico, California. Comments from all interested parties must be received by May 6, 1991. Any comments received after the closing date may not be considered in the final decision on this proposal.

ADDRESSES: The public hearing will be held in the City Council Chamber, Chico Municipal Center, 421 Main Street, Chico, California. Written comments and materials should be sent directly to Mr. Wayne S. White, Field Supervisor, U.S. Fish and Wildlife Service, Sacramento Field Station, 2800 Cottage Way, Room E-1803, Sacramento, California 95825. Comments and materials received will be available for public inspection during normal business hours, by appointment, at the above address.

FOR FURTHER INFORMATION CONTACT: Mr. Jim A. Bartel, Sacramento Field Station, at the above address (telephone (916) 978-4866 or FTS 460-4866).

SUPPLEMENTARY INFORMATION:

Background

Limnanthes floccosa ssp. *californica*, a small white-flowered annual plant, is threatened principally by urban development in the undeveloped northern and eastern portions of the City of Chico in Butte County, California. In addition, conversion of the plant's habitat, vernal pools and ephemeral drainages, for agricultural purposes threatens the plant. Overgrazing by livestock, garbage dumping, off-road vehicle use, competing alien vegetation, poor air quality, and stochastic (random) extinction by virtue of the small isolated nature of the remaining populations threaten the subspecies to some degree. A proposed rule to list *L. floccosa* ssp. *californica* as an endangered species was published in the Federal Register (56 FR 6345) on February 15, 1991.

Section 4(b)(5)(E) of the Act, as amended (16 U.S.C. 1533(b)(5)(E)), requires that a public hearing be held if it is requested within 45 days of the publication of a proposed rule. On March 12, 1991, the Service received a written request for a public hearing from Mr. Tom Guarino of the Chico Greater Chamber of Commerce. As a result, the Service scheduled a public hearing for April 25, 1990, from 6 p.m. to 9 p.m. in the City Council Chamber, Chico Municipal Center, 421 Main Street, Chico, California.

Parties wishing to make statements for the record should bring a copy of their statements to the hearing. Oral statements may be limited in length, if the number of parties present at the hearing necessitates such a limitation. There are, however, no limits to the length of written comments or materials presented at the hearing or mailed to the Service. Written comments will be given the same weight as oral comments. The comment period closes on May 6, 1991. Written comments should be submitted to the Service in the ADDRESSES section.

Author

The primary author of this notice is Mr. Jim A. Bartel, Sacramento Field Station, at the above address.

Authority

The authority for this section is the Endangered Species Act (16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted.)

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports Imports, Reporting and recordkeeping requirements, and Transportation.

Dated: March 29, 1991.

William E. Martin,

Acting Regional Director, Region 1, U.S. Fish and Wildlife Service.

[FR Doc. 91-8016 Filed 4-4-91; 8:45 am]

BILLING CODE 4310-55-M

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 222

[Docket No. 910379-107]

RIN 0648-AD90

Endangered and Threatened Species; Proposed Endangered Status for Snake River Sockeye Salmon

AGENCY: National Marine Fisheries Service (NMFS), NOAA, Commerce.

ACTION: Proposed rule.

SUMMARY: NMFS is issuing a proposed determination that the Snake River sockeye salmon (*Oncorhynchus nerka*) is a "species" under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.* (ESA). Furthermore, NMFS proposes to list the Snake River sockeye salmon as endangered under the ESA. The Snake River sockeye salmon has declined to extremely low numbers. Current production is limited to Redfish Lake in the Salmon River Basin in Idaho. Hydropower development, water withdrawal and diversions, water storage, commercial harvest, and inadequate regulatory mechanisms are factors contributing to the decline and represent a continued threat to the Snake River sockeye salmon's existence. Should the proposed listing be made final, the prohibitions of the ESA would be in effect and a recovery program would be implemented.

DATES: Comments from all interested parties must be received by June 4, 1991. Public hearings are scheduled as follows:

1. May 8, 1991, at 9:30 a.m., Seattle, Washington;
2. May 9, 1991, at 9:30 a.m., Portland, Oregon;
3. May 10, 1991, at 9:30 a.m., Boise, Idaho.

ADDRESSES: Comments on this proposed rule should be sent to the Environmental and Technical Services Division, NMFS, Northwest Region, 911 NE. 11th Avenue, suite 620, Portland, OR 97232, or provided at any one of the public hearings. The hearings will be held at the following locations:

1. NOAA, Western Administrative Support Center, Building 9, 7600 Sand Point Way, NE., Seattle, Washington;
2. 1st Floor West Side, Federal Complex, 911 NE. 11th Ave., Portland, Oregon;
3. Boise Interagency Fire Center, 3905 Vista Ave., Boise, Idaho.

FOR FURTHER INFORMATION CONTACT: Tracey Vriens, Environmental and Technical Services Division, NMFS, Portland, Oregon, 503–230–5420 or FTS–429–5420.

SUPPLEMENTARY INFORMATION:

Background

NMFS initiated a status review of sockeye salmon (*Oncorhynchus nerka*) in the Salmon River, a tributary of the Snake River, on April 9, 1990 (55 FR 13181). NMFS also received a petition (April 2, 1990) from the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation to list Snake River sockeye salmon as endangered under the ESA. NMFS published a notice on June 5, 1990 (55 FR 22942), that the petition presented substantial scientific information indicating that the listing may be warranted and requested information from the public.

NMFS has reviewed all available scientific information pertaining to the status of Snake River sockeye salmon. The assist in this review, NMFS convened a Technical Committee to provide information and to review and comment on the data in the record. The Technical Committee consists of representatives from Federal and state fisheries agencies, Indian tribes, industries, and public interest groups that have technical expertise relevant to sockeye salmon. NMFS Northwest Region Biological Review Team has prepared a technical paper "Status Review Report for Snake River Sockeye Salmon" (Waples *et al.* 1991) that is available upon request (see **FOR FURTHER INFORMATION CONTACT**)

Snake River Sockeye Salmon

The Snake River (Redfish Lake) sockeye salmon is one of three remaining stocks of sockeye salmon in the Columbia River system, the other two being in the upper Columbia River. Snake River sockeye salmon enter the Columbia River primarily during June and July. Arrival into Redfish Lake, which now supports the only remaining run of Snake River sockeye salmon, peaks in August and spawning occurs near the shoals along the lake's shoreline primarily in October (Bjornn *et al.* 1968). Shoal spawning is less typical of sockeye salmon than spawning in lake tributary or inlet streams (Foerster 1968; Scott and Crossman 1979). Kokanee, a permanent freshwater form of *O. nerka*, are also produced in Redfish Lake and in other Stanley Basin lakes, including Alturas, Pettit, and Yellowbelly Lakes.

Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerging April through May and, if hatched in inlet (or outlet) streams, move immediately into the lake, where juveniles feed on plankton for 1 to 3 years before migrating to the ocean (Bell 1986). Juvenile residence of sockeye salmon in Redfish Lake rarely exceeds 2 years (Bowles and Cochnauer 1984).

