VIA U.S. MAIL April 25, 2002

D. Robert Lohn
Regional Administrator
Northwest Region
National Marine Fisheries Service
7600 Sandpoint Way
Seattle, WA 98115

Dear Administrator Lohn,

Enclosed please find a Petition to define and list the wild stocks of coho along the Oregon coast as a threatened species, pursuant to the Endangered Species Act, 16 U.S.C. Sec. 1531 et. seq. (2001) ("ESA").

As the Petition highlights, there is ample and significant biological and legal justification for recognizing a distinction between wild stocks and hatchery populations of coho within the Oregon coast's watersheds. The Petition explores the behavioral, physiological, physical, ecological, reproductive and evolutionary differences between the hatchery and wild stocks. Both NMFS' "Evolutionarily Significant Unit" Policy and the joint NMFS and U.S. Fish and Wildlife "Distinct Population Segment" Policy support a delineation between wild and hatchery coho stocks along the Oregon coast. Additionally, many of NMFS' own documents explored in the Petition implore that the protections of the ESA apply to wild stocks, that hatchery stocks are a threat to wild stocks and instead hatchery fish should only available for consideration in the recovery of threatened or endangered species.

NMFS has a legal mandate to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve [these] purposes…." 16 U.S.C. § 1531(b) (2001). As NMFS recognized (60 Fed. Reg. 38011, July 25, 1995; 53 Fed. Reg. 42587, Aug. 10, 1998) and the Petition now demonstrates, the wild stocks of Oregon coast coho have clearly been on a continuing path to extinction over the last one hundred years. Instead of reversing the direction of that decline, NMFS has hastened the decline by failing to actively pursue judicial protections in Alsea Valley Alliance v. Evans and National Association of Homebuilders v. Evans.

In the Petition, NMFS will note that not just one, but all five statutory factors for decline are currently contributing significantly to the erosion of any future livelihood of the wild stocks of Oregon coast coho populations. Without serious, concerted effort at restoring habitat, reducing overutilization, curbing disease and predation, improving the regulatory mechanisms and minimizing the natural and manmade impacts, it is not hard to imagine a world without wild Oregon coast coho in the foreseeable future, especially if NMFS continues to fail to adhere to their legal mandate and protect the wild Oregon coast coho stocks in their natural habitat. With this urgency, Petitioners ask that NMFS promptly issue their 90-day finding, other related agency actions notwithstanding.

One final note, websites and/or hard copies of pertinent references to be considered, as with all cited references, as part of the record will be mailed to you separately within the week. If you have any further questions about this matter, please do not hesitate to contact us. We will gladly supply any information needed to assist NMFS in this decision making process.

Respectfully submitted,

Kaitlin L. Lovell

Kaitlin L. Lovell

on behalf of:

Ric Abbett, President, Washington Council of Trout Unlimited
Sybil Ackerman, Conservation Director, Audubon Society of Portland
Bill M. Bakke, Director, Native Fish Society
Kurt Beardslee, Executive Director, Washington Trout
Nicole Cordan, Policy and Legal Director, Save our *Wild* Salmon
Thomas Gilg, Vice President of Conservation, Oregon Council of the Federation of Fly Fishers
Jan Hassleman, Counsel, National Wildlife Federation Northwestern Natural Resource Center
Doug Heiken, Wildland Advocate, Oregon Natural Resources Council
Andrew Josephson, Executive Director, Orange Ribbon Foundation
Rob Masonis, Acting Director of Northwest Regional Office, American Rivers
Glen Spain, Northwest Regional Director, Pacific Coast Federation of Fishermen's Assoc. *and* Institute for Fisheries Resources
Barbara Ullian, Conservation Director, Siskiyou Regional Education Project
Joe Whitworth, Executive Director, Oregon Trout
Tom Wolf, Chairman, Oregon Council of Trout Unlimited

ENCLOSURES

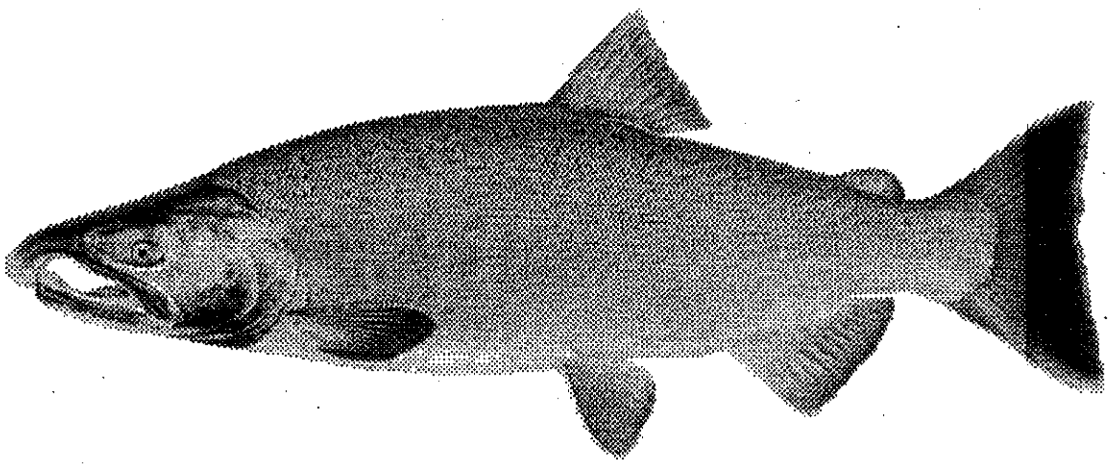
cc:

Mr. Rodney McInnis, (Acting) NMFS Regional Administrator, Southwest Region
Secretary Don Evans, Dept. of Commerce
Dr. William Hogarth, Assistant Administrator for Fisheries, NOAA
Mr. Donald Knowles, Director, Office of Protected Resources, NMFS
Dr. Usha Varanasi, Director, Northwest Science Center, NMFS
Governor John Kitzhaber, M.D.
Senator Gordon Smith

Senator Ron Wyden
Representative Peter DeFazio
Representative Darlene Hooley
Representative David Wu
Mr. John Esler, Oregon Department of Fish and Game Commission Chair

PETITION TO LIST THE OREGON COAST COHO SALMON (*Onchorhyncus kisutch*) AS A THREATENED SPECIES UNDER THE FEDERAL ENDANGERED SPECIES ACT

April 25, 2002



Trout Unlimited

Acknowledgements

The Petitioners would like to thank Daniel Rohlf, Esq., the Director of the Pacific Environmental Advocacy Center, Patti Goldman, Esq., Managing Attorney at Earthjustice Legal Defense Fund, and Dr. Richard Williams of Clear Creek Genetics for their reviews and contributions to this Petition.

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I. Introduction

Trout Unlimited, Oregon Council of Trout Unlimited, Washington Council of Trout Unlimited, Oregon Trout, Washington Trout, Native Fish Society, Oregon Council of the Federation of Fly Fishers, Pacific Coast Federation of Fishermen's Associations/Institute for Fisheries Resources, Oregon Natural Resources Council, Save our *Wild* Salmon, Orange Ribbon Foundation, American Rivers, Audubon Society of Portland, National Wildlife Federation, and Siskiyou Regional Education Project are petitioning the National Marine Fisheries Service ("NMFS") to define and list all wild, indigenous, naturally-spawned, coho found in the Oregon coastal drainages north of Cape Blanco and south of the Columbia River, as a threatened distinct population segment of Oregon coast coho under the Endangered Species Act, 16 U.S.C. § 1533 ("ESA"). The definition of wild coho as a "species" and the petition are warranted because the ESA and NMFS' own policies emphasize the need to protect wild fish and that hatchery fish are partly responsible for the continual demise of wild coho. The wild coho of the Oregon coast have been historically, and are presently, threatened by the destruction and modification of their habitat due to logging activities, agricultural impacts, urbanization, dam construction and operation, stream diversion, stream channelization, stream withdrawals, water quality degradation, wetland loss and mining activities. Additional pressures to the survival of the species include overharvest by commercial and recreational consumers, the failure of mandatory and voluntary regulatory mechanisms in the recovery of the species, poor atmospheric and marine conditions, and finally predation, competition, interbreeding with hatchery fish, and incidental catch mortality, from the continued introductions of massive numbers of hatchery fish. Without the protections afforded by the ESA, the wild Oregon coast coho are destined to decline to extinction.

A. BACKGROUND

On July 25th, 1995, prompted by multiple petitions, NMFS published a proposed rule to list the Oregon coast coho (*Oncorhynchus kisutch*) as a threatened species under the ESA. 60 Fed. Reg. 38011 (July 25, 1995). That proposed listing was substantially supported by data gathered during a coastwide status review of coho salmon by NMFS' own Biological Review Team (BRT), as well as other sources. Quantitative and qualitative assessments based on 20 years of evidence determined that nearly seventy-five percent (75%) of Oregon coastal coho populations were depressed. (*Id.* at 38018, 38021). Compared to historical numbers the Oregon coast coho's habitat capacity was reduced by fifty percent (50%), and even more alarmingly, their abundance had declined by between ninety percent (90%) and ninety-five percent (95%). (*Id.* at 38021). NMFS also concluded that there was a heavy hatchery influence in the streams occupied by the Oregon coast coho, and that it was "cause for concern about the sustainability of natural production in these systems" because the hatchery stocks "could hinder the ability of natural populations to sustain themselves in the long term." (*Id.* at 38021, 38019). Consequently, NMFS proposed to list all naturally-reproducing populations of Oregon coast coho as threatened, but reserved the ability to examine and determine the relationship of hatchery populations to the proposed population listing. (*Id.* at 38025).

Despite the dire straits of the coho stocks, on October 31, 1996, NMFS extended the final listing decision for six months in order to analyze and evaluate additional data. 61 Fed. Reg. 56211. On May 6, 1997, NMFS issued a final determination not to list the Oregon Coast coho as a threatened species. 62 Fed. Reg. 24588. Although NMFS still acknowledged that the Oregon coast coho stocks were at less than ten percent (10%) of their historical abundance levels and that state and federal programs were unable to create and protect the high quality habitat necessary for long term survival, the agency nonetheless determined that the short-term risk of extinction was reduced by future, voluntary hatchery and harvest improvements. (*Id.* at 24588, 24607).

On June 1, 1998, the District Court of Oregon ruled on a case brought by Oregon Natural Resources Council *et al.*, challenging NMFS' failure to list the Oregon coast coho in reliance on the State of Oregon's coastal salmon restoration plan. Oregon Natural Resources Council v. Daley, 6 F.Supp.2d 1139 (D.Or., 1998). In doing so, the court did not disturb NMFS' findings of the decline in Oregon coast coho and the multitude of long-standing, human induced reasons for the decline. (*Id.* at 1145-46). The court held that NMFS applied the wrong legal standard by relying improperly on the prospect of future programs contained in state's salmon restoration plan as the reason for not listing the Oregon coast coho. (*Id.*). In response to the decision, NMFS listed the Oregon coast coho as threatened on August 10, 1998. (63 Fed. Reg. 42587).

On September 10, 2001, yet another legal decision voided the listing decision. Alsea Valley Alliance v. Evans, 161 F.Supp.2d 1154 (D. Or. Sept. 10, 2001). Without addressing the perilous decline of the coho, the court found that NMFS acted arbitrarily and capriciously in listing the Oregon coast coho on August 10, 1998 because, the court held, that if NMFS defines a distinct population segment (DPS) to include hatchery fish with wild fish, then the agency cannot further subdivide the DPS to segregate out the hatchery fish when making the listing determination. (*Id.* at 1162). The court ordered NMFS to reconsider the listing determination based on the best available scientific information, and delisted the Oregon coast coho in the interim. (*Id.* at 1163-64). On December 14th, 2001, the Ninth Circuit granted intervenor-appellants' emergency motion for a stay pending appeal, thereby temporarily restoring protections to the Oregon coast coho. This Petition proposes that NMFS define the Oregon coast coho to explicitly exclude hatchery fish from the distinct population segment and list the coho as threatened under the Endangered Species Act.

B. PRESENT SITUATION JUSTIFIES LISTING

NMFS has continued to find that the wild Oregon coast coho, as defined in this Petition, have suffered from serious and continued threats to their habitat, ocean survival, and their long term genetic fitness, at the hands of human influences, such that it required federal protections. (Weitkamp *et al.* 1995; WCCSBRT 1997); 60 Fed. Reg. 38011 (July 25, 1995); 62 Fed. Reg. 24588 (May 6, 1997) (NMFS determined that a listing would be justified but for the future, voluntary mitigation measures of the State of Oregon's recovery plan, a decision which was later overturned); 63 Fed. Reg. 42587 (Aug. 10, 1998)). Prior to and since the initial listing decision in 1998, the scientific literature and the State of Oregon have continued to document the adverse impacts that these threats have on the survival of wild Oregon coast coho. (Waples 1991; Hard *et al.* 1992; Fleming and Gross 1993; IMST 1999; Reisenbichler and Rubin 1999; Maleki and Riggers 2000; IMST 2000; Oregon Progress Board 2000; Jacobs *et al.* 2001). The decision by Judge Hogan in Alsea Valley Alliance v. Evans, 161 F.Supp.2d 1154 (D. Or. Sept. 10, 2001) to delist the Oregon coast coho, and the subsequent decision by NMFS not to appeal that decision and/or list the Oregon coast coho on an emergency basis, departs significantly and disturbingly from a long line of the best available science; indeed there is *no* science available at all to suggest that the threats to the Oregon coast coho have been alleviated and therefore these fish should not be protected. In fact, as reaffirmed by the order by the Ninth Circuit granting the motion for a stay pending appeal, the opposite holds true.

The wild populations of Oregon coast coho have continued to oscillate in population numbers especially during the 1990's, seeing their lowest spawner abundance numbers in 1997. Like the historical trends, the small increases in spawner abundances since 1997 offer no insight into the long term abundances. Indeed, the coho populations are still at less than ten percent of their original, historical populations and show no signs of recovering without federal protection. Furthermore, recently released reports indicate that the 2001 outgoing ocean migrations in other parts of Oregon were at record lows, suggesting that the corresponding 2003 broodyear returns may also set record low levels. (Fish Passage Center 2001). Even the most optimistic review of abundances offer misleading hope that those coho that do return will find an acceptable spawning area awaiting their arrival.

Indeed, the listing led to many improvements to the human induced practices responsible for the decline of the salmon. The State of Oregon adopted the Oregon Plan for Salmon and Watersheds ("Oregon Plan") (the plan at issue in Oregon Natural Resources Council v. Daley, 6 F.Supp.2d 1139 (D.Or., 1998)), which introduces various voluntary programs to improve salmon habitat and passage, compliance with which is directly encouraged due to the listing of the coho. The listing required federal agencies to consult with NMFS; one such example is over numerous federally sponsored timber harvests and other projects in sensitive salmon habitat. Those consultations were stymied by the September 21, 2001 directives to release timber sales that had been suspended in response to the Alsea Valley Alliance decision. Harvest allowances were similarly curtailed with Pacific Fisheries Management Council prohibiting all coastal coho harvests after 1994. (IMST 2000). Hatchery restrictions also occurred with the listing, leading to a reduction in hatchery output and the closure of the Fall Creek hatchery as a direct response to the listing. (IMST 2001).

Without the protections afforded by the listing, the multitude of threats identified by NMFS in 1995 will continue to wreak havoc on the coho population, eventually resulting in its extinction. The opinion in Alsea Valley Alliance and NMFS' subsequent inaction to protect the Oregon coast coho in defiance of its previous findings, highlight how tenuous a temporary listing of Oregon coast coho may be. The tenuous nature of the current listing may be alleviated if NMFS modifies the listing to define the Oregon coast coho species as including only the wild Oregon coast coho and those coho that are naturally spawned from Cape Blanco to the Columbia River. As this Petition explains, the hatchery fish and the wild coho along the Oregon coast are two distinct species for the purposes of protection under the ESA. Given the current precarious status of coast coho and the constantly changing legal protections for these fish and their habitat, Petitioners hereby request that NMFS delineate extend protections under the ESA to the Oregon coast coho, as defined here.

II. Petitioners

A. Trout Unlimited

Trout Unlimited ("TU") is a non-profit organization with over 130,000 members in over 450 chapters nationwide. TU's mission is to conserve, protect, and restore North America's trout and salmon fisheries and their watersheds. TU has been involved for many years in protecting the Pacific Northwest salmonid populations. Along the Oregon coast, TU's efforts have included advocating the breaching of dams along the coast, harvest limits on ocean fisheries, and habitat and water quantity issues along the Columbia River and Oregon coast. Many of our members actively participate in their Oregon communities to improve passage, restore coho habitat and protect riparian areas in and around the streams and tributaries of the Oregon coast. The increased likelihood of extinction of Oregon coast coho to their riverine habitat will greatly hinder TU's efforts to protect and restore the region's watersheds and the species that they support.

B. Oregon Council of Trout Unlimited

The Oregon Council of Trout Unlimited represents all TU members in Oregon. There are 2,400 members in the state who are actively involved in protecting and restoring native salmonids in Oregon. The Council's members have been very active in all aspects of recovering wild Oregon coho. These include habitat projects, increasing fish passage and working on state regulations that will help in the recovery of native coho. The Oregon Council of Trout Unlimited considers the recovery of Oregon coho a vital part of its mission to restore Oregon's native salmonids and ensure that the wild coho does not go extinct but increases and prospers. The Oregon Council therefore considers it important that wild Oregon coastal coho be given ESA status in order to assure their continued survival.

C. Washington Council of Trout Unlimited

The Washington Council of Trout Unlimited represents all TU members in Washington. The more than 4,500 TU members in Washington are active volunteers in the efforts to protect salmonids in the Pacific Northwest. Their tireless effort to improve habitats, water quality, stream passage, as well as advocate for selective fisheries, catch and release fisheries, and tribal fishing rights has resulted in changed practices and perceptions that have benefited salmon and steelhead coastwide, including the Oregon Coast Coho.

D. OREGON TROUT

Founded in 1983 and based in Portland, Oregon, Oregon Trout ("OT") is a non-profit organization advocating on behalf of its 2,500 members for the conservation of our native fish heritage. OT's mission is "to protect and restore native fish and their ecosystems." The organization pursues this mission by developing, forwarding, and implementing science-based conservation projects and ecologically and economically sound approaches to native fish recovery while educating the next generation of Oregonians through our SalmonWatch curriculum. Since its founding, OT has worked to protect and restore Oregon coast native coho salmon. Our programs include advocacy, local volunteer workgroups, and habitat restoration projects targeted at restoring the habitat of Oregon Coast native coho. Oregon Trout has worked extensively in the rivers of the Oregon north coast, including the development of a widely-acclaimed report "A Salmon Conservation Strategy For the Tillamook and Clatsop State Forests" in October of 2000, and has run SalmonWatch education programs in waters that support Oregon Coast coho.

E. WASHINGTON TROUT

Washington Trout ("WT") is a non-profit conservation-ecology organization dedicated to the preservation and recovery of Washington's wild fish and their habitats. WT attempts to address all factors that contribute to wild salmon declines and that may impact their recovery, including habitat preservation and restoration, commercial and sport harvest-management, and hatchery practices. WT has conducted research on the status and recovery needs of wild fish populations and their habitats, successfully advocated for changes in resource-management policy, and developed and implemented model habitat-restoration projects. Since its founding in 1989, WT has built a reputation among public and tribal agencies, the business community, scientific institutions, and environmental and community organizations for expertise, credibility, and a focus on the needs of the resource.