Migrants leave Redfish Lake when temperatures are between 38° to 50° F, from late April through May (Bjornn *et al.* 1968), and smolts migrate almost 900 miles (1440 kilometers) to the ocean, where they remain inshore or within their home river's influence zone for the early summer. Later, they migrate through the northeast Pacific Ocean (Hart 1973; Hart and Dell 1986). Snake River sockeye salmon usually spend 2 years in the ocean and return in their fourth or fifth year of life. The survival rate for Snake River sockeye salmon, from the time they migrate from the lake to returning adults, is between 0.14 to 1.83 percent (Bjornn *et al.* 1968).

Consideration of Snake River Sockeye Salmon as a "Species" under the ESA

To consider the Snake River sockeye salmon for listing, it must qualify as a "species" under the ESA. The ESA defines a "species" to include any "distinct population segment of any species of vertebrate * * * which interbreeds when mature." NMFS published an interim policy (March 13, 1991; 56 FR 10542) on how it will apply the ESA species definition in evaluating Pacific salmon stocks. A salmon stock will be considered a distinct population, and hence a species under the ESA, if it represents an evolutionarily significant unit (ESU) of the biological species. The stock 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 would be met if the population contributed substantially to the ecological/genetic diversity of the species as a whole. Further guidance on application of this policy is contained in the NMFS paper "Definition of Species under the Endangered Species Act: Application to Pacific Salmon" (Waples 1991).

In this case, the question of population distinctness is complicated by the presence of kokanee in Redfish Lake. One hypothesis is that the sockeye and kokanee share a common gene pool. If so, they should be considered as a unit in ESA evaluations. If the two forms are reproductively isolated, they should be considered separately.

No adult sockeye salmon from Redfish Lake were available for genetic studies to compare them with kokanee sampled from the lake in 1990. However, other evidence suggests that the two forms are distinct (Waples *et al.* 1991). Recent studies of *O. nerka* in other areas of the Pacific Northwest (Foote *et al.* 1989) found substantial genetic differences between the two forms, in spite of occasional cross-spawning behavior and viability of hybrids through early life-history stages in culture. Foote *et al.* (1989) found significant differences in the frequencies of alleles between sockeye salmon and kokanee in each of the lake systems they studied, and also found that the magnitude of genetic divergence between sympatric sockeye salmon and kokanee increased with distance upriver from the ocean. An electrophoretic survey conducted by NMFS for this status review also found substantial genetic differences between sockeye salmon and kokanee in two river/lake systems where they co-occur (Monan 1991). Thus, it is likely that, historically, sockeye salmon and kokanee were reproductively isolated in Redfish Lake. Recent observations at Redfish Lake support the hypothesis that the two forms remain distinct. Kokanee continue to spawn in the inlet (Fishhook Creek) in August/September, but sockeye salmon spawn later (generally October) and only along the shores of the lake (Bjornn *et al.* 1968; Fulton 1970; Bowler 1990).

An alternative hypothesis, that Sunbeam Dam caused the extinction of the original sockeye salmon gene pool and that recent anadromous *O. nerka* in Redfish Lake have resulted from the seaward drift of kokanee, was also considered (see discussion under "Status of Snake River Sockeye Salmon" below). Although it is known from studies in other geographical areas that kokanee can occasionally produce anadromous fish, number of outmigrants that successfully return as adults is typically quite low. There is no evidence that kokanee anywhere have naturally produced a sustained run of sockeye salmon. Thus, if kokanee were responsible for post-Sunbeam Dam anadromous *O. nerka* in Redfish Lake, it would be an unprecedented occurrence for the species (Waples *et al.* 1991).

Given evidence that sockeye salmon continued to pass Sunbeam Dam prior to its removal, and given the uncertainty regarding the ability of Redfish Lake kokanee to produce anadromous *O. nerka* in the numbers observed, NMFS is proceeding on the premise that the original sockeye salmon gene pool still exists in Redfish Lake and is distinct from the kokanee (Waples *et al.* 1991).

Available information indicates that Snake River sockeye salmon are also reproductively isolated from other sockeye salmon populations and represent an important component in the evolutionary legacy of the species. The great distance (over 700 river miles (1,127 kilometers)) separating Redfish Lake from the nearest sockeye salmon populations in the upper Columbia River ensures a strong degree of reproductive isolation. There is no evidence of straying of sockeye salmon from the upper Columbia River or elsewhere into Redfish Lake (Waples *et al.* 1991).

Redfish Lake supports the world's southernmost natural sockeye salmon population. Sockeye salmon returning to Redfish Lake also travel a greater distance from the sea (almost 900 miles (1,448 kilometers)) and to a higher elevation (6,500 feet (1,219 meters)) than do sockeye salmon anywhere else in the world. In contrast, sockeye salmon in the upper Columbia Basin spawn at elevations more than 4,000 feet lower. Furthermore, the upper Columbia River populations are in a different ecoregion domain (humid temperate) than is Redfish Lake (dry) (Waples *et al.* 1991). Collectively, these data argue strongly for the ecological uniqueness (with respect to sockeye salmon) of the Snake River habitat and make it likely that the Redfish Lake population contain unique adaptive genetic characteristics.

Electrophoretic studies of sockeye salmon throughout North America and Asia typically have found substantial genetic differences between sockeye salmon stocks from different river systems (e.g., Utter *et al.* 1984; Foote *et al.* 1989; Monan 1991). Furthermore, a recent study (Monan 1991) demonstrated that samples of kokanee from Redfish and Alturas Lakes are genetically similar to each other but quite distinct from samples from other lakes in Idaho, Washington, and British Columbia. These results suggest that, although the relevant data are not available for Redfish Lake sockeye salmon, this population is probably genetically distinct from other sockeye salmon populations.

NMFS concludes that the best available information indicates that this stock meets both of the criteria necessary to be considered an ESU. Therefore, NMFS is issuing a proposed determination that the Snake River sockeye salmon is a "species" under the ESA.

Status of Snake River Sockeye Salmon

Historically, sockeye salmon were produced in Idaho in the Stanley Basin of the Salmon River in Alturas, Pettit, Redfish, Yellowbelly and Stanley Lakes and may have been present in one or two other Stanley Basin lakes (Bjornn *et al.* 1968). Welsh *et al.* (1965) also included Little Redfish Lake, on Redfish Creek downstream from Redfish Lake, as sockeye salmon habitat. Outside of the Salmon River Basin, but within the Snake River Basin, sockeye salmon were produced in Big Payette Lake on the North Fork Payette River and in Wallowa Lake on the Wallowa River (Evermann 1895; Toner 1960; Bjornn *et al.* 1968; Fulton 1970).

In 1881, 2,600 pounds (1,180 kilograms) of fresh sockeye salmon were taken by prospectors at Alturas Lake, near Redfish Lake in the Stanley Basin (Evermann 1896). However, agricultural diversions using all the water in Alturas Lake Creek currently prevent adult sockeye salmon from migrating upstream and eliminates production in Alturas Lake. Treatment of Pettit and Yellowbelly Lakes with piscicides (chemicals used to kill fish) in 1961 and 1962 and the operation of migration barriers to prevent warmwater fish species from reinhabiting the lakes eliminated juvenile sockeye salmon and prevented adult salmon access.

There is no reliable information on the numbers of sockeye salmon spawning in Redfish Lake in the early 1900s (Bjornn *et al.* 1968). However, Evermann (1895, 1896) reported that there were plans to build a cannery there.

Construction of Sunbeam Dam in 1910, 20 miles (32.2 kilometers) downstream from Redfish Lake Creek on the mainstem Salmon River, seriously impeded sockeye salmon access to the Stanley Basin lakes. The original adult fishway was constructed with wood and was ineffective in passing fish over the dam (Kendall 1912; Gowen 1914). It was replaced in 1920 with a concrete adult fishway that improved passage.

There is a difference of opinion regarding the effects of Sunbeam Dam on the original sockeye salmon run to lakes in the Stanley Basin. Some argue that the dam represented a complete barrier to upstream passage for enough years that the original anadromous run was eliminated (Chapman *et al.* 1990). On the other hand, eyewitness accounts (Jones 1991) document adult sockeye salmon spawning in Redfish Lake in a number of years prior to and immediately after partial removal of the dam in 1934. Subsequently, Parkhurst (1950) reported sockeye salmon spawning in the lake in 1942.

Escapement of sockeye salmon to the Snake River has declined dramatically in recent years. Counts made at Lower Granite Dam (the first dam on the Snake River downstream from the confluence of the Salmon River) since 1975 have ranged from 531 in 1976 to 0 in 1990. It should be noted that the number of fish counted at a dam may differ from the number actually passing; some fish may pass during non-counting periods or may pass through navigation locks. Records are available on escapement into Redfish Lake for the years 1954 through 1966 and from 1985 through 1987. During these years, the Idaho Department of Fish and Game (IDFG) enumerated adult sockeye salmon at Redfish Lake weirs. In the years from 1954 through 1966, the number of adults counted by IDFG varied from 4,361 in 1955, to 11 in 1961, to 335 in 1964. In the years 1985 through 1987, IDFG operated a temporary weir at Redfish Lake Creek. The total escapement in these years was 12 in 1985, 29 in 1986, and 16 in 1987. In 1988, IDFG also conducted spawning ground surveys that identified four adults and two redds (gravel mounds in which the eggs are deposited). In 1989, one adult was passed into Redfish Lake and one redd and a second potential redd were identified. No redds or adults were identified in 1990.

Summary of Factors Affecting the Species

An endangered species is any species in danger of extinction throughout all or a significant portion of its range; a threatened species is any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Section 4(a) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, without reference to possible economic or other impacts of such determination. 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. These factors, as they apply to Snake River sockeye salmon, are discussed below.

1. The Present or Threatened Destruction, Modification or Curtailment of its Habitat or Range

(a) *Hydropower development.* Dams and reservoirs have substantially reduced the abundance of salmon in the Columbia River Basin. The Northwest Power Planning Council (NWPPC) estimated that current annual salmon and steelhead production in the Columbia River Basin is more than 10 million fish below historical levels, with 8 million of this annual loss estimate attributable to hydropower development and operation (NWPPC 1987). The NWPPC further estimated that approximately half of the 8 million fish loss was caused by the loss of habitat blocked by Chief Joseph and Hells Canyon Dams in the upper Columbia and Snake Rivers. The remaining 4 million fish loss was attributed to ongoing annual passage losses at and between the eight mainstem projects below Chief Joseph and Hells Canyon Dams. Although the specific number of Snake River sockeye salmon lost is unknown, they are included in the overall numbers presented by the NWPPC.

(1) *Juvenile sockeye salmon passage.* Juvenile Snake River sockeye salmon migrants must pass eight hydroelectric projects between upriver rearing areas and the ocean. Each project includes a dam and a reservoir, both of which decrease the survival of juvenile migrants. System mortality estimates include loss at the dams and in the reservoirs. Additional impacts not included in these estimates could also occur due to sub-lethal effects attributable to passage. These sub-lethal impacts (e.g., stress, injury and delay) can affect long-term survival (Matthews *et al.* 1987; Johnson *et al.* 1990; and Hawkes *et al.* 1991).

Although no system mortality studies have been conducted specifically with sockeye salmon, studies have been conducted with other species of salmon in the Columbia and Snake Rivers. Studies using Snake River steelhead and chinook salmon released above the dams and later recovered in the lower Columbia River provide an annual loss estimate per project (dam and reservoir) in the range of 13 to 54 percent (average 28 percent). Assuming the average rate per project, the cumulative mortality over eight dams would be 93 percent. The greatest mortality occurred in years when Snake and Columbia River flows during the spring migration were low. Estimates of cumulative losses of inriver migrants past eight dams approached 100 percent in these low flow years (Raymond 1979; Sims and Ossiander 1981). Similar studies with chinook salmon in the Columbia River above the confluence with the Snake River resulted in an estimated annual loss per project in the range of 13 to 25 percent (Chapman and McKenzie 1980; McKenzie *et al.* 1983; and McKenzie *et al.* 1984). The Columbia River studies included no low flow years.

Injury and mortality can occur through each dam passage route (turbines, spillways, ice and trash sluiceways, and juvenile fish bypass systems), but there are numerous studies documenting that loss rates from passage through turbines is generally high relative to the other routes of passage.

One means of avoiding juvenile losses at dams is to collect and transport juveniles around the dams. While such transportation has been shown to have positive benefits for some salmon and steelhead stocks, for other stocks, the benefit is unclear. Most of these studies used steelhead, chinook or coho salmon. No studies have been done specifically on Snake River sockeye salmon. Limited information on Columbia River sockeye salmon suggests that this species is more susceptible to physical injury and mortality in project passage and handling than are other species (Gessel *et al.* 1988; Johnsen *et al.* 1990; Koski *et al.* 1990; Parametrix 1990; and Hawkes *et al.* 1991).

Fish mortality also occurs while juveniles are in reservoirs. Causes include predation, disease, temperature, and other factors that affect the condition of the environment or the fish at the time of their transition to saltwater. Dissolved gas supersaturation due to spill of water at the dams was also identified as a significant cause of mortality in the 1970s, but increased hydraulic capacity at the mainstem projects, greater flow control, and structural modifications to some spillways have substantially reduced this problem. Some fish also lose the urge to migrate. These fish remain in the reservoir and are lost to the migrating population.

Delay of migration during reservoir passage may also result in a loss. Because salmon and steelhead must undergo a temporary physiological change that enables them to make the transition from fresh to saltwater, delay can cause the fish to either cease migrating or to arrive at the ocean and be unable to adapt to saltwater. Delay can also increase predation due to both increased exposure time and an increasing predation rate that accompanies a rise in temperatures through the spring and into summer (Columbia Basin Fish and Wildlife Authority (CBFWA) 1991).

Juvenile fish passage through reservoirs has been estimated to take one-third to one-half longer than passage through free-flowing water stretches (Raymond 1988). Delay in mainstem reservoirs is the result of low water velocity from two causes. The first is increased cross-sectional area of the river due to impounding the water above the dam. The second is the reduction in spring and summer flows due to withdrawals of water for irrigation and the use of headwater storage reservoirs to impound water during the spring and summer snowmelt. Impounded water is used for hydroelectric power in fall and winter when the regional energy demand is greatest.

The present management of water in the Columbia River system does not provide adequate flows and velocity to move downstream migrants safely to saltwater. As a result, many stocks of salmon and steelhead (including Snake River sockeye salmon) are continuing to decline.