Washington Trout has approximately 2000 individual members, who use and enjoy rivers, streams, and nearshore saltwater-bodies throughout the Northwest for recreational, scientific, aesthetic, and commercial purposes, deriving benefits from the existence of robust wild-salmon populations and healthy aquatic and marine systems. Many of our members, through participation in WT and other community activities, take an active role in the protection and recovery the Northwest's wild fish and their habitats. The interests of Washington Trout and its members would be hindered by the increased likelihood of the extinction of Oregon Coast coho in the absence of necessary and appropriate protections afforded by listing under the Endangered Species Act.

F. NATIVE FISH SOCIETY

The mission of Native Fish Society ("NFS") is to protect and restore wild native fish and their habitats. NFS staff petitioned for the initial listing of Oregon coastal coho salmon. This petition proved successful and the salmon were listed as threatened under the ESA until recently challenged in Alsea Valley Alliance v. Evans, 161 F.Supp.2d. 1154 (D.Or., 2001). These fish are an important segment of the natural biological diversity of coho salmon on the west coast of North America. They have declined in abundance and are at risk of extinction. The loss of this biological treasure is unacceptable and for this reason NFS is participating in a new effort to list only the wild Oregon coast coho under the federal Endangered Species Act.

G. OREGON COUNCIL OF THE FEDERATION OF FLY FISHERS

The Oregon Council of the Federation of Fly Fishers ("ORCFFF") is a non-profit organization with 21 member clubs representing over 2,000 members in Oregon. The ORCFFF itself is a Council within the Federation of Fly Fishers ("FFF"), a nationwide organization. FFF's and ORCFFF's mission is to "Conserve, Restore and Educate Through Fly Fishing." In response to continuing threats to native naturally-reproducing fish stocks, the ORC has become increasingly involved in legal and on-the-ground efforts to better study and restore at-risk salmon and trout populations.

H. PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS AND THE INSTITUTE FOR FISHERIES RESOURCES

Pacific Coast Federation of Fishermen's Associations ("PCFFA") is by far the largest trade organization of commercial fishermen on the west coast. PCFFA is a federation of 25 smaller commercial fishermen's vessel owners' associations, trade associations, port associations, and marketing associations, with member associations in most U.S. ports on the West Coast from San Diego to Alaska. Oregon ports in which PCFFA has active member associations within the Oregon coast ESU for coho salmon include the Port of Astoria, in which the organization Salmon for All is a PCFFA associate member. PCFFA also has fishermen members "at-large" who are unaffiliated with any particular fishermen's association but who have become individual members of PCFFA. Collectively, PCFFA's port and member associations and "at-large" members represent nearly 3,000 west coast commercial fishing families who are small and mid-sized commercial fishing boat owners and operators, most of whom derive all or part of their income from the harvesting of Pacific salmon.

The Institute for Fisheries Resources ("IFR") is a California non-profit corporation dedicated to the protection and restoration of marine fisheries and anadromous salmon resources along the entire United States west coast. IFR directs and manages the many salmon fisheries conservation and restoration efforts of the PCFFA and is closely affiliated with, although legally and financially independent of, PCFFA. IFR has approximately 850 members coastwide, most of whom are commercial salmon fishermen or women, or individuals who have a personal interest in the restoration of west coast salmon fisheries.

I. Oregon Natural Resources Council

Oregon Natural Resources Council Fund ("ONRC"), headquartered in Portland, Oregon, is a charitable 501(c)(3) non-profit corporation with approximately 6,700 members. ONRC's goals are: (1) to defend and conserve Oregon's wildlands, wildlife, and waters, including the state's remaining old-growth forest and roadless areas, and (2) to protect and restore fully-functioning terrestrial and aquatic ecosystems with a full complement of native species.

ONRC petitions on its own behalf and on behalf of its members, many of whom regularly enjoy and will continue to enjoy Oregon coastal coho salmon and coho habitat for educational, recreational, and scientific activities, including hiking, camping, photography, and observing wildlife. The interests of ONRC and its members have been harmed unless NMFS acts quickly to designate Oregon coast coho as a threatened species.

J. Save our *Wild* Salmon

With a combined individual membership of 6,000,000, Save our *Wild* Salmon ("SOS) is a coalition of more than 50 sport fishing, commercial fishing, and conservation organizations – local, regional, and national – which seek restoration of salmon stocks throughout the Pacific Northwest to sustainably harvestable numbers. Among our members groups is Salmon for All, a commercial fishing association, located in Astoria, Oregon, that fish for coastal coho in Oregon's coastal and ocean waters.

K. Orange Ribbon Foundation

The Orange Ribbon Foundation is a coalition of environmentalists and concerned citizens whose mission is to "preserve and develop research, habitat, and policy for endangered species throughout the Pacific Northwest." Its members come from all walks of life and share a common interest in the long-term sustainability of wild habitat. The Orange Ribbon Foundation has long advocated for sound management policies to protect coastal and inland resources, and has led successful campaigns to protect against debilitating oil spills in Washington and to preserve pristine freshwater, land-based, and marine habitat for countless endangered species.

L. American Rivers

American Rivers is a national, non-profit conservation organization dedicated to protecting and restoring the nation's outstanding rivers and river resources and the fish and wildlife they support. American Rivers' Northwest Regional Office located in Seattle, Washington covers the states of Oregon, Washington, and Idaho, and focuses on recovering wild salmon and steelhead by protecting and restoring the freshwater ecosystems on which they depend. American Rivers has more than 30,000 members, over 750 of whom reside in the state of Oregon and use and enjoy Oregon's rivers and streams for recreational, aesthetic, economic, and educational purposes.

M. AUDUBON SOCIETY OF PORTLAND

Audubon Society of Portland ("ASP") is an Oregon non-profit conservation organization established in 1902 to promote the enjoyment, understanding, and protection of native birds, other wildlife, and their habitats in the Pacific Northwest. With 10,000 members and its principal office in Portland, Oregon, ASP plays an important role in the activities along the Oregon coast, including ASP sponsored outings to learn about coho salmon, and conservation programs working for the protection of the Tillamook and Clatsop State Forests, important spawning grounds for Oregon coast salmonid species. To serve ASP's mission to protect wildlife and their habitats, ASP petitioned to list the Oregon coast coho in 1993. ASP has also been actively involved in the Tillamook and Clatsop State Forest Management Plans, the Forest Practices Advisory Committee and the Oregon Plan for Salmon and Watersheds, to improve the habitat and spawning grounds of the Oregon coast coho.

N. NATIONAL WILDLIFE FEDERATION

National Wildlife Federation ("NWF") is the nation's largest conservation advocacy and education organization. Founded in 1936, NWF is a non-profit organization with its headquarters in Reston, Virginia. NWF has eleven regional offices, including the Northwestern Natural Resource Center in Seattle, Washington. NWF's mission is to educate, inspire, and assist individuals and organizations of diverse cultures to conserve wildlife and other natural resources and to protect the Earth's environment in order to achieve a peaceful, equitable, and sustainable future. As part of this mission, NWF and its over 4.5 million members and supporters are dedicated to protecting and restoring the Northwest's salmon runs, including the Oregon coast coho salmon ESU.

O. SISKIYOU REGIONAL EDUCATION PROJECT

The Siskiyou Project is a non-profit, tax-exempt, public interest organization with members in Oregon and northern California. The Siskiyou Project seeks to preserve, protect, and restore the wildlands, wild river, wild fish, and wildlife of the Siskiyou Mountain Bioregion. The Siskiyou Project has been involved in the petitions for listing of Oregon Coast coho under the Endangered Species Act and was a plaintiff in several lawsuits which eventually resulted in the Oregon Coast coho being listed as threatened under the Endangered Species Act. The Siskiyou Project plans to continue advocating for the strongest possible protection of Oregon coast coho and will continue to monitor mining projects, timber sales, and other activities on federal land which have the potential to threaten the continued existence of the species.

III. Species Description

A. Coho Generally

Coho salmon (*Oncorhynchus kisutch*) are one of eight species of anadromous salmonids that inhabit the Pacific Ocean. Although historically the species existed from central California north to Point Hope, Alaska west through the Aleutian Islands to the Anadyr River in Russia, and then south to Hokkaido, Japan, many of those populations are now extinct. 62 Fed. Reg. 24588.

The populations remaining on the west coast of the United States and Canada typically have a three year life cycle. After 1.5 to 4 months, depending on river temperatures, of incubating in freshwater gravel nests ("redds") and surviving off their yolk sac, the salmon emerge from the redds as juveniles ("fry"), and begin months of feeding and rearing before beginning their migration as smolts out to sea, typically in May, averaging between 90-115 mm fork length. (Weitkamp *et al.* 1995). The outmigration and timing of the smolts is significantly altered by habitat degradation, restoration and flow control. (*Id.*). In 1995, Weitkamp *et al.*, found based on coded wire tag recoveries of Oregon coast coho, that a majority of Oregon coast coho are recovered in Oregon (57-60%), followed by California (27-39%), Washington (2-9%), British Columbia (2-6%), and Alaska (<1%). After spending 2 years maturing in the oceans, the adults exhibit strong homing ability and return to their natal streams to spawn. (Waples 1991). Because the coho usually return in October and November, they spawn between November through January (sometimes into February), although the entry time typically depends on river flow levels that coincide with fall rains, with the exception of early(summer) and late(winter) runs in some areas. (*Id.*). Once in the appropriate spawning habitat, female coho will create redds and lay up to 2,500 eggs which will hatch in 5-7 weeks, depending on water temperatures. (Nickelson 2001).

B. OREGON COAST COHO

1. Listing Distinct Population Segments

The Endangered Species Act, 16 U.S.C. § 5131 *et. seq.*, as amended, authorizes NMFS and the U.S. Fish and Wildlife Service (FWS) to list as threatened or endangered those "species" facing threats to their existence. The statute defines the term "species" to include subspecies, as well as "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. § 1532(15) (2001). The language was introduced in the 1978 amendments without comment from the Committee on Merchant Marine and Fisheries, H.Rep. 95-1625 (H.R. 14104), and was not present anywhere in the Senate version of the bill, S. 2899. The only reference to the definition of "species" is in the floor statements in the U.S. House of Representatives when Representative Duncan from Oregon offered an unsuccessful amendment to alter the definition of "species" to exclude any categorization below that of species, namely that of "subspecies" and "distinct population segment." Cong. Rec. 96th Congress, 2nd Session, 38155 (Oct. 14, 1978). In a pertinent response, Representative Dingell retorted that

> [t]he provisions of the amendment offered by the gentleman from Oregon (Mr. Duncan) would say that if a buffalo and a cow occupy the same physical habitat that because they can produce fertile offspring they are cataloged as the same species. So if the buffalo is really approaching extinction and there are cows occupying the same range, the protections of the statute [under the proposed amendment to eliminate "subspecies" and "distinct population segment"] will not apply to the buffalo.

(*Id.*). This example could easily be substituted with wild and hatchery fish, and as Representative Dingell's comments indicate, the subdivisions of "subspecies" and "distinct population segment" are exactly the mechanisms designed to distinguish between domesticated, commercial, production substitutes, such as the hatchery fish on the Oregon coast, from wild threatened or endangered salmonids occupying the same stream.

Since the phrase "distinct population segment" (DPS) is not one ordinarily employed by biologists, its meaning is not otherwise readily apparent from the ESA's language. Though the agencies employed their authority to list groups of organisms other than species or subspecies, neither FWS nor NMFS provided any clarification as to the meaning of this phrase for more than a decade after lawmakers wrote it into law in 1978. During this period, the agencies made listing delineations by distinguishing between captive and wild populations (split listing of chimpanzees), and often listed groupings below the subspecies level based on political boundaries. With respect to the latter type of listings, the FWS delineated protected groupings by employing international boundaries (e.g. grizzly bears), state boundaries (e.g. bald eagles), and even county or parish boundaries (e.g. American alligators).

Only when it was faced with the first petitions to list salmon in the Columbia Basin did NMFS fine tune its effort to develop guidance on defining distinct population segments eligible for listing. In 1991, after going through a public comment process, NMFS finalized a policy (which the agency did not codify as part of its ESA regulations) applicable to all Pacific salmonids for determining whether a given grouping of salmon satisfies the definition and listing requirement. (56 Fed. Reg. 58612 (Nov. 20, 1991)). In this policy, NMFS announced that in order to qualify for listing consideration, a group of salmon must constitute an "evolutionarily significant unit" (ESU). (*Id.*). An ESU, according to NMFS, is distinguishable from other salmon of the same species by two factors: 1) it is "substantially reproductively isolated," and 2) it "represents an important component in the evolutionary legacy of the species." (*Id.* at 58618). Elaborating on these criteria, NMFS explained that an ESU's reproductive isolation need not be absolute, but must allow for "evolutionarily important differences" in genetic makeup and other characteristics, elaborating that "a lack of direct genetic information...[or] a finding of 'no significant difference' on the basis of protein electrophoresis or DNA analysis does not rule out consideration of a population as an ESU." (*Id.* at 58616, 58617). The second factor, according to the agency, emphasizes a prospective ESU's genetic uniqueness; in order to qualify as an ESU, a grouping must "contribute substantially" to the "ecological/genetic diversity" of the species as a whole. (*Id.*). Of important note here is the emphasis on both ecological and genetic diversity, indicating that how the species interacts in its environment, i.e. how locally adapted traits improve its fitness, is one of the main components of the very diversity that the ESA seeks to protect.

In making actual listing decisions however, NMFS was forced to confront the question of how to deal with salmon hatchery programs. Accordingly, in 1993 NMFS published in the Federal Register what the agency termed an "interim policy" addressing how the agency would take into account artificial propagation of Pacific salmonids in making listing determinations under the ESA. 58 Fed. Reg. 17573 (Apr. 5, 1993). This policy summarized NMFS views on the issue as follows:

> The evaluation of the species' status for listing or delisting under the ESA depends on natural populations, which for Pacific salmon are defined as the progeny of naturally reproducing fish. Natural fish are also the focus of evaluations to determine whether a Pacific salmon population represents an evolutionarily significant unit (ESU) of the biological species and hence can be considered a "species" under the ESA. Pacific salmon from artificial propagation programs may be candidates for use in recovery programs depending on available knowledge of the similarity of the naturally and artificially propagated fish in genetic, phenotypic, and life-history traits, and in habitat characteristics.

(58 Fed. Reg. 17573).

In its "interim" policy, NMFS also pointed out that the potentially conflicting roles that hatcheries play in efforts to restore wild salmon populations. (*Id.*). On one hand, NMFS cataloged a variety of ways in which hatchery operations pose threats to wild runs. (*Id.* at 17574). The agency concluded that "genetic and ecological risks of artificial propagation can pose serious threats to natural salmon populations." (*Id.*). On the other hand, NMFS noted that the ESA allows for artificial propagation as a recovery tool, and that salmonid hatcheries have led to "increased juvenile production [that] in some cases has resulted in increased returns of adult fish and has supported recreational, tribal, and commercial fisheries."[1] (*Id.*). However, NMFS also cautioned that at present there is "considerable uncertainty about artificial propagation as a means to increase natural salmon populations." (*Id.*).

NMFS carried this double-edged approach to hatcheries into its statement of policy on the hatchery issue. NMFS acknowledged that "[g]enetic resources important to the species' evolutionary legacy may reside in hatchery fish as well as in natural fish." (*Id.*). However, NMFS specified that it would not include hatchery fish in an ESU if any of the following three factors were present: "(1) the hatchery population in question is of a different genetic lineage than the listed natural populations, (2) artificial propagation has produced appreciable changes in the hatchery population in characteristics that are believed to have a genetic basis, or (3) there is substantial uncertainty about the relationship between existing hatchery fish and the natural population." (*Id.* at 17575).

After setting forth how it would consider hatchery fish in defining ESUs, NMFS identified an additional step that the agency would take in the listing process. The interim policy established a presumption that the agency would not include hatchery fish in the listing. (*Id.*). NFMS did not explain the precise basis for this presumption though the agency apparently acted in accord with its legal conclusion that "[t]he ESA…mandates the restoration of threatened and endangered species in their natural habitats." (*Id.* at 17573). Indeed, NMFS cited hatcheries generally as threats to naturally spawning coho populations, concluding that "because successful salmon hatchery dramatically changes the mortality profile of a population, some level of genetic change relative to the wild population is inevitable, even in hatcheries that use local broodstock. These changes are unlikely to be beneficial to naturally reproducing fish" (internal citations omitted). (Weitkamp *et al.* 1995). However, NMFS recognized that hatcheries could potentially play a role in salmonid conservation in cases where "the natural population faces a high short-term risk of extinction, or if the hatchery population is believed to contain a substantial proportion of the genetic diversity remaining in the species." (*Id.* at 17575). Only in such cases where NMFS considered hatchery fish "essential for recovery" of the ESU would the agency include these fish in the listed group; otherwise, NMFS would not extend ESA protections to hatchery fish even though they were part of the listed ESU. (*Id.*).

NMFS went on to widely apply the listing policy described in its interim policy. Many of the ESU's the agency listed as threatened or endangered, including coho along

[1] Ironically, NMFS' own scientists concluded the opposite in the supporting literature for the hatchery policy stating, "[d]espite the fact that many artificial propagation programs for Pacific salmon have succeeded in producing fish for harvest, supplementation programs involving artificial propagation have generally not increased the abundance of natural fish." (Hard *et. al.* 1992).

the Oregon coast, included hatchery fish within the ESU delineation that NMFS then excluded from the actual listing itself.

In 1996, FWS and NMFS finally developed a generally applicable interpretation of what constitutes a "distinct population segment." In a joint policy (hereinafter "DPS Policy") that also did not become part of the FWS' and NMFS' codified regulations, the agencies declared that they would delineate groupings eligible for ESA listings based on two factors: 1) "discreteness," measured by whether the population is "markedly separated" from others by "physical, physiological, ecological, or behavioral factors" or by international boundaries; and 2) "significance," a measure of the population's "importance to the taxon in which it belongs." 61 Fed. Reg. 4722, 4725 (Feb. 7, 1996). Explaining the relationship between NMFS' ESU policy for Pacific salmon and the DPS policy, the agencies asserted that the two are components of a consistent "general policy," but that an ESU approach is "formulated specifically to address the biology" of salmon. (*Id.* at 4723).

2. Listing of Oregon Coast Coho

After the petitions submitted to NMFS in 1993, the agency convened a biological review team (BRT) and initiated a coastwide status review of the coho populations using the best available scientific and commercial data available to the agency. Based on the data gathered during that review in 1995, the agency determined that six coho groupings exhibited "a reasonable degree of reproductive isolation from each other." (Weitkamp *et al.* 1995). The agency thus categorized coastal coho populations into six evolutionary significant units (ESUs): 1) Puget Sound/Strait of Georgia, 2) the Olympic Peninsula, 3) Lower Columbia River/Southwest Washington, 4) Oregon Coast, 5) Southern Oregon/Northern California, and 6) Central California. (*Id.*).

In 1997, NMFS' West Coast Coho Salmon Biological Review Team (WCCSBRT) updated the status of coho in the Oregon coast ESU. (WCCSBRT 1997). As part of this analysis, the WCCSBRT assessed whether fish originating in hatcheries operating on coastal streams in Oregon should fall within this ESU. To answer this question, the BRT asserted that "the guiding principle should be whether the hatchery population contains genetic resources similar to those of natural populations in the ESU." (*Id.*). Applying this yardstick to thirteen hatcheries with the ESU boundaries, the WCCSBRT concluded that nine hatchery populations "were clearly" part of the ESU, reasoning that these fish were "recently derived" from native stocks, and that most incorporated native broodstock into each hatchery generation.[2] On the other hand, the WCCSBRT found that three hatcheries that had been in operation for at least 40 years and that did not incorporate native broodstock, should not be included within the ESU "based largely on the length of domestication of these stocks, and their genetic dissimilarity to either natural fish or the recently-derived hatchery populations."[3] (*Id.*). Finally, the WCCSBRT reported

[2] The nine hatchery populations included hatchery coho in the Coos River, Coquille River, Cow Creek, North Umpqua River, Smith River, Tahkenitch/Siltcoos, Alsea River, Salmon River and Fishhawk Creek.
[3] These include hatchery stocks in Fall Creek and the Siletz and Trask Rivers. NMFS did not define "recently derived," although 40 years was apparently not "recently derived," yet NMFS also failed to

"considerable uncertainty" whether the North Fork Nehalem River hatchery population was "sufficiently different" from natural fish that it should not be classified as part of the ESU. (*Id.*).

In reaching its conclusions as to which hatchery populations to include in the ESU, the WCCSBRT did not specify precisely how it determined the genetic makeup of each hatchery population; the WCCSBRT did not cite any specific data on the genetic composition of any of the hatchery stocks (unlike the extensive genetic studies done on the entire Pacific coast coho) beyond the descriptive information about the hatcheries themselves and their operations, such as broodstock origins, number of fish produced, location of releases, etc. (*Id.*). Finally, the WCCSBRT did not identify any of the hatchery populations as "essential for recovery" for Oregon coast coho, though it asserted that some of the hatcheries "might become" important components of recovery efforts. (*Id.*). Instead, the WCCSBRT found that artificial production substantially affects the genetic integrity of natural populations. (WCCSBRT 1997).

A year after the WCCSBRT issued its report, and in response to an Oregon federal district court ruling overturning NMFS' decision not to list the Oregon coast coho, Oregon Natural Resources Council v. Daley, 6 F.Supp.2d 111139 (D.Or., 1998), NMFS published a notice in the Federal Register listing the ESU as threatened. (63 Fed. Reg. 42587 (1998)). In the listing notice, NMFS adopted – without further analysis or public comment – the WCCSBRT's conclusions on hatcheries, incorporating into its ESU delineation fish from nine hatcheries, and leaving out of the ESU the three hatchery populations recommended by the WCCSBRT for exclusion, as well as the one population for which the WCCSBRT was not able to provide a recommendation. (*Id.* at 42589). NMFS also adopted without comment the WCCSBRT's finding that none of the hatchery populations was "essential for recovery" of Oregon coast coho, and thus left all hatchery populations of coho out of the listing. (*Id.*).

NMFS' decision to list Oregon coast coho proved to be as controversial as its decision not to list these fish. On September, 10, 2001, in Alsea Valley Alliance v. Evans, 161 F.Supp.2d 1154 (D.Or., 2001), an Oregon federal court ruled that NMFS exceeded its authority under the ESA by listing a grouping of fish smaller than what the agency had defined as a distinct population segment under its ESU policy.[4] The court vacated NMFS' listing decision. On December 14, 2001, the Ninth Circuit granted intervenor-appellants motion for a stay pending appeal, thereby effectively reinstating the listing for the Oregon coast coho.

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address the issue of what would happen to the hatcheries initially included in the ESU when the hatchery stocks were no longer "recently derived," i.e. over 40 years had passed. In other words, NMFS provided no direction for determining the point of future divergence of hatchery and wild stocks.

[4] In dicta, the court went on to make other observations about the relationship between hatchery and wild fish, including at one point characterizing these fish as "genetically identical." Alsea Valley Alliance, 161 F.Supp.2nd 1154, 1163.

3. Requested ESA Protections

In this petition, the above-named parties respectfully request that NMFS define and list as threatened under the ESA, naturally spawning coho salmon that reside below long-term, naturally impassible barriers in streams between the Columbia River and Cape Blanco, *specifically excluding all hatchery stocks produced by the seven*[5] *hatcheries currently operating for coho production in the petitioned area.*[6] This section sets forth the biological and legal reasons demonstrating that this grouping qualifies for listing consideration under the ESA's definition of "species." Further, this section's organization corresponds with the way in which FWS and NMFS have approached the task of defining groupings of vertebrates eligible for ESA listing; it discusses, in turn, how listing naturally spawning coho is consistent with a) the ESA and congressional intent; b) NMFS' and FWS' joint DPS Policy, which sets forth the Services' "general policy" on listing distinct population segments; and c) NMFS' ESU policy, which is consistent with the DPS Policy but provides additional criteria "formulated specifically to address the biology" of Pacific salmonids. One thing is common to all of the statutory and policy level guidance on listing distinct population segments: hatchery stocks of Pacific salmon are fundamentally and functionally distinct from the wild, naturally spawning coho. The scientific evidence has and continues to support this conclusion, especially as it relates to the inability of hatchery fish to interact with their local environment such that they cannot contribute to future generations, and in fact they inhibit the fitness of the wild coho.

a. The ESA and its legislative intent support a distinction between naturally spawning and hatchery coho for purposes of listing consideration

In its "interim" policy on artificial propagation, NMFS described the ESA's emphasis on protecting naturally spawning fish and their natural habitat. (58 Fed. Reg. 17573

[5] Since NMFS originally listed the Oregon coast coho in 1998 the Fall Creek hatchery has closed (IMST, 1998) and the Alsea hatchery no longer produces coho in an apparently successful attempt to bring back wild Oregon coast coho in the Alsea river. Joel Gallob, "Possible turn-around for Alsea fish" Newport (Or.) News, Nov. 26, 2001. Only seven hatcheries produce coho (IMST 2000), but they release hatchery coho into nine different streams and tributaries. (Lewis 2001). Earlier in 2002, the Oregon Department of Fish and Wildlife announced that they will close the Cedar Creek, Salmon and Trask River hatcheries effective June 1, 2002.

[6] NMFS interpretation of the ESA, as well as the agency's own policies emphasize the importance of focusing on natural fish , i.e. the progeny of naturally spawning stocks. (Weitkamp *et al.* 1995; 58 Fed. Reg. 17573). Therefore, any progeny of hatchery stocks spawning naturally in the wild are petitioned for inclusion within the distinct population segment that is the subject of this petition. This petition acknowledges that hatcheries may potentially be used as a conservation tool in the recovery of a listed stock under the definition of "conservation" in ESA, 16 U.S.C. §1532(3). The ESA also provides for alternative means to protect hatchery stocks used in recovery, such as listing them under the statute's similarity of appearance provisions or as experimental populations. 16 U.S.C. §§1533(e), 1539(j) (2000). However, because there are no conservation hatcheries planned or in operation that currently affect Oregon coast coho, nor has the need for any such hatcheries been demonstrated at this point, the species petitioned herein for listing does not include any hatchery stocks.

(April 5, 1993); (Hard *et al.* 1992)). After setting forth Congress' findings and purposes in enacting the ESA, NMFS concluded that the statute's "focus is, therefore, on natural populations – the progeny of naturally spawning fish – and the ecosystems upon which they depend." (*Id.*).[7] In evaluating the risk assessment to a species, NMFS has again emphasized natural production by stating "[a] fundamental question in ESA risk assessments is whether natural production is sufficient to maintain the population without the constant infusion of artificially produced fish." (Weitkamp *et al.* 1995). Indeed, NMFS has emphasized that artificial propagation should be terminated if there is *reason to believe* that it is actually impeding recovery of listed species. (Hard *et al.* 1992) (emphasis added).

Petitioners concur with NMFS' analysis of the ESA, as well as the agency's characterization of lawmakers' intent in enacting the law. Quite clearly, Congress created and passed the Endangered Species Act to protect wild "species." Given NMFS' recognition that the statute's "focus" is on naturally spawning fish, Petitioners submit that this focus extends to the process of delineating groupings of fish eligible for listing.

As NMFS also noted in its "interim" hatchery policy, the ESA explicitly provides that "propagation" may constitute a method of "conserving" threatened and endangered species. 58 Fed. Reg. 17573, 17574 (1993); 16 U.S.C. § 1532(3) (2001). This provision allows the agency to remain true to the intent of Congress through drawing distinctions between hatchery and naturally spawning fish when delineating groups of salmonids eligible for listing. (Hard *et al.* 1992).

First, the ESA's definition of the term "conservation" allows and even encourages NMFS to make such distinctions. The statute defines conservation as "methods and procedures which are necessary to bring any endangered species or threatened species to the point at which measures pursuant to this Act are no longer necessary," and includes propagation as an example of such methods. (16 U.S.C. § 1532(3) (2001)). In other words, the Act directly provides for the use of artificial propagation in the recovery of wild stocks. But because the language describes measures affecting species *already listed as threatened or endangered*, it indicates that the Act envisions listing the wild stocks and then potentially using artificial propagation as a recovery tool if necessary whereby the progeny of the hatchery stocks would also be protected.

Second, to the extent that the ESA's definition of "conservation" is at least instructive on the question of how NMFS should define salmonid groupings for purposes of listing consideration, it cuts strongly against inclusion of fish from hatcheries currently operating within the range of Oregon coast coho that are the subject of this petition. In order to qualify as a "conservation" method or procedure, an activity must be "necessary" to bring a listed species toward recovery, i.e. it must provide some sort of *benefit* to the species which advances it toward the point where it no longer requires the protection of the ESA. With respect to coho along the Oregon coast, NMFS has quite explicitly (and

[7] In contrast, a recent NMFS technical memorandum described hatchery production as, "geared toward mass-producing under conditions which are best described as 'unnatural'." (Flagg *et al.* 2000).

in many different findings and documents discussed in this petition) determined that operations of existing hatcheries pose *threats* to naturally spawning fish rather than in any way providing benefits to naturally spawning coho.[8] Therefore, the ESA's definition of "conservation," coupled with NMFS' findings on the threats posed by hatchery fish, suggest that the agency should exclude hatchery fish from the group of salmon considered for listing.

One type of hatchery, conservation hatcheries, has only been used when listed populations have reached extremely critical levels warranting endangered status. Even though hatcheries may potentially be a useful tool for restoring naturally spawning coho populations, no evidence exists to date of a species restored due to a hatchery program. Just as NMFS may not consider, in making listing decisions, actions that may benefit salmon in the future, ORNC v. Daley, 6 F.Supp.2d 1139, 1153-54 (D.Or. 1998), the agency may not delineate groups of salmon eligible for listing based on the possibility that hatcheries may at some point in the future be an aid in conserving Oregon coast coho.

Existing and past ESA listings provide real-world examples that support Petitioners request to list only naturally spawning coho. Listings of species such as peregrine falcons, California condors, black-footed ferrets, and Snake River sockeye have included captive populations within the listed species. However, in all of these cases propagation activities are or were directed primarily toward augmenting wild populations of these species. On the other hand, FWS distinguishes between captive and wild chimpanzee populations for purposes of listing under the ESA (the former listed as threatened and the later listed as endangered) because captive populations are used primarily for purposes other than to promote conservation of the species in the wild. Similarly, hatchery populations of Oregon coast coho are currently maintained primarily for purposes other than promoting recovery of naturally spawning population, and thus should not fall within the grouping considered for listing.

b. The "general policy" for delineating distinct population segments set forth by NMFS and FWS in their DPS Policy supports a distinction between naturally spawning and hatchery coho for purposes of listing consideration.

As both NMFS and FWS's "general policy" for delineating distinct population segments, the DPS Policy obviously provides relevant guidance for making the listing determination for Oregon coast coho. Particularly since NMFS' ESU policy for Pacific salmonids does not specifically address hatchery populations, it is important to look to both NMFS' DPS Policy and its ESU policy for factors that merit consideration in making decisions about listing eligibility.

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[8] In fact, as part of its strategy to conserve naturally spawning coho, the State of Oregon has adopted a number of measures designed to further separate hatchery from naturally spawning salmon. OAR 635-007-0501 *et. seq.* (2001).

As mentioned previously, the DPS policy focuses on two factors: 1) "discreteness," marked by whether the population is "markedly separated" from others by "physical, physiological, ecological, or behavioral factors" or by international boundaries; and 2) "significance," a measure of the population's "importance to the taxon in which it belongs." (61 Fed. Reg. 4722, 4725 (Feb. 7, 1996)). The agencies did also recognize that evidence of genetic distinctness or of the presence of genetically determined traits could assist in determining the discreteness of a DPS but was not required, in the same way that the ESU policy does not require it. (*Id.* at 4723). When applying the DPS Policy in order to determine whether or not to include hatchery fish in an ESU the chief issue is whether:

> there are appreciable differences between hatchery and natural fish in characteristics believed to have a genetic basis...important factors to consider in this regard are the length of time the hatchery population has been domesticated; the incidence of straying by hatchery fish in to the wild and the degree to which natural broodstock has been regularly used in the hatchery; the stock history of the hatchery population, including evidence for importation of fish or eggs from other stocks; attention to genetic considerations in selecting and mating broodstock; and evidence for divergence of the hatchery population from the wild phenotype in characteristics that are thought to have a genetic basis (e.g. size and age at return, spawning date, etc.).

(Hard *et al.* 1992). Thus, genetic considerations are not required, but they can legitimately influence the decision as to whether hatchery fish should be included in a distinct population segment. However, NMFS clearly emphasizes that this issue only arises *after* "an ESU has been defined on the basis of a natural population." (*Id.*).

Further, it is important to note that NMFS emphasized that the use of hatchery fish in listed populations should only be for recovery purposes and stated, "the burden of proof should lie in showing that the inclusion of hatchery fish is consistent with recovery objectives." (*Id.*). NMFS then failed to satisfy that burden of proof when it included hatchery stocks in the initial determination of Oregon coast coho as an ESU.

The nature of a genetic basis for distinguishing between hatchery and wild salmon has since expanded in the scientific literature, particularly with respect to characteristics affecting fitness. Genetic consideration should not be limited just to broodstock origins and straying, but also to locally adapted traits and coadapted gene complexes that contribute to genetic fitness.[9] (Taylor 1991; Hard 1995; Lynch 1996; Taylor 1997;

[9] For the purposes of simplicity and understanding in this petition, the following terms take on the following meanings: "gene" is a portion of a DNA molecule that encodes for an enzyme or protein structure, and is an inheritable unit; "genetic diversity" is the variety of genes present in a particular individual, population, or species, which is often measured in terms of "heterozygosity,"or two different forms of a gene – one from each parent – and "homozygosity," the presence of the same form of a gene, twice; and "genetic fitness" is the ability of genes to successfully pass through generations, which is a function of genetic diversity and "selection" – the environmental and ecological factors that act upon an individual, population, or species, during its lifetime to allow for the differential reproduction or survival.

Lynch 1997; Reisenbichler 1997, Reisenbichler and Rubin 1999; Einum and Fleming 2001; Fleming and Peterson 2001). Local adaptation may be responsible for the genetic variation in morphological, behavioral, developmental, meristic, physiological, biochemical and life history traits of salmon. (Taylor 1991; Taylor 1997; Lynch 1997; Reisenbichler 1997; Reisenbichler and Rubin 1999). Examples of locally adapted traits are levels of aggression and territoriality (during both juvenile growth and migration, and adult spawning), predatory avoidance response, migration patterns, feeding patterns and behavior, and morphology. (Fleming and Gross 1994; Fleming *et al.* 1996; Einum and Fleming 2000; Fleming *et al.* 2000; Einum and Fleming 2001). Examples of coadapted gene complexes are harder to isolate, however a shuffling of the complexes, most likely due to outbreeding depression, is a significant concern for artificial propagation because it may reduce the ability of individuals to respond to variable environmental and ecological pressures. (Waples 1995; Lynch 1996; Lynch 1997; Lynch and O'Hely 2001; Ford, in press).

Taylor (1991) pointed to the importance of local adaptation for four reasons: 1) importance to evolutionary theory; 2) the promotion of genetic divergence between stocks and the identification of genetic resources; 3) the potential role in matching ecological-genetic populations for rehabilitation programs or the identification of unique traits of aquaculture and hatcheries; and 4) its assistance in understanding the diversity of populations and the ability to more closely examine ecological-genetic interactions. Furthermore, local adaptations occur on a small scale, based in part on geography and the trait being investigated, and occur over various time periods as it is a dynamic, ongoing process. (*Id.*).

Increasingly, this literature is also recognizing that genetic analysis – protein or otherwise – does not necessarily provide evidence of locally adapted characteristics that have an impact on genetic fitness over time, and thus a genetic basis. (Taylor 1991; Waples 1995; Reisenbichler 1997; Reisenbichler and Rubin 1999; Waples 1999; Einum and Fleming 2001; Fleming and Peterson 2001; Ford, in press). As Dr. Waples (1999) stated, "artificial propagation could substantially harm natural populations long before there is any reasonable expectation of being able to detect it" because differences in physiological or behavioral traits may not be discernable in an electrophoretic, nuclear DNA (nDNA), or mitochondrial DNA (mtDNA) analytical test, but may still have profound effects on genetic fitness and diversity. (*Id.*). The most notable reason for this is that the relaxed or altered selection at hatcheries will work to produce fish that are genetically optimalized for hatchery conditions by altering the mortality regime (also known as domestication or domestication selection) whereas natural selective pressures will optimize the genetic fitness of wild stocks in their natural environments. (Reisenbichler 1997; Reisenbichler and Rubin 1999; Waples 1999). It is interesting to note that the genetic analyses done on Oregon coast coho have found greater similarities

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(Ricklefs, 1993). "Coadapted gene complexes" are interactions between genes which are thought to have a favorable impact on genetic fitness, and evolve together as a functional unit. (Waples 1995). These are slightly different from "locally adapted" characteristics that are consequences of the environment (or selection) acting upon genes and coadapted gene complexes, and are associated with differential survival or reproductive capability. *Id.*

between hatchery stocks than between wild and hatchery stocks or between pure wild stocks. (Hjort and Schreck 1981; Currens and Farnsworth 1993; Reisenbichler and Rubin 1999). Therefore, while there may be some detectible genetic differences between hatchery and wild stocks on the Oregon coast, there may be even more profound, undetectable differences in genetic fitness.

Thus, discreteness, as discussed in terms of distinguishing between hatchery and wild fish within the DPS Policy is discussed herein in the usual terms of physical, physiological, behavioral and ecological differences, without necessarily referring to observable laboratory genetic differences, but in terms of impacting genetic fitness, local adaptation, and diversity nonetheless.

i. Discreteness

The Services delineate distinct population segments under their DPS policy by first considering a population's "discreteness," i.e. whether the population is "markedly separate" from others in the same taxon "as a consequence of physical, physiological, ecological, or behavioral factors." (61 Fed. Reg. 4725 (Feb. 7, 1996)). Analysis of these factors provides compelling bases to distinguish between hatchery and naturally spawning coho for purposes of defining a distinct population segment of these fish.

NMFS has noted that there are only two similarities between wild and hatchery fish, water and photoperiod, but the fish are markedly different from each other in behavior, morphology, survival and reproductive ability. (Waples 1999; Flagg *et al.* 2000). The following table, adapted from a NMFS Technical Memorandum published last year, summarizes those differences, which are discussed in more detail below.

Table 1: Relative Differences between Wild and Hatchery Reared Salmonids. (*Adapted from* Flagg *et al.* 2000.)