(2) *Adult sockeye salmon passage.* Cumulative adult passage loss for salmon passing mainstem dams can be substantial. Analysis of adult Columbia and Snake River sockeye counts for Bonneville and Priest Rapids/Ice Harbor Dams (Ross 1991b), adjusted for commercial, ceremonial and subsistence fisheries, showed an average annual loss of 10.5 percent (2.7 percent per dam) in the lower Columbia River since completion of the last dam in this reach in 1968 (Washington Department of Fisheries and Oregon Department of Fish and Wildlife, 1990). Assuming a similar loss per project in the Snake River, an additional 8 percent loss would occur from Ice Harbor Dam to Lower Granite Dam.

Delay at dams can also be an important factor in the survival of Snake River adult sockeye salmon. Factors influencing delay include the effectiveness of fish passage facilities, powerhouse and spillway operations, flow, and water quality. Average delay for adult salmonids at a Columbia River mainstem dam is about 1 to 3 days when good passage conditions exist (Ross

1983; Turner 1984). Average delay at a lower Snake River mainstem dam is about 1 to 2 days when little or no spill is occurring, increasing to about 5 to 7 days during high spill (Turner 1983; Turner 1984). Radio-tagged sockeye salmon had a mean passage time of 74 (range 5 to 150) hours at Bonneville Dam in 1982 (Ross 1983) and 24 (range 3 to 73) and 16 (range 2 to 49) hours at McNary and John Day Dams, respectively, in 1985 (Shew 1985).

Delay can be greater when adult passage facilities are not operated consistent with established criteria (i.e., at reduced hydraulic head and weir depths attraction flows at entrances are reduced). Inadequate water velocity inside fish ladders also increases delay. Fish Passage Center (FPC) Adult Fishway Inspections Annual Reports (1988, 1989, 1990) indicate that mainstem dam adult fishways are operating below velocity criteria a substantial amount of time (Ross 1991a).

Because sockeye salmon do not feed during their upstream migration, delays during migration may deplete limited energy reserves and reduce survival. Delays of as little as 3 to 4 days at migration barriers have been associated with pre-spawning mortality (CDE and IPSFC 1971).

Adult salmon fall back through spillways at dams can be as high as 58 percent (Monan and Liscom 1975). Most adult fish that fall back reascend the fishways and continue their migration. Fallback can also occur through turbines, which can result in mortalities of at least 22 to 41 percent (Wagner and Ingram 1973). Dissolved gas supersaturation caused by large amounts of water spilling over dams can also result in injury and death to adult salmon.

(b) *Water withdrawal and storage.* Diversion and storage of water within the Columbia River has decreased water availability and altered historical run-off patterns in the Columbia River Basin. In addition, unscreened water diversions have often permitted juvenile anadromous fish to move onto irrigated lands and be lost.

Within the Snake River system, the major consumptive use of water is for agricultural irrigation. Both Federal and private reservoirs store natural flows from the Snake River Basin for agriculture. The total annual discharge of the Snake River is approximately 36 million acre-feet (MAF) (44.4 cubic kilometers). Approximately 16 MAF (19.73 cubic kilometers) are diverted annually from the Snake River and of this, 6 MAF (7.4 cubic kilometers) are consumed by agriculture.

Total active storage (the amount of water that can be removed from a reservoir) in the Snake River Basin above Hells Canyon Dam (including Brownlee Reservoir) is approximately 11.3 MAF (13.94 cubic kilometers). The amount of active storage available for use varies from year to year, depending on rainfall and run-off. This storage alters timing or peak flows in the Snake River that would, under natural conditions, have occurred during the spring run-off when juvenile anadromous fish are migrating.

Water diversions have had a significant impact on Stanley Basin sockeye salmon populations. Chapman *et al.* (1990) listed agricultural diversion among the causes of the sockeye salmon's decline from all Stanley Basin lakes, including Redfish Lake. Chapman *et al.* (1990) notes that more than 68 agricultural diversions are present on the Salmon River and tributaries within the Sawtooth National Recreation Area (SNRA). Agricultural diversion at Busterbach Ranch, on Alturas Lake Creek in the Stanley Basin, completely de-waters the creek, totally blocking sockeye salmon from Alturas Lake (Bowles and Cochnaur 1984; Chapman *et al.* 1990; IDFG 1990). Screens have been installed in the Salmon River Basin since the mid-1950's to prevent fish from entering diversions (Delarm and Wold 1985). However, many Stanley Basin streams in the SNRA were not screened until the mid to late 1970s and some unscreened diversions still exist.

In the Columbia River Basin above the confluence with the Snake River, a significant amount of water is also withdrawn for agricultural irrigation. For instance, irrigation diversion at the Bureau of Reclamation's (BOR) Columbia Basin Project above Grand Coulee Dam averaged 2.3 MAF (2.84 cubic kilometers) annually between 1968 and 1987 (BOR 1989).

The BOR (1989) evaluated the impact on fishery resources from proposed increases in agricultural withdrawals at the Columbia Basin Project. By modeling smolt survival for Columbia and Snake River spring chinook and steelhead at various flows, the BOR demonstrated decreased smolt survival with increased Columbia River agricultural withdrawal. Thus, water withdrawals from the Columbia River Basin impact the survival of juvenile salmonids by reducing flow during the time they migrate through the Columbia River to the ocean.

2. Over-utilization for Commercial, Recreational, Scientific or Educational Purposes

Data specific to the exploitation of Snake River sockeye salmon are limited, but available information indicates that commercial fisheries in the lower Columbia, and harvest on the spawning grounds, were primary factors in the decline of Columbia River sockeye salmon (Fulton 1970).

The sockeye salmon fishery in the lower Columbia River began in 1889 and peaked in 1898 when harvest exceeded 4.5 million pounds (2.04 million kilograms) (Fulton 1970). Between 1905 and 1930, sockeye salmon production in the Columbia River Basin was effectively limited to the Wenatchee, Osoyoos/Okanogan, and Salmon River systems following the construction of barriers to fish passage in the Yakima, Payette, Wallowa, and Arrow Lakes systems.

In the years from 1960 to 1973, commercial and tribal sockeye salmon fisheries in the Columbia River, downstream from the Snake River, averaged 35,956 fish. Non-treaty and treaty commercial fisheries for sockeye salmon were closed from 1974 through 1983. Harvest figures for tribal ceremonial and subsistence fisheries were first reported in 1977 and averaged more than 1,000 fish annually and ranged up to 2,131 fish (1984) through 1990. From 1975 to 1983, annual sockeye salmon counts over Lower Granite Dam averaged 221 fish, ranging from 25 to 531. Commercial fisheries for sockeye salmon resumed in 1984 and escapement over Lower Granite Dam from 1984 to 1989 declined to an annual average of only 26 fish, (ranging from 2 to 49).