Category	Wild	Hatchery
Survival		
egg-smolt survival	lower	higher
Smolt-adult survival	higher	lower
Behavior		
foraging ability	efficient	inefficient
aggression	lower	higher
social density	lower	higher
territorial fidelity	higher	lower
migratory behavior	disperse	congregate
habitat preference	bottom	surface
predator response	flee	approach
Morphology		
juvenile shape	more variable	less variable
nuptial coloration	brighter	duller
Kype size	larger	smaller
Reproductive potential		
egg size	smaller	larger
egg number	lower	higher
breeding success	higher	lower

aa. Physical/ecological discreteness

The extensive physical and ecological separation between hatchery and naturally spawned fish provides the most obvious distinction between these two groups. The vast majority of adult salmon reared in hatcheries return to these facilities to spawn. Indeed, the very nature of hatcheries in Oregon is intended to prevent the spawning of hatchery fish in nature, through the programming, rearing and releasing of salmon in such a manner as to achieve maximum harvest of returning hatchery fish with little interaction with natural production and the genetic resources of wild fish, leaving only a minimum number to escape to the hatchery to fulfill hatchery egg-take requirements. (ORS §§ 635.007.0815, 635.007.0816 (2001)).[10] The majority of these fish that escape the fisheries are captured, spawned in tubs by human intervention, and their eggs and progeny reared in tanks and ponds for nearly 1/3 of their lifetime, until the resulting juvenile salmon are finally released back into streams. (Reisenbichler and Rubin 1999). In contrast, naturally spawning fish return to spawning areas within their natal streams and spawn naturally with other fish. Their eggs and progeny hatch and mature in these

[10] Indeed, hatchery coho and wild coho are visibly distinct since 1998 when the Oregon Department of Fish and Wildlife began requiring that the adipose fin of all hatchery fish be clipped for marking purposes. (Nickelson 2001; Jacobs *et al.* 2001; ORS § 635.040.0101 (2001)).

streams and adapt to their surrounding before surviving young salmon eventually migrate out to the ocean. The two settings in which coho complete a key phase of their life cycle results in a marked physical and ecological separation between hatchery and naturally spawning fish during a prolonged and crucial period of their existence.

Additionally, hatchery and naturally spawning coho inhabit completely different environments during this period, and thus are acted upon by distinct ecological conditions and selection regimes. Naturally spawning salmon and their progeny are influenced and shaped by natural forces such as behavior of other salmon, water and weather conditions, availability of food and cover, and the presence and behavior of competitors and predators. Hatchery fish, on the other hand, exist in conditions designed and regulated by humans, ensuring they are fed in a timely manner, the proper quantity of food made of the proper composition, with optimal cover and substrate composition, proper water regimes, good water quality, minimal predator and competitor densities – in other words optimal rearing conditions that provide the best possible conditions for early survival. (Reisenbichler and Rubin 1999). These conditions have been credited with relaxing or altering the selection regime that affects genetic change, especially notable over multiple generations, although genetic changes can occur multiple times over a single generation. (Waples 1999; Einum and Fleming 2001).

Although many proponents of hatchery programs note that the physical selection pressure differences only act on hatchery fish for at most 1/3 of their life, this may be more than enough time for the selection to have a profound effect on genetic fitness and diversity. Numerous reports in scientific literature indicate that the remaining 2/3 of its life that is spent in wild does not compensate for the pressures placed, and changes conformed, in the first 1/3 of the hatchery fish's life history. (Waples 1991b; Fleming and Gross 1993; Fleming and Gross 1994; Reisenbichler 1997; Reisenbichler and Rubin 1999; Waples 1999; Lynch and O'Hely 2001; Ford in press;). As a consequence, hatchery fish will genetically diverge from their wild counterparts, more so the longer they spend in captivity. (*Id.*).

Physically, Oregon coast coho are an extremely important component of the ecological and evolutionary legacy of their own species and in the larger Pacific Northwest ecosystem. One example is in the input of marine nutrients. (IMST 1998). Gresh *et al.* (2000) estimate that coho salmon returning to the Oregon coast were responsible for between 9 million kg and 20 million kg of biomass recycled into the ecosystem, but today only bring between 3% and 4.7%, or 329,000 kg to 996,000 kg, back to those same streams. That represents a loss of over 95% of marine derived nutrients, namely phosphorus and nitrogen, to the entire Oregon coast watershed. (*Id.*). Those nutrients are utilized, not only by the developing salmon smolts for their food and growth, but also by bears, trees, and other local wildlife. (*Id.*).

The addition of hatchery fish to this system will not solve the nutrient deficiency but actually exacerbates it in the first place due to the artificially increased competition on very limited resources, creating an imbalanced nutrient cycle where there is greater demand than supply. (WCCSBRT 1997; IMST 1998). Because of selective fishing pressures, the intention is for a small percentage of hatchery fish to actually return to the hatcheries, with the others being fished out of, as opposed to being recycled into, the stream system. Those that do make it to the hatchery are removed from the system (at least theoretically) before they are allowed to spawn and die off. This, of course, is in addition to the detrimental impacts the hatchery fish have on the fitness of wild stocks attempting to return and spawn in the system which are discussed later. Finally, any efforts that are made by hatcheries to deliver carcasses to streams, nowhere nears the 93-155 salmon carcasses per km needed to restore the deprived nutrients necessary to sustain the regional ecosystem. (Bilby *et al.* 1998; Waplfli *et al.* 1999; Bilby *et al.* 2000; Gresh *et al.* 2000; Helfield and Naiman 2001). To allow the wild stocks to sink into extinction would undermine the physical ecological and evolutionary legacy that has blossomed around the salmon returns.

The Oregon coast coho hatchery stocks have been in existence for a century, flooding the streams and ocean with coho genetically unfit and behaviorally maladapted for the natural environment, for purely commercial and recreational purposes.[11] Jim Lichatowich, in his 1999 book, *Salmon without Rivers* (Island Press), documents the continual degradation of the genetic, behavioral and ecological legacy of wild salmon due to the influences of their hatchery counterparts. These impacts are duly recognized by NMFS. (Hard *et al.* 1992; Weitkamp *et al.* 1995; WCCSBRT 1997; Flagg *et al.* 2000). Failure to recognize the distinct differences between wild and hatchery coastal coho will only continue to erode the evolutionary legacy, imbedded in the locally adapted traits, developed over millions of years of wild coho returning to the Oregon coast. The hatchery stocks are but a blip in the evolutionary timeline of the Oregon coast coho, but a blip that can completely alter, to the point of extirpation, the future evolution of the wild Oregon coast coho. Due to their life-history traits, wild coho salmon are an irreplaceable component of the Oregon coast.

<u>bb. Physiological discreteness</u>

As the table above indicates, there are also numerous physiological differences between hatchery and wild salmon. For example, hatchery fish tend to be larger at release whereas wild, natural juveniles of the same age tend to be smaller, which may affect their age and size at maturity. (Hard *et al.* 1992; Fleming and Gross 1993). But at the same time, due to the hatchery management practices described above, survival rates are different. More than 50% of eggs of hatchery fish are likely to survive until the smolt stage (which also has direct consequences on the influence of natural selection on fitness levels), compared to only 10% of wild fish that survive the various ecological elements acting on the eggs. (Waples 1991b). However, once hatchery salmon are released, they tend to suffer significant mortality (up to 99%) as compared to the wild salmon. (Waples 1991b; Reisenbichler and Rubin 1999; Flagg *et al.* 2000; Waples *et al.* in press). However, due in part to the robust characteristics and genetic diversity of the wild juveniles that do survive the egg to smolt stage, wild coho are three times more likely to

[11] The hatcheries along the Oregon coast are mostly for harvest augmentation – to increase sport and commercial harvest opportunities. (IMST, 1998). The Cole Rivers hatchery is a mitigation hatchery to compensate for the Lost Creek Dam. (*Id.*).

survive migration and ocean conditions than the hatchery coho. (*Id.*). There are many studies that indicate these differences are as a result of both adaptive and environmental factors that act within a very short evolutionary time scale. (*Id.*).

Other studies have looked at size measurements and other morphological differences to indicate discreteness between hatchery and wild fish. Morphologically, differences in color and kype may affect breeding success, and thus, genetic fitness. (Fleming and Gross 1989; Reisenbichler and Rubin 1999; Einum and Fleming 2001; Fleming and Peterson 2001). Other differences include different shapes (in coho- streamlined versus not and the presences of paired fins), sizes, swimming speed (hatchery fish were slower), swimming capability (linked to distance of freshwater migrations in coho) physiological stress (more stress in hatchery fish when in the presence of predators), and position holding. (Taylor 1991; Flagg *et al.* 2000).

<u>cc. Behavioral discreteness</u>

Multiple behavioral differences exist between hatchery and naturally spawning coastal coho, further demonstrating a high level of discreteness between the two populations. These behavioral differences likely stem from both environmental as well as genetic factors.[12] For example, although the often unsuccessful foraging behavior of hatchery salmon within the first months of feeding while at the parr stage (such as preferentially feeding at the water's surface) may be attributed to hatchery management practices, NMFS and others have also suggested that the foraging behavior is innate. (Flagg *et al.* 2000; Einum and Fleming 2001). In other words, in eggs of hatchery and wild salmonids raised in identical environments, the wild strain will continue benthic foraging while the hatchery fish will feed at the surface.

Similarly unsuccessful is the reproductive behavior of hatchery fish. Hatchery males tend to be less aggressive and less likely to engage in courting behaviors, resulting in a lower breeding success rate than even hatchery females, a trait which appears to be inheritable. (Fleming and Gross 1993; Fleming and Gross 1994; Fleming *et al.* 1996; Reisenbichler 1997; Chebanov and Riddell 1998; Fleming *et al.* 2000; Fleming and Peterson 2001). Hatchery females may also be unsuccessful in breeding success when compared to their wild counterpart. Delays in the onset of breeding, fewer nests, although in potentially better habitat, and greater retention of eggs all contribute to the inferior reproductive success of hatchery females. (*Id.*). Some of the breeding success

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[12] While NMFS has done little analysis of the differences in genetic makeup between naturally spawning fish in a particular watershed and coho originating from a hatchery in the same watershed, all of the agency's discussions of this topic cite actual or likely genetic differences between these populations. In the original status review, the BRT used hatchery coho along the coast to distinguish the Oregon coast coho ESU from the other five ESUs, however they did not review how those hatchery stocks were genetically related to the wild coho in their own watersheds. (Weitkamp *et al.* 1995). However, as mentioned previously, a lack of any finding in either electrophoretic testing or even mtDNA or nDNA testing, does not preclude a genetic basis for differences, but merely indicates that the difference may be a consequence of local adaptation or a coadapted gene complex that depends on the interactions of many different genes. (Taylor 1991; Taylor 1997).

may be affected by stray rates. Hatchery fish may stray at a higher rate than wild fish, thereby having disproportional impact on the receiving stream by possibly reducing the breeding success of the wild stocks or increasing the presence of hybrid juveniles that have higher overall mortality. (Waples 1991b; NMFS 1997b; Waples 1999). Although coho typically do not have high stray rates, the presence of hatchery strays spawning along the Oregon coast is notable, as discussed later. Reproductive issues are also discussed in more detail later in the petition.

Other behaviors in coho are likely the result of a combination of both hatchery management policies as well as genetic differences between hatchery and naturally spawning fish. Excess alevin movement, lowered energetic efficiency, and aberrant behaviors are likely consequences of lack of substrate and high light levels in hatchery complexes, but some of these traits – especially aberrant behavior – may also have genetic sources, and likely have an impact on genetic fitness. (Flagg *et al.* 2000; Einum and Fleming 2001). Additionally, the higher level of aggression typical of hatchery reared coho was found to be a heritable trait; even though this trait may be influenced initially by rearing conditions, it becomes a genetically inheritable trait in a few generations. (*Id.*). Agonistic behavior may also be influenced by predator densities and flow regimes. (Taylor 1991).

The agonistic behavior has been linked both genetically and environmentally to long-term reproductive success through greater foraging success, an inverse relationship to starvation, lower stress, higher growth rates, higher predation in the wild, better breeding habitat, and egg and juvenile coloration important for social status (paler being more dominant). (Swain and Riddell 1990; Fleming and Gross 1993; Einum and Fleming 1998; Chebanov and Riddell 1998; Berejikian *et al.* 1999). Agonistic behavior may actually benefit wild salmon over hatchery salmon in direct competition for breeding opportunities. However, along the Oregon coast hatchery coho have been selected for their early spawning, resulting in little direct competition between wild and hatchery returning stocks. Consequently, due to the early spawning time and other hatchery management practices, hatchery stocks are typically the first fish in the streams and therefore likely to secure the optimum breeding grounds increasing the negative impact that hatchery coho will have on wild coho through agonistic behavior. (Fleming and Gross 1993; Chebanov and Riddell 1998).

The impact of hatchery practices on the long term differences between wild and hatchery reared fish is also apparent in how the two strains respond to predators. (Einum and Fleming 1997; Flagg *et al.* 2000; Einum and Fleming 2001). Because hatchery fish are more likely to be fed at the top of the water column, they tend to feed and swim near the surface of the stream, increasing their vulnerability to predators, such as northern pike minnow and birds. (Flagg *et al.* 2000). Experiments have shown that when hatchery and wild fry are raised in the same environment, the risk-taking behavior prevails in the hatchery derived fish, again indicating a possible genetic basis as opposed to just a hatchery management practice. (*Id.*).

Scientific evidence suggests differential run times between hatchery reared Oregon coast coho and wild stocks and indeed hatcheries along the Oregon coast have typically used early run broodstock. (Nickelson *et al.* 1986; Waples 1995; Lichatowich 2000). However, the broodstock is typically selected from outside of the basin, including stocks from throughout the entire Oregon coast (but within the same ESU), the Southern Oregon coast/Northern California coho ESU, and Puget Sound, Washington, all of which exhibit distinct, locally adapted, and often genetically based behavior. (Weitkamp *et al.* 1995; Lichatowich 1999; Flagg *et al.* 2000; Nickelson 2001). Currently only four hatcheries use local, native broodstock. (NMFS 1998a). Although compressed run times increases reproductive isolation from the wild stocks it has the opposite effect of threatening the juvenile wild coho. The release of early run hatchery coho results in a flooding of the ecosystem (at the rate of 3 million fry and smolts a year) when fewer wild coho were historically present in the system consequently tending to outcompete those few wild coho and attract predators. (Nickelson *et al.* 1986; Waples 1991b; Lichatowich 1999). Due to the off timing, mortality rates in the early run hatchery coho are high, however those that do survive and are given the opportunity to spawn in the wild, further distinguish the wild coho stocks from those derived from the early-run, hatchery selected coho. (Lichatowich 1999; Flagg *et al.* 2000).

ii. Significance

After finding a population to be discrete from others in the same taxon, the DPS Policy calls for an assessment of the population's "significance," or in other words, "its importance to the taxon to which it belongs." (61 Fed. Reg. 4722, 4724 (Feb. 7, 1996)). Indications that a particular population is "significant" include (but are not restricted to) its persistence in a unique or unusual ecological setting, evidence that loss of the discrete population would "result in a significant gap in the range of a taxon," and evidence that the population "differs markedly" from others in the species in its genetic characteristics. (*Id.* at 4725). As elaborated in more detail in prior sections, each of these factors indicate that naturally spawning coast coho salmon between the Columbia River and Cape Blanco are significant to coho salmon as a species.

NMFS has already outlined the ecological uniqueness of coho habitat along the Oregon coast, as well as discussed in great detail the genetic and phenotypic differences between coho inhabiting this area and other coho populations. (Weitkamp *et al.* 1995; WCCSBRT 1997). Accordingly, Petitioners will not recount these findings here, and emphasize that there is no evidence to the contrary. Finally, Oregon coast coho are undoubtedly "significant" because their loss would result in a significant gap, nearly 4 million acres of Oregon coast watershed drainage, in the range of west coast coho. The resultant huge discontinuity in the range of coho would have deleterious effect on coho throughout the Pacific range.

c. NMFS' ESU Policy for Pacific salmonids supports a distinction between naturally-spawning and hatchery coho for purposes of listing consideration.

According to NMFS and FWS, NMFS' ESU Policy for Pacific salmonids provides criteria for delineating distinct population segments tailored specifically to the biology of these fish. (61 Fed. Reg. 4722 (Feb. 7, 1996)). This policy provides two criteria for identifying an "evolutionary significant unit" of salmon that qualifies for listing consideration as a distinct population segment: 1) the group must be "substantially reproductively isolated from other conspecific population units," and 2) it must "represent an important component in the evolutionary legacy of the species." (56 Fed. Reg. 58612, 58618 (Nov. 20, 1991)). NMFS acknowledges that one of the goals of the ESA is to "conserve genetic resources, both within and between populations." (*Id.* at 58614). However, NMFS acknowledged "[t]here is strong evidence for a genetic basis for some phenotypic and life history characteristics in some Pacific salmon populations. NMFS continues to recommend that judgments regarding evolutionary significance be made based on all available scientific information, weighted as deemed most appropriate for the particular case." (*Id.* at 58616). NMFS went on to state that "[d]ata from protein electrophoresis or DNA analysis can be very useful in determining population 'distinctness,' but they are not essential...NMFS agrees that a lack of direct genetic information does not preclude the consideration of a population as an ESU." (*Id.*). On the basis of this directive, Petitioners address both of the factors below to demonstrate that identifying naturally spawning coho as the ESU is not only consistent with NMFS' ESU Policy, but is actually *required* by the policy.

NMFS' ESU Policy provides that "[a] stock of Pacific salmon will be considered a distinct population segment, and hence a 'species' under the ESA" if the stock satisfies the two criteria listed above. (*Id.* at 58618). However, in the Federal Register notice setting forth this policy, NMFS does not clearly specify whether the "stock" subject to initial consideration as an ESU should include hatchery fish of the same species within the geographical area in question. However, the conceptual paper that formed the basis of the ESU Policy is far more elaborative.

When NMFS developed its ESU Policy for delineating distinct population segments of Pacific salmonids in 1991, the agency based this policy primarily on a 1991 NOAA Technical Memorandum by Dr. Robin Waples, entitled "Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon." (61 Fed. Reg. 58612). In this paper, Dr. Waples specifically addressed the relationship between hatchery and wild fish in delineating "species" eligible for listing consideration. While noting that "the effects of supplementation and straying by hatchery fish should be considered in evaluating whether a wild population is an ESU," Dr. Waples reached the following conclusion:

> Artificial propagation may also play a role in recovery plans for some "species." However, fish hatcheries do not provide a substitute

> for natural ecosystems that the Act mandates the Department to conserve. The role of artificial propagation under the Act is to restore populations in natural habitat to the point where they can be removed from formal ESA protection. Therefore, only naturally-spawning populations should be considered in determining whether a population is distinct for the purposes of the Act.
>
> An exception to the rule that an ESU must correspond to a wild stock may be made for a hatchery population that represents the only remaining component of a native gene pool. In that case, the hatchery population could be determined to be an ESU if it met the [reproductive isolation and genetic/ecological uniqueness] criteria set out in Section II.

(Waples 1991a).

The passage is highly significant. First, and most importantly, it emphasizes that NMFS should consider only naturally spawning populations when considering whether a group of salmon qualifies as an ESU, except in cases where a hatchery population represents the only remaining remnant of a native gene pool. To support this conclusion, the Technical Memorandum cites the ESA's focus on restoring species in the wild, a rationale also discussed by the Petitioners above as well as by NMFS in other documents 58 Fed. Reg. 17573 (April 5, 1993); (Hard *et al.* 1992; Weitkamp *et al.* 1995). Since hatchery populations do not harbor the only remaining remnant of the gene pool for Oregon coast coho, the scientific basis for NMFS' ESU policy explicitly supports Petitioners' assertion that *only* naturally spawning coho, as proposed in this petition's definition of Oregon coast coho, qualify as a listable entity.

Second, NMFS' Technical Memorandum on the ESA's definition of species also stresses that hatchery operations play a role relevant to the ESA only to the extent that they form a component of a recovery strategy for natural populations. (Waples 1991a; Hard *et al.* 1992). Currently, however, the seven coho hatcheries within the range of the coho grouping subject to this listing petition are operated primarily for the purposes other than as part of a program for restoring naturally spawning runs. (IMST 1998). Indeed, the State of Oregon has adopted measures intended to *limit* interactions between these hatchery fish and naturally spawning coho as part of the state's restoration strategy for the latter. (OAR 635-007-0501 *et. seq.* (2001)). Thus, even if it may be appropriate to consider fish in hatcheries operated exclusively for restoration purposes as part of an ESU, that is not the case for the Oregon coast coho, and inclusion of hatchery fish within the group considered for ESU designation is therefore not warranted. Notably, NMFS did not look to any of the purposes of the hatcheries along the Oregon coast when determining their status as part of the ESU and thus failed to discover that none of the hatcheries form a component of recovery of the natural wild populations.

In the Federal Register notice setting forth its ESU policy, NMFS asserted that the "meeting the two [ESU] criteria is the real test of whether a population affected by artificial propagation is an ESU." 56 Fed. Reg. 58612, 58617 (Nov. 20, 1991). Even setting aside the NMFS Technical Memorandum's clear direction that NMFS should focus only on naturally spawning populations in delineating ESUs, application of the ESU Policy's criteria demonstrates that NMFS should distinguish between hatchery and naturally spawning coho.

i. Substantial reproductive isolation

Because of the strong homing ability of salmon that has allowed coho and other species to evolve into local populations, it is not surprising that reproductive isolation is a consideration of delineating populations. (Waples 1991b). Coho do not tend to stray in high frequencies, and if they do, they tend to stay within close distance to their natal stream, thereby limiting gene flow between populations over long distances. (*Id.*). Nonetheless, as discussed below, hatchery strays make up a considerable portion of spawners along the Oregon coast.

The Technical Memorandum by Dr. Waples (1991a) emphasizes that reproductive isolation must be strong enough to allow for evolutionarily significant differences to develop, although the isolation itself does not have to be absolute. Dr. Waples points to a variety of factors that can be used to identify reproductive isolation for the purposes of identifying ESUs. These include when the isolation occurred, movements of fish, recolonization rates of other populations, measurements of genetic differences between populations, effectiveness of physical barriers, and how much exchange is actually occurring through each of these factors. (Waples 1991a). However, Dr. Waples warns that "[t]he best strategy is to use all available lines of evidence for or against reproductive isolation, recognizing the limitations of each and taking advantage of the complementary nature of the different types of information." (*Id.*). Dr. Waples also warns that isolation alone is not enough and that "a population recently isolated as the result of human activity probably does not play an integral role in maintaining ecological or genetic diversity of the species." (*Id.*). Although Dr. Waples uses that example to argue that the human induced isolation (i.e. hatchery fish) should not result in a separate ESU, the same reasoning supports the position that hatchery fish should not be included in the original, naturally spawning ESU because hatchery fish in almost all cases do not play any role in supporting the ecological and genetic diversity necessary for the evolutionary legacy of the natural spawners – and in fact hatcheries have often been cited as a critical factor in the decline of that legacy.

In assessing whether to include hatchery populations within coho ESUs, NMFS' Biological Review Team (BRT) specified that "the guiding principle should be whether hatchery populations contain genetic resources similar to those of natural populations within the ESU." (Weitkamp *et al.* 1995). The BRT went on to conclude that nine hatchery populations fell within the Oregon coast ESU for coho.

The BRT's conclusions on inclusion of hatchery fish within the ESU are highly questionable because the factors considered by the BRT were inconsistent with NMFS' guidance in its ESU policy. Rather than applying the two step analysis mandated by NMFS' ESU Policy for determining whether to lump together naturally spawning and hatchery fish, the BRT merely performed a hasty, non-scientific, back-of-the-envelope comparison between these two groups, compressing the ESU Policy's two step approach into a single assessment of whether the hatchery populations contained genetic material "similar" to the wild population.

The problem with the BRT's approach is that it ignored the ESA's and NMFS' emphases – discussed above – that natural populations should be the focus of the listings. In other words, by using a "guiding principle" that focused on hatchery fish, the BRT started off its analysis on the wrong foot. In delineating an ESU, NMFS' policy calls first for an analysis of whether "substantial reproductive isolation" exists between conspecific populations. Since some of the costal coho hatcheries continue to employ wild fish for broodstock, it is obvious that there is no reproductive isolation between naturally spawning and hatchery fish *in hatcheries*. However, since the ESA focuses on protecting wild populations, what happens in hatcheries is relevant for listing purposes *only to the extent that it affects wild populations*. Accordingly, before attempting any sort of genetic analysis of hatchery fish, the BRT should have examined whether naturally spawning coho are substantially reproductively isolated from hatchery fish. By failing to grasp the ESA's emphasis on protecting wild populations, the BRT did not understand that the relevant inquiry for purposes of defining "species" under the ESA is not whether hatchery managers mix wild and hatchery fish, the key question under NMFS' ESU policy is whether naturally spawning fish are substantially reproductively isolated from hatchery stocks.

Had the BRT looked to the wild populations to determine whether they are substantially reproductively isolated from the hatchery populations, they would have had to look beyond "genetic similarities." As indicated in an earlier NMFS Technical Memorandum supporting the "interim" hatchery policy, conclusions about reproductive isolation and evolutionary legacy must be based on factors such as straying, the degree of natural broodstock regularly used in the hatchery, attention to genetic considerations in selecting and mating broodstock, and evidence for divergence in phenotypic characteristics that are thought to have a genetic basis, such as size and age at return. (Hard *et al.* 1992). In contrast, the BRT instead focused on assessing whether *hatchery populations* contained genetics "similar" to natural populations by looking at the stock histories and broodstock collection methods (Weitkamp *et al.* 1995) instead of all of the other factors included in the previous hatchery policy Technical Memorandum (Hard *et al.* 1992) or the additional factors that indicate genetically based (locally adapted or otherwise) differences between individual hatchery stocks and their native counterparts, such as morphology, reproductive success, competitive differences, predatory responses, foraging behavior etc. (Reisenbichler and Ruben 1999). These differences taken in concert, highlight the reproductive isolation and other differences between the hatchery coho and wild coho along the Oregon coast.

An analysis of the reproductive interactions between naturally spawning and hatchery fish is crucial because if substantial reproductive isolation is present the genetic makeup of the hatchery population is irrelevant. Naturally spawning coho and hatchery fish could not qualify as part of the same ESU if the two groups are substantially reproductively isolated.[13] However, the BRT's report contains no explicit analysis of whether naturally spawning coho are reproductively isolated from hatchery populations. This would entail an examination of the extent to which hatchery fish stray and spawn successfully with wild coho, where they migrate, the genetic differences and similarities, especially as related to genetic fitness and smolt survival, and physical barriers (which could include the weirs and dams used by hatcheries to separate hatchery from wild fish), factors the BRT did not thoroughly assess. Unlike the initial status review that resulted in the six separate ESUs based on extensive genetic studies, the BRT very superficially lumped together hatchery and naturally spawning fish by noting that a number of hatcheries used naturally spawning fish as a portion of their broodstock and implied genetic similarities. (Weitkamp *et al.* 1995). However, this observation provides no information whatsoever about the extent to which naturally spawning populations are reproductively isolated, genetically or otherwise, from hatchery fish. As discussed above, NMFS' policy establishes a clear presumption against including hatchery populations in an ESU and places a strong case-specific evidential burden on any who would attempt to argue that a specific hatchery population be included in a particular ESU.

The BRT's report provided limited information on this question. The Team reported as a "major concern" what it saw as "widespread spawning by hatchery fish," but also noted that the State of Oregon "has made some significant changes in its hatchery practices" to limit hatchery fish interacting with natural populations – although later scientific review teams indicated that there is a significant lack of a monitoring system in place to adequately assess the exact nature of that interaction. (Weitkamp *et al.* 1995; WCCSBRT 1997; IMST 1998; Lichatowich 2000). Data on observed spawning of hatchery fish reported by the BRT was highly variable, ranging from 0-100% of observed spawners, numbers which have recently been augmented by additional data. (Weitkamp *et al.* 1995; Jacobs *et al.* 2001). On average, however, these data revealed a low degree of hatchery fish (approximately 10%) spawning naturally in many watersheds along the Oregon coast. (*Id.*). Nonetheless, even current hatchery management protocol encourages the natural spawning of hatchery fish in some streams. (ODFW 2001b).

The heavy presence of hatchery fish in natural streams may be a detriment to the reproductive success of wild fish, even though the overall average is low. The wild fish tend to seek out partners of the same origin, i.e. other wild fish, likely due to sexual imprinting during ontogeny, thereby indicating that early environmental factors play an important role in genetic fitness of wild salmon. (Chebanov and Riddell 1998). If, due to the heavy presence of hatchery fish, wild coho are not able to find other wild mates, the risk of outbreeding depressing increases. The mere presence of hatchery fish spawning in a stream tells very little about the effective reproductive success of the hatchery fish, and therefore merely offers circumstantial evidence to the possible lack of reproductive

[13] The BRT and NMFS excluded four hatchery populations from their ESU delineation for coastal coho based on the genetic dissimilarities between these fish and naturally spawning fish. However, unless these hatchery fish are also substantially reproductively isolated from naturally spawning coho, the four hatchery fish populations cannot, consistent with NMFS' ESU Policy, fall in a separate ESU. Under the ESU Policy, in order to be in separate ESUs, conspecific populations must be substantially reproductively isolated as well as genetically distinct.

isolation. (Waples 1991b). However, if spawning by hatchery fish is successful, there may be notable reductions in fitness which may take many more generations to mitigate. (Waples 1991b; Lynch 1997; Reisenbichler 1997; Reisenbichler and Rubin 1999; Lynch and O'Hely 2001; Ford in press).

Spawn timing also serves to reproductively isolate hatchery fish. The Oregon Department of Fish and Wildlife reported substantial differences in spawn timing between hatchery and naturally spawning fish. (Nickelson *et al.* 1986). The early run time of hatchery fish may serve as a competitive disadvantage to later returning wild fish, in terms of optimum habitat for nests. (Chebanov and Riddell 1998). Though the BRT was somewhat reserved about this claim, it acknowledged that this timing "was clearly different in some basins." (Weitkamp *et al.* 1995; WCCSBRT 1997). Finally, it is crucial to recognize that hatchery managers gear their efforts toward fostering reproductive isolation between hatchery and wild populations, through selection of early run broodstock and early releases of fry and smolts, in order to support selective fisheries and minimize negative interactions between hatchery and wild fish, and there is indication that this has resulted in genotypic changes. ORS §§ 635.007.0815, 635.007.0816 (2001) (Nickelson *et al.* 1986; Waples 1991b; Lichatowich 1999; Lichatowich 2000; Flagg *et al.* 2000).

Other factors also influence the reproductive isolation between hatchery and wild fish. Hatchery fish have a lower survival success than their wild counterparts when released from the hatchery into the wild. (Fleming *et al.* 1996; IMST 1998; Flagg *et al.* 2000; Fleming *et al.* 2000; Fleming and Peterson 2001). Hatchery fish have also been shown to have a much lower breeding success rate. (*Id.*). Indeed, hatchery males were less likely to show aggressive and positive courtship behavior, resulting in decreased breeding success and fewer spawners. (Fleming and Gross 1993; Fleming and Gross 1994; Fleming and Peterson 2001). Hatchery females are similarly unsuccessful due to delayed onset of breeding, fewer nests and a greater retention of eggs, even though they may have a competitive advantage in terms of nesting habitat selection from their early run times. (Fleming and Gross 1993; Fleming and Gross 1994; Chebanov and Riddell 1998; Fleming and Peterson 2001). With lowered breeding success of hatchery fish in the wild, hatchery and wild coho are effectively reproductively isolated even though they may appear to be spawning in the same stream at the same time.

All of the factors and information discussed above demonstrate that naturally spawning fish are *substantially* reproductively isolated from hatchery coho. Had the BRT actually assessed this ESU criterion, it likely would have reached the conclusion that none of the thirteen hatchery populations it examined merited inclusion within the Oregon coast ESU. Since it used the wrong standard for defining the ESU however, the BRT reached conclusions inconsistent with NMFS' own ESU Policy. Moreover, NMFS' ESU Policy does not demand absolute reproductive isolation in delineating an ESU. (56 Fed. Reg. 58612, 58618 (Nov. 20, 1991; Waples 1991a). Accordingly, based on both actual data on reproductive interactions (isolation), as well as on management practices designed to minimize hatchery influences on natural wild fish, it is clear that overall there is substantial reproductive isolation between hatchery and naturally spawning Oregon coast coho. Accordingly, naturally spawning coho and hatchery fish cannot be within the same ESU.

ii. Evolutionary legacy

Dr. Waples also emphasized the importance of looking only to wild stocks when evaluating the evolutionary legacy of Pacific salmon, noting that "[i]n determining whether a wild population is an ESU, it is sufficient to demonstrate that the population in question is 'distinct' from other wild populations," which NMFS has done previously with regard to salmonids. (Waples 1991a; Weitkamp *et al.* 1995). The evolutionary legacy looks to factors such as life history traits, including size, fecundity, and age and time of spawning, genetic traits, phenotypic traits and habitat characteristics. (Waples 1991a).

As already indicated, there are extensively documented differences in all of these factors between hatchery and wild Oregon coast coho. (Weitkamp *et al.* 1995; Flagg *et al.* 2000). Indeed, it is the unique adaptation to the coho's individualized environments that Dr. Waples and NMFS regard so highly in the determination of evolutionary legacy that has led to many of the differences in the other categories such as life history, genetic differences and phenotypic differences. Furthermore, as Dr. Waples (1991) cautioned "[e]lectrophoretic data provide valuable insight into levels of overall genetic differentiation among populations but little direct information regarding the extent of adaptive genetic differences." These adaptive genetic differences are the basis for many of the differences described between hatchery and naturally spawning Oregon coast coho, and are essential in the evolutionary legacy between the two.

Naturally spawning Oregon coast coho represent an important component in the evolutionary legacy of the species, as NMFS has already determined for coho salmon along the Oregon coast. (Weitkamp *et al.* 1995; WCCSBRT 1997). As noted above, naturally spawning coho are genotypically and phenotypically distinct from other conspecific populations, including hatchery fish. As explained in NMFS' prior listing of Oregon coast coho, as well as explained by Petitioners in the DPS "significance" discussion above, the wild coho are genetically adapted to their environment and can take advantage of a wider range of environmental conditions and a variety of habitat types. (*Id.*).

d. Summation

NMFS has continued to find that hatchery fish pose a threat to the genetic diversity and long term viability of wild coho. (Weitkamp *et al.* 1995; WCCSBRT 1997; Flagg *et al.* 2000). As the information presented above demonstrates, distinguishing between hatchery and naturally spawning coho along the Oregon coast is consistent with the ESA and its legislative history, NMFS' and FWS' joint DPS Policy, and with NMFS' ESU Policy. Indeed, NMFS' prior inclusion of hatchery fish within the Oregon coast ESU is directly at odds with the Technical Memorandum upon which the agency's ESU Policy is based, as well as the ESU Policy itself. The differences between these two types of fish are well documented and extensive. Finally, distinguishing between these populations when determining listing eligibility under the ESA is also a matter of common sense: why, even in the absence of the precautionary principle, would NMFS even consider defining as part of a protected species, hatchery fish that NMFS has numerous times labeled as a threat to the existence of natural runs that the agency asserts are the focus of the ESA? NMFS should therefore define the "species" as only the wild, naturally spawning Oregon coast coho, and should list them accordingly.

IV. Taxonomy

In 1792, coho were first described as *Salmo kisutch* after the Kamchatka (Russia) word for coho. (Sandercock 1998). The Oregon coast coho is in the phylum Vertebrata, class Osteichthyes, order Salmoniformes, family Salmonidae, genus *Onchorynhcus*, species *kisutch*. Common names include silver salmon, coho salmon, sea trout, blueback and hooknose. (Laufle *et al.* 1986).

V. Distribution

A. Coho Generally

As mentioned in the Species Description, coho, generally, were historically distributed from Monterey, California to Point Hope, Alaska westward through the Aleutian Islands to the Anadyr River in Russia, south to Hokkaido, Japan. (Laufle *et al.* 1986; Weitkamp *et al.* 1995); 62 Fed. Reg. 24688 (1997). Historically, the Pacific Ocean production was estimated at between 228 million to 351 million fish, 15%-16% returned to California, Oregon, Washington and Idaho, specifically between 1.9 million and 4.1 million salmon returning to the Oregon coast. (Gresh *et al.* 2000). Today, however, the ocean production is 142 million – 287 million salmon, but only 1%-1.5% return to the rivers in California, Oregon, Washington, and Idaho. (*Id.*). Although at one point coho probably inhabited most coastal streams in Washington, Oregon, and northern and central California, they have been nearly rendered extinct in nearly all of the Columbia River tributaries, and are in decline in many of the Oregon coastal streams. (Weitkamp *et al.* 1995).

B. Oregon Coast Coho

NMFS has described the Oregon coast coho as extending between Cape Blanco and the Columbia River, including 23 major rivers, streams and tributaries. (Weitkamp *et al.* 1995); 63 Fed. Reg. 42587, 42589 (1998). In 1992, before the worst coho returns in history in 1997, state scientists determined that of 55 identified coastal coho stocks, 41 were depressed, including major river basins such as the Nehalem, Trask, Tillamook, Nestucca, Siletz, Yaquina, Siulslaw, Umpqua, and Coquille. (Nickelson *et al.* 1992a). Since that time, the wild coho abundances have continued to fluctuate near those same low levels, between 14,000 and 60,000 spawners, indicating that the depressed stocks remain threatened or are nearing extinction. (Jacobs *et al.* 2001). Along the Oregon coast, hatchery fish are found in nearly every coastal basin, including in the Necanicum, Wilson, Nestucca Rivers and Beaver Creek where hatchery fish are not released. (Jacobs *et al.* 2001). Additionally, the some hatcheries along the coast are managed to allow hatchery fish to spawn naturally within the streams. (ODFW 2001b). Within naturally spawning populations however, hatchery fish make up a relatively small percentage of the Oregon coast basins, averaging 10% across the basin but higher in individual basins. (*Id.*).

VI. Natural History and Habitat Requirements

A. Life History

As mentioned previously in the Species Description, coho have a 3-year life cycle, returning from a 2 year ocean migration to their natal streams beginning in August. (Laufle *et al.* 1986). The coho tend to rely on freshets to enter the rivers, usually making their run up the rivers between October and November to spawn between November and February. (Weitkamp *et al.* 1995; Nickelson 2001). Hatchery fish tend to return to spawn earlier than the wild Oregon coast coho. (Nickelson *et al.* 1986). Those hatchery fish that do return, tend to do so in 50-50 male to female sex ratios, although the early spawners have a greater proportion of precocious two-year males (jacks) and later spawners have a higher proportion of females. (Laufle *et al.* 1986; Nickelson 2001).

After laying approximately 2500 eggs, the female spawners and their male counterparts, die off in freshwater, while the eggs incubate and hatch in 5-7 weeks. (Nickelson 2001). After hatching as alevins, the salmon remain in the gravel to absorb their yolk saks for another 2-3 weeks. (*Id.*). Once the salmon emerge from their redds as fry, they actively feed for one winter and one spring. (*Id.*). After that time, at about 10-12 cm in length, the salmon migrate out to the ocean as smolts in the late summer and fall. (*Id.*).

Once in the ocean, the Oregon coast coho tend to migrate close to their natal streams, with a majority staying within Oregon and California waters. (Weitkamp *et al.* 1995). While in the ocean, the coho grow quickly, especially in their last summer at sea, reaching lengths of 60-80 cm (2-3 feet) and weigh between 3.6-5.4 kg (8-12 pounds). (ODFW 1996; Nickelson 2001). The size of the returning spawners has steadily decreased over the years. (Weitkamp *et al.* 1995).