Salmon River sockeye salmon generally comprised less than 1 percent of the sockeye salmon entering the Columbia River between 1954 and 1966 (Bjornn *et al.* 1968). It is likely that Salmon River, Wenatchee and Osoyoos/Okanogan sockeye salmon have overlapping in river migration timing and therefore are harvested at similar rates (ODFW and NMFS 1990). Considering the low abundance of Salmon River sockeye salmon relative to Wenatchee and Osoyoos/Okanogan River sockeye salmon, and their similarly timed migration, Salmon River sockeye salmon may be subjected to excessive exploitation during inriver fisheries. Bjornn *et al.* (1968) reported that the number of adults returning to Redfish Lake appeared to be related somewhat to the fisheries in the low Columbia River. A disproportionately high number of Redfish Lake sockeye salmon may have been harvested since Columbia River fisheries were selective for larger fish and Redfish Lake sockeye salmon are relatively large compared to Columbia River sockeye salmon (Bjornn *et al.* 1968).

The recreational harvest of sockeye salmon in the Columbia River is negligible (Washington Dept. of Fisheries and Oregon Dept. of Fish and Wildlife 1990).

The ocean harvest of sockeye salmon is believed to be relatively insignificant. The catch of all Pacific salmon off Oregon, Washington, and California includes fewer than 100 sockeye salmon annually (Pacific Fishery Management Council 1990). Other possible areas of ocean catch are in the high seas driftnet fishery and the troll fishery off British Columbia. Although no information is available to identify Snake River sockeye salmon in these high seas and British Columbia catches, the numbers of Snake River sockeye would be expected to be low.

Based on existing records, NMFS concludes that fisheries (other than recreational) in the Columbia River and near the spawning grounds have contributed to the decline of Snake River sockeye salmon.

3. Disease or Predation

(a) *Disease.* Sockeye salmon are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, migratory routes, and the marine environment. Specific disease pathogens such as infectious hematopoietic necrosis virus, *Flexidacteras columnaris, Tricophera* sp., *Ceratomyxa shasta*, as well as others are known to be present. Even though *O. nerka* is susceptible to these, their effect on Snake River sockeye salmon is not documénted.

(b) *Predation.* While predation has been investigated for Columbia and Snake River juvenile and adult salmon migrants in general, little information exists for Snake River sockeye runs specifically. However, because juvenile Snake River sockeye salmon migrate with other Columbia River spring and summer migrating salmon, the rate of predation should be similar for all of these species.

(1) *Freshwater predation.* There are several causes of increased freshwater predation on juvenile salmonids. Non-native predatory species such as walleye (*Stizostedion vitreum vitreum*) have been introduced into the Columbia River system. Native predator populations, including northern squawfish (*Ptychocheilus oregonensis*) and several species of fish-eating birds, have benefitted from dam impoundments that provide foraging areas. Furthermore, various bird species, such as gulls (*Larus* sp.) and common mergansers (*Mergus merganser*), prey on juvenile salmonids in their natal streams and migration corridors. Turbulence at turbine and dam bypass outlets and spillways has increased predator success by disorienting juvenile migrants (Poe *et al.* 1988). Slack water conditions in reservoirs have increased smolt travel time, resulting in an increased exposure to resident predators.

Studies in John Day Reservoir indicated that native northern squawfish were the primary predator of juvenile salmonids, but introduced predators such as walleye, smallmouth bass (*Micropterus dolomieui*), and channel catfish (*Ictalupus punctatus*) also took significant numbers of smolts. These predators were estimated to consume between 9 and 19 percent of the juvenile salmonids entering the reservoir, with northern squawfish accounting for approximately 78 percent of this loss (Poe *et al.* 1988).

Predation on eggs, fry, and pre-smolt sockeye has been estimated in Alturas Lake at up to 60 percent. This was primarily due to large populations of rainbow trout (*Oncorhynchus mykiss*) and dolly varden (*Salvelinus malma*) (Bowles and Cochnauer 1984). Alturas and Redfish lakes were stocked with Kamloops rainbow and eastern brook trout (*Salvelinus fontinalis*) (IDFG Biennial reports 1923–1942, both of which eat fish (Scott and Crossman 1979). Freshwater predation is a factor contributing to the decline of sockeye salmon in the Snake River.

(2) *Marine and estuarine predation.* Marine and estuarine predation of salmonids in general has been extensively investigated, but again, very little information exists for Snake or Columbia River sockeye salmon stocks. NMFS has noted that marine mammal numbers, especially harbor seals and California sea lions, are increasing on the West Coast and increased predation by pinnipeds has been noted in all Northwest salmonid fisheries (NMFS 1988). In 1990, and average of 18 percent of the fish examined at Lower Granite Dam on the Snake River had bite marks thought to be from sea lions (Harmon and Matthews 1990). Of the 34 species of marine mammals known to frequent all salmon occupied waters, 15 are known to prey on salmon (Fiscus 1980). The salmon shark (*Lamna ditropis*) and Pacific hake (*Merluccius productus*) are also thought to be important predators of sockeye salmon (Gilhousen 1989, Beachum 1989). Predation by birds on downstream migrants also occurs in the estuary. Information is not available to determine if marine and estuarine predation has any measurable impact on Snake River sockeye salmon.

4. Inadequacy of Existing Regulatory Mechanisms

There is a wide variety of Federal and state laws that impact the abundance and survival of anadromous fish populations in the Columbia River. These laws, such as the Fish and Wildlife Coordination Act, the Federal Power Act, the Pacific Northwest Electric Power Planning and Conservation Act of 1980 and the Water Resources Development Act, concern fish resource measures at water resource developments, including hydropower projects. Other Federal laws applicable to Snake River sockeye salmon include the National Environmental Policy Act, Federal Water Pollution Control Act, and the Salmon and Steelhead Conservation and Enhancement Act. Some of these laws are summarized below. None of these laws has proven sufficient to prevent the decline of Snake River sockeye salmon.

(a) *Fish and Wildlife Coordination Act (16 U.S.C. 661–666c) (FWCA).* The FWCA requires that wildlife conservation receive equal consideration and be coordinated with other features of water-resource development programs. Federal water development and permitting and licensing agencies are to seek the recommendations of the Federal and state fish and wildlife agencies for mitigation and enhancement of fish and wildlife resources. These recommendations are to be given "full consideration." However, because acceptance of the fish and wildlife agencies' recommendations is not mandatory, they are not always adopted, particularly when they affect another purpose for which a project may be authorized. While the coordination required by the FWCA has been helpful, it is not adequate to protect Snake River sockeye from the harmful impacts of water development activities.

(b) *Federal Power Act (16 U.S.C. 791–825) (FPA).* Non-Federal dam construction and operation for hydropower is authorized by the FPA. Like the FWCA, fish and wildlife agencies have the authority to make recommendations pertaining to project construction and operation actions affecting fish and wildlife. The fish and wildlife agencies' authority was strengthened by the Electric Consumer's Protection Act of 1986, which requires the Federal Energy Regulatory

Commission to include conditions in each license, based on fish and wildlife agencies' FWCA recommendations, to equitably protect, mitigate and enhance fish and wildlife.

The Hells Canyon Complex, licensed under the FPA, is currently owned and operated by the Idaho Power Company, and consists of Hell's Canyon, Oxbow, and Brownlee Dams. The Hell's Canyon Dam, the most downstream dam, poses a complete barrier to anadromous fish passage. The complex was authorized under a single FPA license in 1955. At the time of licensing, there were no downstream Federal dams in the mainstem Snake River and minimum flow requirements for juvenile migration were not included in the license. Modifying the license to include flows adequate for migration would take many years, based on experience with other modification proceedings. The only automatic opportunity for changing the license conditions will come with the project's relicensing, which will likely occur in 2005, at the end of the license's 50-year term.