B. Environmental Setting

The Oregon coast sits to the west of a coastal range of mountains that dictate much of the environment in that area. All of the rivers on the coast have their headwaters in this coastal range, with peak flows occurring from November through January. (Weitkamp *et al.* 1995). The coastal rainforest vegetation is predominantly sitka spruce trees, western hemlock and Douglas fir. (*Id.*). These forests have been, and are currently, heavily logged, resulting in a loss of shade, increased temperatures, and increased runoff into the streams. (62 Fed. Reg. 24588, 24592 (1997)).

Stream channels must be free from complete barriers and have adequate flow between the estuary and the spawning area for migration to occur. (IMST 1999). Low flows, excessive flows, excessive debris, culverts, splash dams and weirs, high turbidity, high temperatures, high bacterial levels and low concentrations of dissolved oxygen can effectively block the migration up and down stream. (*Id.*). When Oregon coast coho return to their natal streams to spawn, they spawn preferentially in low gradient, small tributaries, although there are some stocks that spawn in lakes. (Laufle *et al.* 1986; Nickelson 2001). The coho look for clean, pea to orange sized gravel in relatively fast riffles to spawn. (Laufle *et al.* 1986; ODFW 1996; Nickelson 2001). The gravel nests or redds must allow for continuous flows of highly oxygenated water, with minimal siltation and ideal temperatures. (IMST 1999). Oregon coast coho spawn and rear in cool waters, between 53°-58° F (11.6° C to 14.4° C). (Nickelson 2001). Over winter, the coho prefer off-channel alcoves, beaver ponds and other small pools with complex cover. (*Id.*). Oregon coast coho need large and small woody debris in their stream systems during rearing to create pools, and seek streams shaded with large tree lined banks, which likely aid in keep the river temperatures cool. (ODFW 1996; Nickelson 2001).

Little is known about the ocean life of the coho, however it is known that marine conditions play an important role in the survival of the coho. The Oregon coast coho tend to migrate within Oregon and California waters and are particularly affected by ocean productivity patterns, such as El Nino, La Nina and the Pacific Decadal Oscillation (PDO). (Weitkamp *et al.* 1995; Lichatowich 1999). This migration is further supported by early studies on the rate of travel, suggesting that Oregon coast coho only travel 3 km per day. (Sandercock 1998). Juvenile Oregon coast coho, both hatchery and wild, will eat anchovy and surf smelt while in the beach areas, however in the channel areas, the hatchery coho will feed on shrimp and Dungeness crab larvae but the wild coho will eat surf smelt. (*Id.*). Once in the far ocean, the coho feed primarily on crab. (*Id.*).

VII. Population Status

As the Petitioners laid out in the Species Description, the hatchery and wild coho are fundamentally and functionally distinct whether evaluated by the general DPS Policy or the ESU Policy. Further, the best scientific evidence shows these two stocks of fish are reproductively isolated in part due to their physical, physiological, behavioral and ecological differences. As a consequence, and as NMFS has stated from the beginning, the ESA's protections should only extend to wild fish and only wild fish should be reviewed when evaluating the population status and subsequent listing determinations. NMFS own policies recognize that "[a] fundamental question in ESA risk assessments is whether natural production is sufficient to maintain the population without the constant infusion of artificially produced fish." (Weitkamp *et al.* 1995). In other words, the evaluation of whether a salmon population is threatened or endangered is not whether they are so with hatchery fish included, but rather if they meet the definition of threatened or endangered *without* hatchery fish included in that status review.

NMFS considers a variety of factors when evaluating population status, including 1) absolute numbers of fish and their spatial and temporal distribution; 2) current abundance as it relates to historic abundance, especially as linked to the carrying capacity of the habitat; 3) trends in abundance; 4) natural and human influenced factors that cause variability in survival and abundance; 5) possible threats to genetic integrity; and 6) recent events. (60 Fed. Reg. 38011, 38018). These factors assist NMFS in evaluating the risks facing the species and aid the agency in determining whether a species meets the ESA definitions of "threatened" or "endangered." However, any one of the five statutory factors identified in the Endangered Species Act (ESA) can actually form the basis of the determination of whether to list a species or not. NMFS has previously found that the population status of the wild Oregon coast coho indicates a high level of risk such that the species is likely to become endangered within all or a significant portion of its range in the foreseeable future, thereby qualifying as threatened species under the ESA. (62 Fed. Reg. 24588, 24590 (May 6, 1997); 63 Fed. Reg. 42587 (Aug. 10, 1998)). As this section explores, nothing in the last three years has changed the population status to warrant a change in the determination of Oregon coast coho as a threatened species.

A. ABSOLUTE NUMBERS

Oregon coast coho are still the largest remaining aggregate of wild populations in the United States outside of Alaska, and given their numbers, the future of coho looks very bleak. (ODF 1996). Furthermore, Oregon's spawning escapement goals have not been meet in over 15 years. (*Id.*). Estimates of Oregon coast coho were approximately 55,000 wild spawners in 2000, 160,000 in 2001, and an expected 71,000 wild escapement in 2002. (ODFW 2001a; ODFW 2002; PFMC 2002). Generally in 2000, although abundances were spread relatively evenly across the multiple basins of the Oregon coast coho's geographic range, it appeared to be along a gradient whereby the northern coastal basins had lesser spawner abundance (18,000) than the southern coastal basins including the Umpqua (23,000), although unlike previous years the mid coast numbers (13,000) were less than the north coast. (*Id.*). Within the individual streams, returns were highly variable, ranging from zero to 14,000 spawners. (*Id.*). Because hatchery fish are present in each of the coastal basins, there are numerous early returning coho, in addition to the later returning wild stocks. (Nickelson *et al.* 1986; Jacobs *et al.* 2001). The recruits to spawner ratio remains critically low in all basins along the Oregon coast, and has failed to meet the overall replacement rate for three successive generations. (IMST 2000). In NMFS' own terms, the natural population is insufficient to maintain the population, and the hatchery fish, instead of restoring the population, have actually exacerbated its decline. (Weitkamp *et al.* 1995; WCCSBRT 1997; Flagg *et al.* 2000).

B. CURRENT ABUNDANCE, HISTORICAL ABUNDANCE AND CARRYING CAPACITY

Oregon coast coho numbers once exceeded a million fish per year, with harvest rates of 400,000. (Weitkamp *et al.* 1995). The peak abundance levels within modern time were estimated to be in 1911. (IMST 2000). By the 1970's the population of Oregon coast coho had dropped to a range of 200,000 to 690,000 spawners per year. (*Id.*). In 1996, the spawners numbered a mere 60,000, although the potential number of spawners based on habitat capacity was estimated to be 800,000 – reflecting a loss of 50% of their habitat capacity. (Weitkamp *et al.* 1995; Jacobs *et al.* 2001). Even those returns were linked to the drastic reduction in harvest rates prompted by the low returns and listing decision, and not necessarily natural conditions. (WCCSBRT 1997). Only a year later, 1997, Oregon saw the most critically low returns on record at 14,000 spawners, coast wide. (Jacobs *et al.* 2001).[14] Studies now place high quality habitat at only 22% of the total habitat area, indicating a low carrying capacity, but one that is still not met. (Nickelson 2001). Since NMFS placed the Oregon coast coho on the endangered species list, the spawner abundances have risen. Nickelson (2001) has estimated that the critical threshold for the entire Oregon coast coho population is 16,500 spawners. The critical threshold is the point at which populations have a very high risk of extinction in the near future. (*Id.*). Disturbingly, data indicate the Oregon coast coho have fallen below that threshold level twice (1990 and 1997) in the last decade. (*Id.*; Jacobs *et al.* 2001). At the other end of the spectrum, escapement goals far exceed the critical threshold at between 63,600 and 95,600, goals which have not been met to date. (WCCSBRT 1997; Jacobs *et al.* 2001).

C. TRENDS IN ABUNDANCE

In recent years, the trends in abundance have generally fluctuated between 14,000 and 60,000 wild spawners in the entire Oregon coast, with an anomalously estimated 160,000 wild returns in 2001. From the highs in the early 1900's there has been a decline of nearly 95% - a 75% drop from 1900-1950 and another 90% decline from 1950-2000, both of which are significant. (Weitkamp *et al.* 1995; Jacobs *et al.* 2001). The estimated high wild spawner abundance in 2001 masks an equally high hatchery return of approximately 121,000. (ODFW 2002; Pers. Comm. Kelly Moore). Furthermore, there is growing evidence that the high return is an anomaly. Fishery models predict over a 50% decline in escapements in 2002, jack counts, used as an indicator of future return rates, are relatively low this year and there are reports that El Nino, the negative effects of which are discussed later in this petition, is potentially returning. (PFMC 2002; Newport News-Times 2002; NOAA 2002). A similar relatively high year was last seen in 1996,

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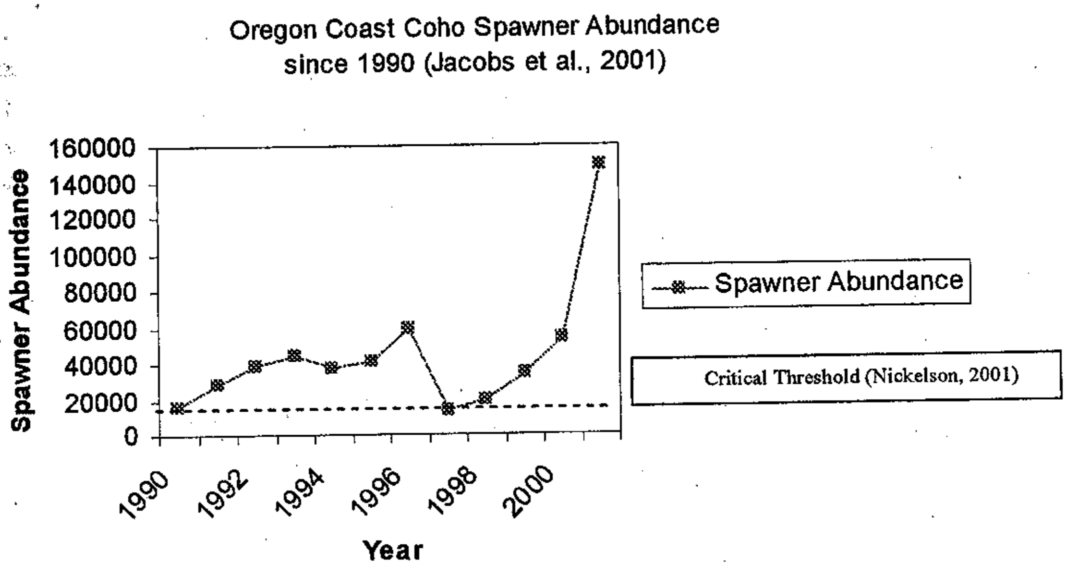
[14] The actual numbers used in this petition are based on the Oregon Department of Fish and Wildlife (ODFW) report by Dr. Jacobs and his colleagues. (Jacobs *et al.* 2001). It is interesting to note that the Review of the Status of Coho Salmon in Oregon, published by ODFW in March, 1998, place the 1997 Oregon coast coho spawner abundance at 24,100. However, both publications acknowledged that the numbers represented the lowest observed on record (approx. 48 years). The 1998 report further points out that the decline is even more disturbing based on the fact that no harvest occurred on the stocks for about 4 years prior. (ODFW 1998a).

however in the following year massive flooding and poor ocean conditions, partially attributable to the El Nino, caused a severe crash in the OCC population that took nearly 4 years to recover completely. A similar crash may be inevitable next year, but even if the crash does not occur, the population remains unstable and at a fraction of its historical levels, with human threats continuing at unprecedented rates. The following graph, adapted from Jacobs *et al.* (2001) depicts the latest decade of spawner abundance, however any trend that can be associated with the graph is muted considerably by the anomalous returns in 2001.

Figure 1:



Similar declining trends exist for spawning escapement and recruits per spawner, with the decline in the recruit per spawner recognized as the worst decline in any salmon on the west coast.[15] (WCCSBRT 1997; Jacobs *et al.* 2001). However, earlier reviews indicate that the decrease in spawning escapement follows a gradient of declining escapement in the north to increasing escapements in the southern coastal basins. (Weitkamp *et al.* 1995). For the past ten seasons, 35% of spawning habitat was unused and 10%-35% of spawning habitat had spawner densities greater than 10 adults per mile. (Jacobs *et al.* 2001). The most disturbing trend in each of the stream systems surveyed, with the exception of the lakes complex, is that only three stream basins in the southern Oregon coast *exceeded* the critical threshold levels more than three times in ten years (at a 95% confidence level). (Nickelson 2001). Further, the recruits to spawner ratio remains critically low in all basins along the Oregon coast, and have failed to meet the overall replacement rate for three successive generations. (IMST 2000).

[15] Other studies have shown that there is a slight increase in spawning escapement, however, the Oregon Department of Fish and Wildlife have indicated that their sampling protocol, on which those conclusions are based, led to overestimations. In addition, escapement has dropped dramatically since that time. (WCCSBRT 1997; Jacobs *et al.* 2001).

D. Natural and Human Influenced Factors that Cause Variability in Survival and Abundance

The variability in survival and abundance has been linked to habitat degradation, ocean conditions, and artificial production. (Jacobs *et al.* 2001). As mentioned, the amount of spawning habitat has declined from 50% to 22% of its previous levels (the decline in habitat quality is discussed later). (Weitkamp *et al.* 1995; Nickelson 2001). However, that habitat has a far greater potential than is actually being utilized indicating that the amount of habitat loss is not the only factor that causes variability in survival and abundance. (Weitkamp *et al.*, 1995). Ocean conditions have likely accounted for a considerable amount of the variability in abundance and survival. (NWPPC 1999). However, even ocean productivity cannot account completely for the variability in the survival and abundance of Oregon coast coho. The presence of hatchery coho in the Oregon coast are responsible for on average, 10% of the spawners, and in some years have exceeded 80% in some basins. (Jacobs *et al.* 2001). However, hatchery fish are present in much greater numbers in the smolt populations, historically over 12 million a year, but recently reduced to between 1 million and 3 million a year, which cause greater competition and decreased smolt survival. (Nickelson *et al.* 1986; Weitkamp *et al.* 1995; WCCSBRT 1997). Indeed, the review team noted that the more hatchery fish released (emphasizing that fry releases are more detrimental than smolt releases), the more impact they have on natural populations. (WCCSBRT 1997).

E. Possible Threats to Genetic Integrity

The genetic integrity of coho, most easily represented by their locally adapted traits, genetic diversity and fitness, is directly linked to the low survival rates, which have likely driven certain alleles and local adaptations into extinction. In other words, the fewer wild coho that survive to spawn into the next generation, the higher the possibility that critical, locally adapted genetic material is lost from the population. Genetic integrity has been, and continues to be, challenged by the presence of hatchery stocks. (WCCSBRT 1997; ISG 2000). As NMFS has previously documented:

> [A]rtificial propagation can substantially affect the genetic integrity of natural salmon populations in several ways. First, stock transfers that result in interbreeding of hatchery and natural fish can lead to loss of fitness in local populations and loss of diversity among populations. The latter is important to maintaining long-term viability of an ESU

> because genetic diversity among salmon populations helps to buffer overall productivity against periodic or unpredictable changes in the environment...Second, because a successful salmon hatchery dramatically changes the mortality profile of a population, some level of genetic change relative to the wild population is inevitable, even in hatcheries that use local broodstock....Third, even if naturally spawning hatchery fish leave few or no surviving offspring, they can still have ecological and indirect genetic effects on natural populations.

(WCCSBRT 1997). There are other, numerous reports that link the genetic impacts on wild stocks to hatchery fish, specifically extinction, the loss of intrapopulation variability, interpopulation variability and domestication. (Waples 1991b; Hard *et al.* 1992; Brannon *et al.* 1999; ISG 2000).

For example, in the broodstock collections, artificial production programs may be responsible for increasing the demographic and catastrophic risks of extinction. (Brannon *et al.* 1999). In very small populations where the broodstock is collected for these purposes, the hatchery will increase inbreeding and hasten the loss of genetic fitness, thereby making that broodstock vulnerable to a potentially catastrophic extinction event either through disease, power failures or predation. (*Id.*). Although four Oregon hatcheries, the Coquille, Coos, Cow and Smith, within the Oregon coast coho range utilize wild, coho for broodstock, because the wild stocks have higher spawner returns, minimal impacts are expected from the broodstock collection. (NMFS 1998a). Nevertheless, those four hatcheries do not provide a plan for the reduction of broodstock collections when the returning natural spawner abundance is at a low or critical level. The catastrophic event may occur outside of the hatchery as well. With wild stocks of Oregon coast coho failing to meet their replacement rate in the past few years, their numbers are declining and yet they are still tapped for broodstock. With such reductions in the sizes of these populations, severe environmental impacts or catastrophes may lead to localized extinctions. (Waples 1991b; Waples 1995).

Genetic drift (change in allele frequencies due to random variations in fecundity and mortality) and inbreeding are threats to the genetic diversity in the smaller populations of salmon. (Brannon *et al.* 1999). By relying on small populations of coho to support the hatchery programs, the fish produced from hatcheries have less genetic variation and less fitness. (*Id.*). As the hatchery produced coho stray or are allowed to spawn naturally, the wild population diversity will also be slowly lost. Unfortunately, no studies are available to document either a loss, or lack thereof, of fitness from inbreeding depression in salmon stocks, however controlling for this effect in hatchery management is nearly impossible, thereby almost guaranteeing it is likely to occur. (*Id.*).

Finally, high levels of gene flow and outbreeding depression may result in a loss of genetic diversity between populations of Oregon coast coho. (Brannon *et al.* 1999). Even within ESU's there may be significant diversity within and among spawning populations, as was found in Oregon coast coho (Hjort and Schreck 1981; Currens and Farnsworth 1993; Weitkamp *et al.* 1995). Because artificial production may result in high gene flows by transferring out of basin fish into hatcheries, as is done with different stocks in the Oregon coast,[16] or stocking out of basin fish in non-native waters, both of which increase the stray rates of the hatchery fish, and may reduce population fitness, crossbreeding between separate populations within the ESU is not recommended. (Hard *et al.* 1992; Brannon *et al.* 1999). By introducing fish from outside of the basin, locally adapted gene complexes within populations will be disrupted lowering the total fitness of the population and making it more susceptible to extreme environmental and selective pressures and potentially localized extinction, even though the actual level of genetic diversity (heterozygosity) in the population will increase. (*Id.*; Waples 1991b; Waples 1995). In other words, the interbreeding among hatchery and wild stocks may lead to a loss of fitness (outbreeding depression), especially given that Oregon coast coho are locally adapted and the hatchery stocks may be from different basins. (*Id.*).

F. RECENT EVENTS

Recent events have certainly altered the survival and abundance of wild Oregon coast coho populations, especially in 1997 and in 2001. The 1997 lows were likely influenced by a strong El Nino in the previous years, and a significant flood event in 1995-1996. (62 Fed. Reg. 24588, 24599 (1997); (NWPPC 1999)). Since 1997, the numbers have slowly increased with the exception of the spiked increase seen in 2001, but notably the major reason for the increases is due to improved ocean conditions. Ocean conditions are an oscillating factor that will again turn poor and be detrimental to coho populations unless they are stable enough to withstand such an impact. (ODFW 2001c). Interestingly, the ocean conditions have not been cited as a factor for the predicted crash in 2002 and currently the crash remains a mystery. (PFMC 2002).

VIII. Five Statutory Factors that Justify a Listing as a Threatened Species Pursuant to the Endangered Species Act

Section 4 of the Endangered Species Act directs NMFS, as an agent for the Department of the Commerce, to determine whether any species qualifies for listing as an endangered or a threatened species due to *any* of the five following factors: 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; or 5) other

[16] Although many of the Oregon coast hatcheries utilize stocks from within the Oregon coast, they do so from the lake systems such as the Siltcoos, Tahkenitch and Tenmile basins, or other out of basin stocks, which have somewhat different lifecycles and habitat requirements than the tributary based stocks. Additionally, the hatcheries use coho from the Southern Oregon/Northern California coho and the Lower Columbia River/Southern Washington coho stocks in many of the basins. (Weitkamp *et al.* 1995). In fact, of the eleven coho hatchery stocks on the Oregon Coast, only four use natural coho for broodstock and the other eight do not incorporate natural coho into their broodstock and have no intention of doing so in the near future. (NMFS, 1998a).

[17] The availability of high quality habitat is itself much more limited than previously thought or presumed by adult abundance models, particularly for critical over wintering habitat (Nickelson, 1992b).

natural or manmade factors affecting its continued existence. 16 U.S.C. § 1533(a)(1) (2001). Therefore, the biological review teams look to whether the species is facing an extinction risk such that it qualifies as a threatened or endangered species under the statutory definitions, but then the agency must determine whether or not that risk is caused by any one of the five factors above such that federal protection is warranted. With regards to the Oregon coast coho, NMFS found that all five factors contributed to its threatened status, thereby prompting its listing as a threatened species. (62 Fed. Reg. 24588 (May 6, 1997); 63 Fed. Reg. 42587 (Aug. 10, 1998)). Those threats continue today on this threatened species, most pertinently from hatchery fish, and all of the factors justify the listing only the wild, naturally spawned stocks of the Oregon coast coho as a threatened species under the ESA.

A. Overutilization of Oregon Coast Coho through Commercial and Recreational Purposes

NMFS found that, "[o]verfishing in non-tribal fisheries is believed to have been a significant factor in the decline of coho salmon." (62 Fed. Reg. 24588, 24593 (May 6, 1997)). In making the listing determination, NMFS highlighted the fact that fisheries continued to take record numbers of coho at precisely the time they were most vulnerable and in precipitous decline, thereby significantly compromising escapement levels. (*Id.* at 24594). NMFS noted that it was not until 1994, when the fisheries closed due to depressed stocks, that the escapement levels began to rebound. (*Id.*). Despite this minor rebound, NMFS still listed the Oregon coast coho as threatened in part based on their overutiliziation through commercial and recreational purposes.

1. Historical use as commodity

Salmon were an integral commodity in tribal relations and survival, forming the basis of their gift-economy. (Lichatowich 1999). In that economy the first signs of overutilization appeared. (*Id.*). Many of the tribes learned from these mistakes and minimized their impact on the harvest to maintain the natural productivity. (*Id.*). However, the harvest of Oregon coast coho increased exponentially with the arrival of early North American explorers in the mid 1800's and today overfishing is considered a significant source of early decline for Oregon coast coho and currently an ongoing impact. (62 Fed. Reg. 24588, 24593 (1997); (SRSRP 2001)). Until 1994, the Oregon coast coho were the largest coho fishery off the coast of Oregon and California. (*Id.*).

2. Commercial and Recreational fisheries

In the Pacific Northwest, the harvest of salmon peaked in between 1882 and 1915, close to 1911 for the Oregon coast coho at around 700,000 fish per year, and ranged between 300,000 and 700,000 through the 1970's. (62 Fed. Reg. 24588, 24594 (1997); (Sandercock 1991; Lichatowich 2000)). The annual catch accounted for between 40%-90% of the annual recruits. (IMST 2000). Commercial fishing licenses numbered 2,565 in 1960, but jumped to 8,566 by 1978, a four fold increase. (Lichatowich 1999). However, by the 1970's, scientists were already witnessing dramatic declines in the

Oregon coast coho abundances, yet the governments failed to restrict the harvest due in part to an inflated notion of estimated spawner abundance due to the presence of hatchery coho. (*Id.*). Flawed spawner escapement estimate models used by the Oregon Department of Fish and Wildlife also contributed to an over-assessment of coho abundances, models that by 1994 had been corrected. (ODFW 1991).

Due to the low returns (an estimated 37,000 in 1994), all fisheries on Oregon coast coho were terminated in 1994. (IMST 2000). Although the post 1994 harvest limits resulted in some increase in returns, the crash of the population in 1997 eliminated any of those gains and the abundance levels are only now reaching the levels seen shortly after the 1994 harvest limitations. Despite those low population abundances, there is still an impact on the coho due to commercial and recreational fisheries, albeit indirectly. (Waples 1991b; IMST 2000). In addition, despite a lack of any significant rebounds in abundance, a selective harvest has been allowed on hatchery coho along the Oregon coast since 1999, which also impacts the wild coho through incidental mortality. (IMST 2000). As a way to prevent future overfishing total incidental mortality is now accounted for under current federal fishery management plans, with incidental mortality ceilings (which may vary by year depending on total abundance) of between 8% and 13% since 1994.

Table 2. Chronology of changes in harvest impact rates associated with commercial and recreational fisheries for Oregon Coastal coho salmon (*Adapted from* IMST 2000).

Fishery	Time Period	Harvest Impact Rates
Coastal river and estuary gillnet	1890's-1920s	40%
Coastal river net and ocean troll	1930s-1940s	40-60%
Ocean troll/sport	1950s	60-80%
Ocean troll/sport	1960s	60-80%
Ocean troll/sport	1970-1983	60-90%
Ocean troll/sport	1984-1986	30-40%
Ocean troll/sport	1987-1992	45-65%
Ocean troll/sport	1993	35%
Ocean troll/sport	1994-1999	8-13%

3. Failures to meet escapement goals

The early escapement goals for wild Oregon coast coho were 42 fish per mile, or 200,000 spawners. (Oregon Trout 1993; IMST 2000). However, between 1981 and 1991 that escapement goal was satisfied only three times and has not been met since 1986. (ODFW 1996; IMST 2000). More troublesome is the likelihood that the measurements of actual escapement were overestimated during those times, indicating that the escapement goal might never have been met. (ODFW 1991; ODFW 1995). Furthermore, the escapement goals set by the Pacific Fisheries Management Council are based on full seeding of 50% of the high quality habitat (roughly 62,000),[17] a goal which has been met only once between 1990 and 2000. (*Id.*). Although the escapement goal was met in 2001, it is unlikely that the goals will continue to be satisfied given that the population of wild coho has failed to meet its replacement value since 1990. (*Id.*; Jacobs *et al.* 2001). In addition to harvest, extreme fluctuations in the ocean productivity and the inability to visibly distinguish hatchery from wild Oregon coast coho in the ocean harvest led to some of the early declines. (62 Fed. Reg. 24588, 24594 (1997)). However, given that the ocean productivity has increased in recent years, the harvest impacts have been reduced to their lowest levels in history, and hatchery fish have been visibly distinguishable from the wild Oregon coast coho since 1998, the failure to meet escapement goals and the replacement rate points to a significant need for further protections of the wild Oregon coast coho.

With post -1994 harvest levels at their lowest levels in history and with good ocean conditions in most recent years, one would have expected to see considerably greater rebound of escapement numbers if harvest levels that were the only major limiting factor on population, but instead only a small rebound was witnessed and the populations were susceptible to other extreme events like the 1995-1996 floods. Even last year's spike is predicted to completely disappear in 2002. These oscillations imply that other inland factors, such as habitat loss and poor fresh water spawning and rearing conditions are also primary limiting factors to Oregon coastal coho salmon production.

4. Little to no impact from scientific or educational research

There is little to no impact on wild Oregon coast coho from scientific or educational research. (62 Fed. Reg. 24588, 24594 (1997)). Most of the research done on the Oregon coast coho is done by the state agencies, universities or environmental consultants. (*Id.*). Any individual take of the Oregon coast coho was regulated by individual permits issued by NMFS under the Endangered Species Act.

B. Present or Threatened Destruction, Modification, or Curtailment of the Oregon Coast Coho's Habitat or Range

NMFS identified the following factors as affecting the decline of Oregon coast coho: channel morphology changes, substrate changes, loss of instream roughness, loss of estuarine habitat, loss of wetlands, loss/degradation of riparian areas, declines in water quality, altered streamflows, fish passage impediments, elimination of habitat, and direct take. (62 Fed. Reg. 24588, 24592 (May 6, 1997)). The causes identified by NMFS included logging, road building, grazing, mining activities, urbanization, stream channelization, dams, wetland loss, beaver trapping, water withdrawals and unscreened diversions for irrigation. (*Id.*). In making the listing decision for Oregon coast coho, in part based on the habitat changes and loss, NMFS explored each of these activities and conditions that had adversely affected the coho salmon in their coastal watersheds. Unfortunately, many of these impacts and causes remain as large threats to the continued existence of the Oregon coast coho. Indeed, both logging and agricultural practices, which NMFS associated with the removal and disturbance of natural vegetation, the disturbance and compaction of soils, the construction of roads, the installation of culverts, the increased sedimentation in streams through erosion and mass wasting, loss of large woody debris, alteration of hydrology and sediment transport, and the alterations to the biological community, are continuing and actually increasing at a disturbing rate. (*Id.* at 24593).

1. Habitat destruction

Numerous changes to the habitat of Oregon coast coho have led to their decline. Overall, 90% of Pacific salmon declines and extinctions have been linked to habitat degradation and 96% of the coastal temperate rainforest in Oregon has been heavily logged in Oregon. (WCCSBRT 1997). Only 22% of their current habitat is considered high quality habitat necessary for recovery. (Nickelson *et al.* 1992b; Nickelson 2001). Furthermore, in 1994 less than 5% of the Oregon coast streams met all ten habitat parameters within the Oregon's "desirable" range (the highest quality habitat classification). (ODEQ 2000). In fact, of the 43,000 kilometers of streams in the Oregon coast coho range, 55% was reported "moderately" or "severely" affected by non-point source pollution (agriculture, urban runoff, erosion etc.). (WCCSBRT 1997). Additionally, loss of large deep pools (at a rate of 80% along the Oregon coast), integral to over winter survival, and loss of wetlands (over one-third along the coast) and estuarine habitat have accelerated that decline along the Oregon coast. (*Id.*).

The remaining habitat continues to be compromised by alterations in natural channel morphology, substrate changes, loss of instream roughness, loss of estuarine habitat, loss of wetlands, loss of riparian areas, increased erosion and runoff, degradation of water quality such as temperature, dissolved oxygen, pH, bacterial contamination, fertility and the biotic community, altered stream flows, impediments to fish passage, and the elimination and fragmentation of the spawning and rearing habitat. (62 Fed. Reg. 24588, 24592 (1997)). The root of these sources is widespread from hydropower, logging and agriculture, mining and urbanization. (WCCSBRT 1997).

a. Riparian and Terrestrial Impacts

The riparian area buffering streams plays a vital role in protecting streams from erosion, increased temperature, and adequate organic nutrients to the Oregon coast coho habitat. The large woody debris from the riparian areas contributes to the storage of sediment, particularly spawning gravels, and creates small pools, side channels and backwaters that are critical to Oregon coast coho. (IMST 1999; NMFS 1998b). Simple changes to the quantity and quality (coniferous versus deciduous) of the riparian area may increase the stream temperatures considerably, reduce water quality, reduce the organic nutrient contribution, adversely alter the biotic community both in stream and terrestrially, and reduce the large and small woody debris desired for rearing. (*Id.*). Riparian areas increase shade, decrease water temperature, provides habitat for juvenile coho. (NMFS 1998b). The large woody debris that is an important component to the coho habitat is provided by adjacent riparian and upstream vegetation. (*Id.*). In addition to regulating sediment and influencing the stream flows and channel stability, the large woody debris also provides essential habitat for coho in the form of backwater, riffles and pools, thereby protecting the coho from high stream velocities and predation. (*Id.*). In fact, studies have shown that streams with undisturbed (for 40 years) riparian areas had five times more salmon spawners than those streams where the riparian areas were cleared of all large wood. (IMST 1999). Furthermore, in a different study, streams with significant disturbances in the form of high timber harvests, had less fish assemblage diversity than those with low harvest levels. (*Id.*). The additional impacts of road construction, chemical and pesticide usage, and riparian area disturbances caused by forestry practices on both federal and state land have significantly impacted coho habitat (NMFS 1998b).

In order to maintain adequate temperatures and water quality, riparian areas should typically range from 100ft.-150ft. to ideally 300 ft. on either side of the stream and have a large percentage of mature and old growth coniferous trees, with fallen trees. (*Id.*). However, this is often not the case in the coho's habitat. Urbanization, agriculture, grazing in riparian areas, logging, and other causes discussed below, have disrupted the ground cover, causing excessive erosion, sedimentation, increased temperatures and loss of available spawning habitat. 62 Fed. Reg. 24588, 24592 (1997); (NMFS 1998b). Review by multiple federal agencies confirm that the state Forest Practices Act actually *adversely* impacts the shade levels, surface erosion, landslide rates, stream morphology and substrate and landscape-scale conditions that all impact the optimum stream temperatures (EPA 2001). Studies have confirmed that the critical riparian areas in the Oregon coast are deficient in both the quality and quantity of necessary wood and recommendations have been made to change the focus of the state forest practices. (IMST 1999; EPA 2001). Large conifers are missing from 30% of the Oregon coast coho streams and 75% had fewer than 60 large conifers per 1/3 km (as compared to 240 per 1/3 km in the ideal, benchmark streams). (*Id.*). The loss of these trees also corresponds to the loss of large wood necessary for salmon habitat. (EPA 2001).

Disturbance to the riparian area also leads to increases in sedimentation. The sedimentation can reduce the availability of adequate spawning grounds, smother alevins developing in redds, and fry in the pool areas, and decrease the dissolved oxygen. Although a natural process, increases in sedimentation increase after disturbances to riparian areas, most typically with road related production, drainage and culverts, especially those activities that affect slope stability and the presence of large woody debris. (NMFS 1998b; IMST 1999; EPA 2001). In some instances, sedimentation can occur in the extreme form of debris flows or torrents that may completely block stream passage upstream and downstream, and smother everything in its path. (*Id.*). Landslides and debris flows are more likely to be associated with clearcutting, although they occur with road building as well. (*Id.*). The riparian areas are also intricately linked to upslope forests and the activities that occur there, which the state laws have failed to evaluate and mitigate in terms of their impact on salmon habitat. (EPA 2001).

Wetlands are similarly important aspects of riparian areas that contribute to Oregon coast coho survival, especially tidal wetlands.[18] Those wetlands not only act as sources of food, but are vital in the physiological transition between freshwater and saltwater as osmotic transition zones. (Green Point 1999). The tidal wetlands also provide cool, well oxygenated habitat for the migrating coho, and offer the additional benefit of protection from predators. (*Id.*). The loss of tidal wetlands, through human alteration, may lead to increased temperatures, sedimentation, passage blockage, inability to serve as a osmotic transition zone, loss of an important food source, and increased risk of predation. (*Id.*). There are approximately 55,600 acres of estuarine wetlands and 10,000 acres of tidal freshmarsh in the Oregon coast coho habitat. (Kjelstrom 2000). Although Oregon lost 68% of tidal areas, 24% of estuary from 1870-1970, and more than 33% of wetlands, today more than 90 percent are currently protected although losses still occur due to urban use and pollution. (*Id*; WCCSBRT 1997; Oregon Progress Board 2000).

b. Water Quality and Stream Flows

Human activities are the source of centuries of detrimental alterations to the water quality and stream flows necessary for Oregon coast coho survival. In addition to disturbances to the riparian and terrestrial areas that affect stream flow and water quality, other factors such as dams, culverts, channelization, diversion, and water pollution all contribute to altered pHs, low dissolved oxygen, high bacterial counts, impassible streams, low and excessively high stream flows. (62 Fed. Reg. 24588, 24592 (1997); EPA 2001).

Of the Oregon coast streams surveyed in 1997 (only 33.5 percent of the 18,137 total miles), only 11.6%, or 706 miles actually met the state water quality standards. (*Id.*). In 1999, 30% of the streams did not meet the dissolved oxygen saturation standard (although most met the minimum dissolved oxygen concentration standard). (ODEQ 2000). Fortunately for the coho, most of the streams meet the pH standard (between 6 and 8). (*Id.*). Temperature is also critical to Oregon coast coho. The statewide average of 64 °F is still higher than the optimum temperatures of 53 °F - 58 °F, and although only 53% of the streams in the Oregon coast met the temperature standard in 1999, 22% exceeded the standard and data are unavailable for the remaining 25%. Nor is the state Forest Practices Act adequately protecting the stream temperatures. (*Id*; EPA 2001). Finally, the supporting biota is also essential to coho survival. There is an expected macroinvertebrate community that Oregon coast streams should support, however in 1994, 53% of streams met that standard while only 29% supported the macroinverebrate community in 1999. In other words, even though there are some improvements in certain water quality indexes, such as pH, others like the macroinvertebrate community are decreasing, but all are necessary for the wild Oregon coast coho to survive.

Oregon's water quality index analyzes ten water quality parameters and then scores the streams accordingly in a range from excellent to very poor. (ODEQ 2000). Along the Oregon coast in 1999, while 57% of streams scored "excellent" (an increase from

[18] Because of the proximity of the Coast Range mountains, the only wetlands in the Oregon coast coho habitat are mainly estuarine wetlands at the mouths of rivers. (Kjelstrom 2000).

42% in 1994), 27% of the streams scored between "fair" and "very poor" (a decrease from 44% in 1994). (*Id.*) However, Oregon also rates habitat quality based on ten parameters such as shade, gravel area, large woody debris, canopy, etc., ranking streams as undesirable, desirable, and transitional. (*Id.*) In 1994, less than 5% of the streams qualified as desirable habitat based on the ten parameters. Therefore, even if the water quality shows an improvement, the overall habitat for salmon is still significantly lacking in the quality wild coho require for survival.

In addition to water quality concerns, stream flows may pose additional impediments to the migration of Oregon coast coho. Migration delays, loss of resting habitat, stranding, and entrainment are all consequences of either increased, reduced or blocked stream flow. (62 Fed. Reg. 24588, 24593 (1997)). In particular, along the coast, there are 46 dams and thousands of miles of streams are closed off from coho due to impassible barriers. (ODEQ 2000; Maleki *et al.*, 2000).

2. Causes

a. Timber

The causes for the degradation of the Oregon coast coho habitat range from logging to road construction (both logging roads and industrialized roads) to urban development to mining to agriculture. Logging is responsible for the disturbance and removal of natural vegetation along the riparian areas, the construction of soils through timber roads and equipment, the installation of culverts associated with those roads, and the use of splash dams. (ODFW 1995; 62 Fed. Reg. 24588, 24593 (1997)). These impacts increase siltation and erosion, decrease large woody debris, reduce shade, and destroy spawning gravel and rearing areas. (ODFW 1995). Along the northern and southern Oregon coast, the main land use is for timber harvest. (*Id.*) As discussed in the previous section, the timber practices on state, federal and private land are all contributing significantly to the degradation of the salmon habitat through disruption of the riparian areas and water quality. (NMFS 1998b; EPA 2001).