The overall impact of the FPA has been to increase the number of Columbia River Basin hydropower facilities—some of which adversely impact migrating salmonids, including Snake River sockeye salmon.

(c) *Salmon and Steelhead Conservation and Enhancement Act of 1980 (16 U.S.C. 3301 et seq.)*. This Act authorized formation of a Salmon and Steelhead Advisory Commission (SSAC) comprised of state, tribal, Federal, and Pacific Fishery Management Council representatives. It was charged with preparing a comprehensive report for developing a coordination and management structure to address salmon and steelhead stocks of Washington and the Columbia River. The report was to be approved by the Secretary of Commerce (Secretary), and, if an effective management structure could be established, participating agencies would be eligible to receive additional funds for "enhancement" activities.

A report was prepared and submitted to the Secretary for approval. The Secretary returned the report to the SSAC for further work, but funds supporting the SSAC had been spent and no further action was taken. No additional funds were appropriated by Congress for continued work on the report or for constructing enhancement facilities.

While the effort of the SSAC was very useful in developing closer coordination of anadromous fish activities among the agencies, it was inadequate in providing any additional protection to upper Columbia River salmonids.

(d) *Mitchell Act (16 U.S.C. 755–757)*. The Mitchell Act was intended to compensate for the progressive decline of Columbia River Basin salmonid resources due to destruction of favorable environmental conditions by hydroelectric development, deforestation, pollution, and water diversions. The Columbia River Fisheries Development Program, administered by NMFS under the Mitchell Act, has a number of successful programs that implement stream improvements, screening of irrigation diversions (some of which have been in the Salmon River basin) and hatchery operations. Although the Mitchell Act has increased fish production and survival, it is limited to screening, stream improvement, and artificial propagation, and alone is inadequate to deal with the comprehensive needs of the Columbia and Snake River Basin salmon problems.

(e) *State laws*. The implementation of the state laws of Oregon, Washington, and Idaho that affect water allocation, water quality, and riparian and wetland protection are very important to the conservation of salmon. One example of water use management that has adversely affected Snake River sockeye salmon is the Busterbach Ranch agricultural diversion, which de-waters Alturas Lake Creek, and prevents sockeye salmon from returning to Alturas Lake.

State laws that require screening of irrigation diversions may also be inadequate. For example, it is illegal in the State of Idaho to receive or take more than 125 cubic feet per second (cfs) (3.54 cubic meters per second) of water from any stream or lake without installing and maintaining a screen to prevent fish from entering therein. For smaller diversions, Idaho state law permits construction and maintenance of irrigation screens by the IDFG. For comparison, the State of Oregon requires diversions of more than 30 cfs (0.85 cubic meters per second) to be screened when gamefish exist. Since the early 1950s, NMFS has been working with the State of Idaho, through the Columbia River Fisheries Development Program, to install screens on approximately 236 diversions in the Salmon River Basin. However, there are still unscreened diversions.

(f) *Harvest regulation*. The only direct fishery harvest on Columbia River Basin sockeye salmon is the mainstem river fishery under the management responsibility of the states and four tribes that are parties to *U.S. v. Oregon* (302 F. Supp. 899 (D.Or. 1969), *aff'd*, 529 F.2d 570 (9th Cir. 1976)).

(g) *Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.) (NWPA)*. The NWPA was passed to encourage efficiency, coordination and regional participation in power planning in the Pacific Northwest while providing protection, mitigation and enhancement of affected fish and wildlife, especially anadromous fish. The NWPA specifically requires that fish and wildlife resources be given equitable treatment in management, operation and regulation of the Columbia River hydroelectric power system. It also requires the development of a comprehensive program to protect, mitigate and enhance fish and wildlife in the Columbia Basin. The NWPA established the Northwest Power Planning Council (NWPPC) to coordinate power planning and fish and wildlife measures.

In 1982, in accordance with section 4(h) of the NWPA, the NWPPC adopted a Fish and Wildlife Program (FWP) based on recommendations of the Region's Federal and state fish and wildlife agencies and Indian tribes. The agencies responsible for managing, operating and regulating Federal and non-Federal hydroelectric facilities in the Columbia River Basin are responsible for implementing the FWP.

In the case of anadromous fish, the NWPA specifically recognized the need for "improved survival * * * at hydroelectric facilities" and the need for "flows of sufficient quality and quantity between such facilities to improve production, migration and survival."

There are two reasons why the NWPA has not achieved positive results for the survival of anadromous fish: (1) There is no mandate requiring compliance with the FWP—the NWPA only requires that measures be taken into account to the fullest extent practicable; and (2) the lack of specificity in program measures often leads to disagreements over interpretation of how measures are to be implemented. Below is a summary of some of the FWP's more important features.

(1) *Water budget*. Mortality of juvenile fish during their seaward migration is a major problem confronting upper Columbia River stocks, such as Snake River sockeye salmon. Flow is important because delays caused by the combination of flow regulation (storing high natural runoff in the spring and early summer to provide regulated releases for power generation in the fall and winter) and changes in river cross-

sectional area (from a free-flowing river to a series of impoundments) result in reduced survival. Passage at the dams is also a problem. Estimates of losses due to passage through turbines at these projects have ranged from 8 to 32 percent (Bell 1981; Long 1968). When the NWPPC solicited recommendations for provisions of the FWP, the fishery agencies and tribes recommended specific minimum and optimum flow levels for each month, with a sliding scale (which would provide additional water in years with better flows) for the critical juvenile fish migration period, April 15 through June 15. The NWPPC response to the agencies' recommendation was to include a "water budget" in the FWP.

The water budget is a specified volume of water to be managed by the fish and wildlife agencies and the tribes and released between April 15 and June 15 to aid the downstream migration of anadromous fish in the Columbia River. It consists of a Snake River component of 1.19 MAF (1.43 cubic kilometers) and a Columbia River component of 3.45 MAF (4.26 cubic kilometers). The greater volume of Columbia River water supplements the Snake River releases in providing flows in the mainstem Columbia River below the mouth of the Snake River. A water budget has been included in planning for Columbia River water management since 1984. The NWPPC did not address flows outside the April 15 to June 15 period, reasoning that flows from power generation during the rest of the year would be sufficient to provide for fish passage (NWPPC 1984).

While the water budget has been beneficial in improving fish passage and survival, its potential has not been achieved due to a number of problems in both design and implementation. Problems include inadequate amounts of water, the limitation to a 60-day period, the lack of a guaranteed firm base flow, changes by the implementing agencies of the NWPPC-established priorities for water use, and constraints imposed by the operators (such as the Corps of Engineers and the Idaho Power Company) on how water is released.

(i) *Inadequate amount of water.* The NWPPC purposely set the water budget for Lower Granite Dam in the Snake River lower than fishery agency and tribal recommendations for minimum flows due to concerns about the impact on reservoir refill (NWPPC 1984). Further, the amount of water specified in the water budget is not always provided. For example, the water budget provides for 1.19 MAF (1.43 cubic kilometers) in the Snake River, but the amount actually obtained has ranged from 0.44 to 0.48 MAF (0.52 to 0.59 cubic kilometers). This amount of water was fully used in 7 to 17 days in the years 1987 through 1990 and, even during the days of release, it did not provide sufficient flows for adequate fish passage (CBFWA 1990). Monitoring at Lower Granite Dam indicates that sockeye salmon migrate past this facility between early April and late June, spanning a period of 38 to 73 days (Fish Passage Center 1988; 1989; February 1990). However, the flow at Lower Granite Dam averaged only 77,000 to 88,000 cfs (2,180.4 to 2,491.9 cubic meters per second) during the period (7 to 17 days) of water budget use. This is well below the flow levels identified by the fishery agencies and tribes as needed for passage (CBFWA 1990).

The FWP also does not address the need for flows above the minimum. The fishery representatives had requested a sliding scale that would have made more water available for fish in those years when the annual runoff was greater. This approach was not made part of the water budget. An additional concern is that, in good water years, some of the water budget commitment is made up of increased runoff, and the amount of stored water available for the water budget is subsequently reduced. This results in a water budget that provides water equivalent only to that which would be required during a critically low-flow year.

(ii) *Limitation to a 60-day period.* The problem with limiting the water budget to a 60-day period is the resulting drop in flows during the subsequent period. Use of water for the water budget in the spring period creates a "hole" in reservoir storage that is then replaced by holding back flows when the water budget request is no longer in force. During these time periods there are still significant numbers of fish passing through the system that are adversely impacted by the low flows caused by water storage

(iii) *Lack of a guaranteed flow.* The FWP requires Federal project operators and regulators to "act in good faith" in implementing the water budget as a "firm" requirement to provide 1.19 MAF (1.43 cubic kilometers) at Lower Granite Dam. However, this requirement is subject to the limits of other firm non-power requirements, such as flood control and other authorized purposes of the facilities. In some cases, these criteria conflict with priorities in the FWP. An example of this occurred in 1989 when a water budget request involving Dworshak Reservoir in 1989 was modified by the Corps of Engineers (COE) based on their expressed policy of only providing flow in excess of 85,000 cfs (2,406.95 cubic meters per second) at Lower Granite Dam if it does not affect refill (Fish Passage Center 1990).

In summary, the water budget has the potential to be one of the most important tools available to move juvenile salmon and steelhead downstream past the dams in the Columbia and Snake Rivers. However, its value has been greatly diminished by decisions of the water operating agencies that must also consider the needs of other water users—particularly at those times when it is most critical to fish passage. It is clear that as currently implemented, the water budget is inadequate to prevent the decline of Snake River sockeye salmon stocks.

(2) *Juvenile fish bypass facilities.* The FWP also addresses juvenile fish mortalities associated with passage through hydroelectric turbines at the mainstem, requiring (1) the construction of new juvenile fish bypass facilities where none existed; (2) the improvement of existing facilities; and (3) interim fish passage through spill of water at projects without adequate juvenile fish bypass systems. These modifications have been scheduled, but not all schedules have been met. As a result, there are continuing losses of fish.

There are eight mainstem river hydroelectric dams, all operated by the COE, that juvenile Snake River sockeye salmon migrants must pass. Five of these projects have juvenile fish bypasses. Progress on bypass facility installation at the remaining three projects has been slow. Facilities that were to have been completed at Lower Monumental and Ice Harbor Dams in 1989 (NWPPC 1984) are now scheduled for completion in 1992 and 1993, respectively. At the Dalles Dam, the COE now estimates that facilities targeted for 1989 completion in the 1984 FWP will not be completed until 1998. Investigation and implementation of measures to improve the performance of existing systems is an ongoing process.

Passing water over spillways is generally used as an interim measure to protect juvenile downstream migrants until permanent bypass facilities are installed. Fish passing over spillways have substantially higher survival than those going through the turbines (Bell 1976; Heinle and Olson 1981). The proportion of fish passed in spill, however, is directly related to the volume of water spilled. Since spilled water is lost hydropower production, spill is resisted by the project operators as a passage option. When it is provided, it generally targets only the peak periods of juvenile fish passage.

In 1988, the fishery agencies are tribes entered into a Fish Spill Memorandum of Agreement (MOA) with the Bonneville Power Administration (BPA) that addresses four COE projects where juvenile fish facilities are inadequate or lacking (Spill MOA, 1988, Reprinted in Fish Passage Center, 1989 Annual Report). The COE did not sign the MOA, but in 1989 and 1990 did operate the four projects in accordance with the agreement. The NWPPC adopted the MOA in the 1989 amendments to the FWP (NWPPC, Notice of Final Action on Spill Amendments No. 89-5, February 15, 1989). Spill provided under the MOA at four dams is expected to improve survival of downstream migrants.

(3) *Transportation.* Collecting fish at an upstream hydroelectric project and transporting them around lower dams and reservoirs for release back into the river are also used to reduce downstream migrant mortalities. Snake River fish are collected and transported from as many as three of the eight COE dams that they must pass. Research has shown that most stocks benefit from such transportation. The effectiveness of transportation is related to in river flow conditions and the transportation program is most effective when flows are low. There are no data specific to the benefits of transporting Snake River sockeye salmon. Limited studies of transport of Columbia River sockeye salmon were inconclusive because it was not possible to isolate and determine the significance of various factors that appeared to influence the results, such as the physiological state of fish when transported, the segment of the outmigration during which fish were collected, and differing responses between two Columbia River tributary stocks (Wenatchee River and Okanogan River).

(4) *Adult fish passage.* The FWP also requires the COE to implement adult fishway operating criteria at all COE's projects on the mainstem Columbia and Lower Snake Rivers. Until 1990, these criteria were included in project operations and maintenance plans and separate criteria were provided in a Detailed Fisheries Operating Plan developed by the fishery agencies and tribes. In a revision to the COE's Fish Passage Development and Evaluation Program (see April 19, 1990 letter from Brigadier General Pat M. Stevens, IV), there was agreement on a process for developing a comprehensive, jointly-approved operating plan for both adult and juvenile facilities, but as of this time, a final plan has not been endorsed by all parties.

Beyond agreement on the definition of operating criteria, there is also a question of implementation. As indicated under causes of decline, there have been problems in recent years in keeping facilities in conformance with established criteria. The FWP has not resolved all of the identified adult fish passage problems at Columbia River hydropower facilities.

(5) *Integrated system plan.* In 1987, the NWPPC established "doubling runs as a reasonable interim goal." Under the FWP, planning for enhancement activities to meet this goal is to be based on individual subbasin plans, and an Integrated System Plan to provide a systemwide framework. The plan includes numerous enhancement measures that could be implemented to increase runs. It also states that "improving mainstem migrant survival is the most important strategy, and has the highest priority," and that without these improvements "actions proposed in many of the upriver subbasins will not be successful in increasing the productivity of anadromous fishes."

In summary, there has been some progress on factors contributing to the decline of sockeye salmon under the NWPA and there is potential for even greater improvement. However, the NWPA does not give a priority to salmon and steelhead or provide any regulatory authority to ensure compliance with decisions of the NWPPC. Consequently, despite efforts to date under the NWPA, Snake River sockeye salmon stocks have continued to decline.

5. Other Natural and Manmade Factors

(a) *Natural factors.* Natural factors of greatest concern to Snake River sockeye salmon are periodic droughts and the oceanographic phenomenon known as El Niño. No known landslides causing excessive sedimentation, naturally recurring barriers to salmon migration, or any other impacts to sockeye production have occurred in the Salmon River Basin (personal communication: John Lloyd, Fish Biologist, Sawtooth National Forest).

(1) *Droughts.* Low water conditions are not as critical for Redfish Lake sockeye spawning and rearing as they are for other species of salmon, since these sockeye spawn and rear in a lake. However, increased periods of slack water further delay downstream juvenile migrants during drought years. Also, low flows may preclude fish from moving through the dams, particularly those with collection and transport systems. Since agricultural diversions tend to take a fixed amount of water, their impact is more severe during drought years than in other years and adult and juvenile migration are subsequently further impacted.

In the Northwest, annual mean streamflows for the 1977 water year (October-September) were the lowest recorded for many streams since the late nineteenth century (Columbia River Water Management Group 1978). Since 1977, precipitation levels in the Snake River Basin above Ice Harbor Dam were below the 25-year average (1961-1985) in the 1979, 1981, 1985, 1987, 1988, and 1990 water years. The 1990 water year became a fourth consecutive year of drought conditions (Columbia River Water Management Group (in press)).

(2) *El Niño.* El Niño ocean conditions are characterized by anomalously warm sea surface temperatures, vertical thermal structure, coastal currents and upwelling. Principal ecosystem alterations are decreased in primary and secondary productivity and changes in distributions of prey and predator species. The three most conspicuous El Niño events of recent decades were those of 1940, to 1941, 1957 to 1958, and 1982 to 1983 (Cannon *et al.* 1985).

The timing and return migration route of mature sockeye salmon may be influenced by major El Niños that affect large eddies in the northeast Pacific Ocean and the distribution of fish and ocean catches (Mysak 1985). There is no direct evidence that the El Niño events have had an adverse impact on sockeye salmon survival in the ocean.

(b) *Manmade factors.* There is no direct evidence that artificially propagated fish have compromised the genetic integrity of Stanley Basin sockeye salmon. Supplementation of kokanee occurred sporadically beginning early in this century. In most cases, the origin of the donor stocks is unknown (Bower, 1990). Preliminary electrophoretic analyses of 19 different sockeye salmon and kokanee samples from Idaho, Washington, and British Columbia (these include the most likely sources for donor stocks for artificially reared smolts) indicated that the Redfish and Alturas Lake kokanee populations are genetically different from the other populations sampled. Sockeye salmon from Redfish Lake were unavailable for sampling. Artificial production of other species may have an adverse impact on sockeye salmon as they jointly migrate through the rivers, estuary and ocean, and may compete with sockeye for food.

Proposed Determination

Based on its assessment of the best scientific and commercial information available. NMFS is issuing a proposed determination that the Snake River sockeye salmon (*Oncorhynchus nerka*) is a "species" under the ESA. Furthermore, NMFS proposes to list the Snake River sockeye salmon as endangered under the ESA. Although NMFS determined that an emergency rule is not warranted at this time, NMFS will reconsider if available information indicates that there is an emergency situation posing a significant risk to the Snake River sockeye salmon.

Available Conservation Measures

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

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 resulting in destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) 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 adversely affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with NMFS.

Examples of Federal actions that may be affected by this proposal include authorized purposes of mainstem Columbia River and Snake River hydroelectric and storage projects. Such authorized purposes include hydroelectric power generation, flood control, irrigation, and navigation. Federal actions including COE section 404 permitting activities under the Clean Water Act, COE section 10 permitting activities under the Rivers and Harbors Act, and Federal Energy Regulatory Commission licenses for non-Federal development and operation of hydropower may also be affected.

Based on discussions in this notice, general conservation measures that could be implemented to help conserve the species include the following:

(1) Adult sockeye returning to the Snake River (Redfish Lake) could be trapped and held for spawning. The progeny would be used to rebuild the sockeye population.

(2) Efforts could be made to ensure that adult passage facilities at dams effectively pass migrating salmon upstream.

(3) Flows in the Snake and Columbia Rivers could be regulated to pass downstream migrating fish effectively through the system. It is recognized that coordination of hydropower production in the Northwest is a long-range effort, and major changes in planned river operation cannot be made on short notice. However, NMFS believes that the parties responsible for flow regulation have sufficient authority and flexibility on a short-term basis to improve passage conditions for sockeye through modification of flow. NMFS will work closely with those parties to monitor water flows during the time the sockeye salmon are in the system.

(4) The catch of sockeye salmon in all Columbia River non-tribal and tribal fisheries could be eliminated. The Oregon Department of Fish and Wildlife and the Washington Department of Fisheries have predicted that returning runs of sockeye salmon in the Columbia River in 1991 will be too low to authorize non-Indian or Indian fisheries. However, under the Columbia River Management Plan, treaty Indian dipnetting remains open and ceremonial and subsistence gillnet fisheries may occur, regardless of sockeye run size.

(5) All water diversions available to downstream migrating juvenile sockeye salmon could be screened. Sockeye salmon juveniles migrate downstream from late April through May. Many unscreened diversions have been identified, and a thorough review of the impact of unscreened diversions on sockeye salmon will be evaluated.

(6) Predators and competitor species in the Stanley Basin lakes could be controlled.

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. To avoid delaying this listing proposal, NMFS will propose critical habitat in a separate rulemaking.

Public Comments Solicited

To ensure that the final action resulting from this proposal will be as accurate and as effective as possible, NMFS is soliciting comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, and any other interested parties. Three public hearings have been scheduled (see **DATES** and **ADDRESSES**). The final decision on this proposal is due by April 1992 and will take into consideration the comments and any additional information received by NMFS, and such communications may lead to a final action that differs from this proposal.

Classification

The 1982 amendments to the ESA (Pub. L. 97-304) in section 4(b)(1)(A), restricted 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*, 657 F.2d 829 (6th Cir., 1981), NMFS has categorically excluded all endangered species listings from environmental assessment requirements of the National Environmental Policy Act (48 FR 4413, February 6, 1984).

The conference Report on the 1982 amendments to the ESA notes that economic considerations have no relevance to determinations regarding the status of species, and that E.O. 12291 economic analysis requirements, the Regulatory Flexibility Act, and the Paperwork Reduction Act are not applicable to the listing process. Similarly, listing actions are not subject to the requirements of E.O. 12612.

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List of Subjects in 50 CFR Part 222

Administrative practice and procedure, Endangered and threatened wildlife, Exports, Fish, Import, Marine mammals, Reporting and recordkeeping requirements, Transportation.

Dated: April 1, 1991.

William W. Fox, Jr.,

Assistant Administrator for Fisheries.

For the reasons set out in the preamble, 50 CFR part 222 is proposed to be amended as follows:

PART 222—ENDANGERED FISH OR WILDLIFE

1. The authority citation of part 222 continues to read as follows:

Authority: 16 U.S.C. 1531–1543.

§ 222.23 [Amended]

2. In § 222.23, paragraph (a) is amended by adding the phrase "Snake River sockeye salmon (*Oncorhynchus nerka*);" immediately after the phrase "Totoaba (*Cynoscian macdonaldi*);" in the second sentence.

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