Timber harvests continue to disrupt coho habitat, as was demonstrated by the impacts of the 1995-96 floods. (WCCSBRT 1997; Maleki 2000). Furthermore, despite the Oregon Plan's attempt to address forestry issues, NMFS determined that the proposal would not provide the protections "essential to creating and maintaining the high quality habitat needed to sustain Oregon coast coho over the long term across a range of environmental conditions." (62 Fed. Reg. 24588, 24607 (May 6, 1997); NMFS, 1998). An independent scientific review of the adequacy of Oregon's Forest Practices Act also concluded that current state forest protection laws in Oregon are not adequate to protect depressed stocks of wild salmonids. (IMST 1999). To date none of the recommendations for reform of these inadequate forest practices by NMFS, by the IMST or by the Oregon Department of Forestry's own Forest Practices Advisory Committee on Salmon and Watersheds (ODF 2000) have been adopted.

The Oregon Forest Practices Act (FPA) was created in 1972 to protect the forest and aquatic resources, however at that time salmonid conservation was not a priority. (IMST

1999). In 1997 the State of Oregon adopted the Oregon Plan, which included numerous provisions affecting forestry and the protection and restoration of the resource, and made the protection of salmonids its mission. (*Id.*). Numerous reviews of the Oregon Plan and the FPA have looked at their effect on riparian areas, large woody debris, sedimentation, landslides and fish passage, all determining that the FPA and Oregon Plan do not adequately protect the habitat necessary for the survival of wild salmonids. (NMFS 1998; IMST 1999; EPA 2001). With each of these reports came numerous recommendations, none of which have been implemented to date, and the programs continue to allow inadequate riparian buffers, increased landslides, blocked fish passage, degrade water quality and enhanced impacts of sedimentation on state and private forests.

Federally, under section 7 of the ESA, the forest agencies – the Bureau of Land Management (BLM) and Forest Service – must insure that any action, "authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species…." 16 U.S.C. § 1536(a)(2) (2000). This requirement applies to the Northwest Forest Plan (NWFP), adopted by the Forest Service and the BLM in 1994 to provide a management program for approximately 24.5 million acres of federal lands within the range of the threatened spotted owl. Pacific Coast Federation of Fishermen's Associations *et al.*, v. National Marine Fisheries Service, 265 F.3d 1028 (9th Cir. 2001).

Integral to the NWFP are Aquatic Conservation Strategies (ACS), plans intended to ensure that the timber practices maintain and restore the ecological health of the waterways in those forests. (*Id.* at 1031-32.). After internal review of the project proposals that are determined to affect listed species (such as the Oregon coast coho), NMFS is asked to formally consult and issue a biological opinion pursuant to section 7 of the ESA. Recently however, the Ninth Circuit Court of Appeals held that the biological opinions for over two dozen timber sales were arbitrary and capricious because NMFS failed to evaluate the cumulative impact of smaller projects and failed to analyze the short term impacts of those sales on the threatened Oregon coast coho. (*Id.*). Other sales were also affected by the Pacific Coast decision because they too were not consistent with the ACS objectives. In other words, the inherent application of the NWFP is not adequately protecting the critical habitat of the Oregon coast coho. Instead, there are attempts to weaken the NWFP and the ACS.

Nevertheless, when the Oregon coast coho listing was suspended in Alsea Valley Alliance v. Evans, 161 F.Supp.2d 1154 (D.Or., 2001), the Forest Service and BLM issued directives to release over a dozen sales previously enjoined by the court, and with nothing preventing them, other inappropriate sales are likely to move foreword. Thus, without the protections of the ESA, many of these sales are proceeding without any consideration to the jeopardy of the Oregon coast coho, and there is no longer the backstop of the ESA to ensure that coho salmon are adequately protected, and remaining functional habitats are not degraded.

b. Urbanization

NMFS found that urbanization has also degraded Oregon coast coho habitat through stream channelization, floodplain drainage and riparian damage. 62 Fed. Reg. 24588, 24592 (May 6, 1997). Additionally, NMFS found that urbanization significantly increases point source and non-point source pollution, thereby further degrading the water quality. (*Id.*). The Oregon Plan created voluntary watershed councils in an effort to engage in projects to improve the conditions of the state's watersheds. (*Id.*). Although numerous watershed councils have been formed in an attempt to implement projects that enhance instream habitat, place large woody debris in streams, and manage and restore riparian areas, there is very little follow-up and oversight of the projects and some watersheds have not yet been addressed. (Maleki *et al.* 2000).

Still today little has changed to have a notable impact on the recovery of Oregon coast coho. Coastal urban areas are still located in former estuaries and rely on diking, channelization and drainage for water control and usage. (ODFW 1995). In addition, dredging and channelization is commonly associated with jetty construction and marine economies in those urban areas. (*Id.*). The continued increase of impervious surfaces leads to increased runoff and sedimentation, which can also increase the flow of pesticides, herbicides and household chemicals, including copper, cadmium, zinc, lead, gasoline and oil into critical coho habitat. (62 Fed. Reg. 24588, 24592-93 (1997)).

c. Agriculture

NMFS found that agriculture had a significant impact on Oregon coast coho habitat through irrigation diversions, overgrazing in riparian areas, and the compaction of soil which led to greater runoff. (62 Fed. Reg. 24588, 24592 (May 6, 1997)). In the Tillamook region and southern area of the Oregon coast, agriculture is prevalent. The lowland areas have been clearcut, channelized, dredged and diked for pasture and croplands. (ODFW 1995). The loss of previously described shade and large woody debris, in addition to the increased sedimentation and nutrient and pesticide rich runoff, has ruined the water quality necessary for coho survival. (*Id.*). In addition, the continued grazing of livestock in riparian areas has reduced the ability of the riparian areas to regrow, and has increased the compaction of soils, which can lead to erosion and sedimentation, again impacting water quality. (62 Fed. Reg. 24588, 24592 (1997)). The dependence on agriculture has also lead to irrigation development, which creates water storage and diversions, essentially blocking fish passage. (ODFW 1995). Although improvements are being made in fish passage and habitat restoration, significant improvements are still necessary to improve Oregon coast coho survival. (Maleki *et al.* 2000).

Measures to control the adverse impacts of agriculture on coho are nearly completely omitted in the Oregon Plan and those that do exist are purely voluntary. No laws in Oregon require farmland buffer zones to protect riparian areas from the impacts of agriculture. Nearly two thirds of coho habitat lies on nonfederal (mostly private) lands, yet agricultural impacts on coho are nearly unregulated in Oregon.

C. Other Natural or Manmade Factors Affecting the Continued Existence of the Oregon Coast Coho

In evaluating the impacts of natural and manmade factors affecting the Oregon coast coho, NMFS found that rainfall trends and marine productivity associated with atmospheric conditions have had "a major influence on coho salmon production." (62 Fed. Reg. 24588, 24598 (May 6, 1997)). NMFS argued that these factors can be linked to the decline in the Oregon coast coho because fragmentation of populations or a reduction in their size and range would make them more vulnerable to extinction. (*Id.* at 24599). NMFS looked at droughts, floods and ocean conditions that create highly variable environments that have both short-term and long-term detrimental impacts on the survival of Oregon coast coho. (*Id.*). Smaller populations of salmon may not have the behavioral or life-history traits to cope with these changes. (*Id.*). These natural factors will continue throughout time. Inevitable, future droughts, floods and changing ocean conditions, will impact Oregon coast coho, however if the populations are too small, and lack the fitness to proliferate to the next generation, the impacts of these factors may be catastrophic.

The single biggest manmade factor (as opposed to a human process such as agriculture and logging) that impacts the survival of Oregon coast coho, according to NMFS, is the propagation of artificial fish. (*Id.*). NMFS found that artificially propagated coho impact wild fish through the genetic impacts, predation on wild fish, and replacement rather than supplementation of wild stocks through competition and continued annual introductions of hatchery fish. (*Id.*). NMFS found that the run time of hatchery populations are advanced and compressed leading to the displacement of wild, naturally spawned fry, even though the early-spawning hatchery fish may not be able to establish permanent, self-sustaining populations due to the early fall floods. (*Id.*). NMFS also found that the release of large hatchery fry and smolts into streams with wild, naturally produced fry and smolts, may place the wild fish at a competitive disadvantage and push them into marginal habitats with low survival potential. (*Id.*). Furthermore, NMFS found that based on scale analysis, there were moderate to high levels of hatchery fish spawning naturally in river basins along the Oregon coast. (*Id.*).

1. Natural Factors

There is no doubt that natural patterns, such as floods, droughts, El Nino, La Nina, oscillation in ocean currents and the population fluctuations of predators and prey, affect coho abundances in any given year. As the coho populations reach more critical numbers, any one of these natural events may result in the extinction of local populations of wild Oregon coast coho. However, although a natural occurrence may precipitate an extinction event, natural factors did not lead to the century of decline of the wild coho stocks. (62 Fed. Reg. 24588, 24599 (1997)). A review of major flood events, droughts and ocean fluctuations over the last century indicates that other factors also led to the coho's decline. (Lichatowich 1999).

a. Floods

Flood has been a common occurrence in coho habitat since the retreat of the ice age, nearly 14,000 years ago, and lasted nearly ten thousand years. (Lichatowich 1999). It was only around 4,000 years ago that the milder climates became common place, and the frequency of flooding declined, creating ideal habitat grounds for Oregon coast coho. (*Id.*). However, flooding is still prevalent and can be especially devastating to coho habitat when heavy erosion is exacerbated by urbanization, grazing, agriculture, fire, and intense logging. (62 Fed. Reg. 24588, 24599 (1997)). The increased sedimentation not only suffocates salmon, but the intensity of the flood may scour the riverbed, leaving little productive habitat for next years returning coho (presuming the flood left stream passage intact). (*Id.*). The flooding removes large woody debris remaining in stream channels and reduces the amount and quality of overwintering habitat. In conjunction with the loss of heavy forestation, and unlike conditions during historic floods, modern day floods do not return large woody debris to stream channels.

The Oregon coast, from November 1995 through April 1996, witnessed hundred year flood events, including high winds, heavy rainfall, rapid snowmelt, landslides, debris torrents, and the mobilization of large woody debris. (NMFS 1997a; WCCSBRT 1997; 62 Fed. Reg. 24588, 24599 (1997)). Surveys indicated that the worst damage to coho habitat occurred in areas where steep slopes, recent timber harvests, high densities of roads, and intense rainfall converged, such as the Siuslaw and Alsea watersheds. (*Id.*). Indeed, in the Siuslaw National Forest, of the 1996 landslides, 41% were associated with roads, 36% were associated with clear cuts, and the remaining 23% were associated with forested areas. (WCCSBRT 1997). However, the after effects of the flooding also produced additional channels in some areas, creating prime overwintering habitat and cool, deep pools in some areas. The overall impact on the wild Oregon coast coho abundances were measurably negative, smolt production was low and overwinter survival rates were their lowest or second lowest on record. (*Id.*). Indeed, some of the lowest returns on record were that brood year season in 1997 and 1998. (Jacobs *et al.* 2001). Had another season of floods impacted the wild Oregon coast coho, especially in 1997 or 1998 when the early jacks and 1995 (that were impacted by the 1996 floods) juveniles returned to spawn, there is no doubt that their low abundance numbers would have contributed to the devastation of the population.

b. Droughts

Similar to floods, droughts are not as common as they once were. In the early 1900's, the infamous Dust Bowl came at a time of excessive harvest and habitat degradation, sending salmon stocks into decline. (Lichatowich 1999). The droughts cause the streams to reduce flow, cutting off essential habitat to coho survival, preventing their migration up and down stream, causing the coho to pool at the mouths of rivers thus increasing predation attempts, increasing water temperatures, increasing erosion and landslides when water finally does precipitate. (62 Fed. Reg. 24588, 24599 (1997)). Currently, the National Oceanic and Atmospheric Administration (NOAA) rates the Pacific Northwest, especially the Oregon coast, as in severe to extreme drought. (Hayes, 2001). As a consequence of the drought, fish passage downstream in some areas of the state, is at an all time low. (Fish Passage Center, 2001). The results of this drought season will likely impact returns in 2003 and 2004.

c. Ocean Conditions

There have been numerous studies attempting to correlate oceanic conditions to salmon production, in particular linking declines in Oregon coast coho to ocean parameters. (ODFW 1986; Johnson 1996). Sea temperatures, salinity, upwelling events, the Pacific decadal oscillation (PDO), El Nino and La Nina have all been linked to overall coho abundances. (62 Fed. Reg. 24588, 24600 (1997)). These oceanic phenomena are as a result of changes in ocean currents, usually on a very large scale, and often on a regular cycle. Recent research has been able to more accurately link the ocean conditions to salmon fluctuations through stable isotope testing, among others. (Johnson 1996; NWPPC 1999). The large scale ocean oscillations have not only been linked to salmon abundance, but also to changes in their migration patterns and overall size. (*Id.*). While it is clear that ocean conditions have played an important role in the evolution and population dynamics of Oregon coast coho, many variables in the relationship have yet to be explored and understood. For example, in 1977, there was a clear shift in the ocean conditions that resulted in a slight decline in ocean survival of Oregon coho stocks. (*Id.*). However, a much greater decline in the ocean survival of some stocks was seen in 1989 during another similar period of clear shift in ocean conditions, yet the reason for the difference in responses still baffles scientists. (*Id.*).

One thing that may be inferred from the corresponding oscillations in salmon and ocean conditions is that the change in the ocean conditions alters the carrying capacity of the ocean. (*Id.*). Carrying capacity is a function of productivity, food web dynamics, trophic levels, ecological efficiencies, consumption by competitors and predation. (ENRI 2001). All of these factors fluctuate seasonally, annually, over decades (on a 10-30 year cycle), centuries and millennia. (NWPPC 1999; ENRI 2001). Similar to droughts and floods, these natural cycles have impacted wild Oregon coho throughout their millennia of existence, and are not directly causally linked to the century of declining abundance. However, with the abundances critically low, increased ocean mortality due to ocean conditions may bring the wild Oregon coast coho precipitously close to extinction.

d. Climate

Currently, there has been very little research done on the impacts of global warming on Pacific salmon returns, although there is much commentary. The consensus seems to be one of ignorance. At the moment there seems little doubt that the temperatures are warming in Oregon –up by 2 °F in Corvallis – and parts of the state have seen an increase in rain while other parts see an increase in drought. (EPA 1998). While different models may show increases by different amounts, there is no doubt that these changes will impact salmon survival. Warmer days mean warmer water temperatures and less dissolved oxygen, and an increase in the intensity of storms, possibly increasing runoff and erosion – impacts that, as previously described, are detrimental to salmon survival. (*Id.*). A rise in sea level would reduce if not eliminate the estuarine and tidal marsh environmental vital to the transition and survival of Oregon coast coho. (*Id.*). Less snowfall in the winter will also mean less freshets in the spring, creating difficult if not impossible migration for the coho. (*Id.*).

2. Artificial Production

Because much of the earlier discussion relating to the DPS and ESU Policies addresses the specific influence of hatchery fish on the wild fish and the research and evidence that supports those conclusions, that evidence will not be repeated here but is instead incorporated by reference. However, the history and management of hatcheries is important to understand why those impacts occur and indeed, persist. Consequently, this section will serve to highlight the historical and management aspect of artificial production.

Artificial production can take on five different forms, as identified by the IMST (2001). First, mitigation hatcheries are common on the Columbia River, as they attempt to compensate for natural production lost to habitat degradation mainly through dams. Many of these are also known as the Mitchell Act hatcheries due to their authorization under the Mitchell Act (16 U.S.C §§ 755-757, as amended). The Cole River hatchery on the Oregon coast is one of 17 mitigation hatcheries in Oregon. The second most common hatchery on the Oregon coast is a harvest augmentation or production hatcheries. Production hatcheries are used solely for increases in commercial and sport fishing opportunities. Third, supplementation hatcheries attempt to maintain natural production and long term fitness of the wild stocks, by allowing releases of hatchery fish intended to be identical (or nearly so) to the local wild populations in fitness, and intended to interbreed with the local wild population. Fourth, restoration hatcheries target extinct or extirpated populations in an attempt to reestablish similar populations. Finally, conservation hatcheries are last resort hatcheries aimed at preventing extinction of stocks using captive broodstocks. Regardless of the type of hatchery, nearly all of the literature encourages the precautionary principle approach of not turning to artificial production unless it can be shown that it will not exacerbate the problem – a burden that is hardly ever enforced. (Waples 1991b; Hard *et al.* 1992; Lichatowich 2000). In a similar vein, monitoring and enforcement, important components that are not efficiently and effectively in place along the Oregon coast, are touted as integral. (*Id.*).

Along the west coast, hatchery releases peaked in the 1980's at nearly 50 million, and along the Oregon coast at nearly 13 million. (ODFW 1995; Weitkamp *et al.* 1995). Still, millions of hatchery coho are released along the coast today. (ODFW 1995; WCCSBRT 1997b; ODFW 1998b). Multiple review panels and scientists have concluded that hatchery programs have failed to meet their objectives, the management of hatcheries has failed to conserve biodiversity and in fact has been detrimental to wild stocks, and there is very little, if any, monitoring of hatchery practices. (62 Fed. Reg. 24588, 24600, 24604 (1997); Hard *et. al.* 1992; Weitkamp *et al.* 1995; WCCSBRT 1997; IMST 1998;

Brannon *et al.* 1999; Lichatowich 2000; ISG 2000; Waples *et al.* 2001; Chilcote 2002). The main risks associated with hatcheries are direct genetic impacts, indirect genetic impacts and domestication of hatchery stocks. (Waples 1991b). The consequences could result in localized extinctions due to extreme environmental or catastrophic events, the loss of genetic diversity, and the loss of genetic fitness – resulting in a gaping ecological and genetic void. (Lichatowich 1999; Lichatowich 2000).

Although the State of Oregon attempted to address many of these criticisms for example, by marking hatchery fish and stocking carcasses, the failure to develop management objectives for the different hatchery programs, and a corresponding monitoring system, have severely limited the State's ability to make any notable progress. (IMST 1998). Despite management precautions to minimize interbreeding, the hatchery coho still average 10% of naturally spawning coho along the Oregon coast and have seen levels nearing 80% in particular watersheds, with little to no data on the interaction between those hatchery and wild spawners – one of the main criticisms of the scientific review teams. (WCCSBRT 1997; IMST 1998; Jacobs *et al.* 2001). Because the purposes of the hatcheries is mainly for fisheries in mixed stock, the incidental mortality rate to wild Oregon coast coho may be measurable (Hooton 2001). Finally, no matter what the State of Oregon does to improve hatchery management strategies, there will always be risks to the wild populations. (Waples 1999; Chilcote 2002). As Dr. Waples notes, this is due to the negative correlation between risks; by decreasing one risk another is increased. For example, releasing hatchery fry instead of smolts reduces the time that negative selection imposed by hatcheries can act on the juvenile, but it increases the competition on wild stocks and increases the mortality of the hatchery stocks, thereby negating the mortality benefits that justify the use of hatcheries in the first place. (Waples 1999).

NMFS has previously made findings of the detrimental impact that the artificial production of Oregon coast coho have on the wild stocks, including genetic impacts, disease transmission, predation, take for broodstock purposes, and competition . (62 Fed. Reg. 24588, 24600 (1997); Flagg, 2000). Furthermore, recent reports indicate that these impacts are not localized, but rather widespread in every basin in the Oregon coast where wild coho are present, based on the presence of hatchery coho in ever stream system. (ODFW 1995; Jacobs *et al.* 2001). Additionally, the fluctuations in the ocean conditions, and the changes in the ocean carrying capacity, may exacerbate the impacts in certain years. (NWPPC 1999). Additional reports suggest that the impact of these hatchery programs is resulting in at least phenotypic differences (genetic and environmental) between coho, and is not limited to hatchery management practices alone, but due to other direct biological and environmental effects. (IMST 2000; Flagg *et al.* 2000; Chilcote 2002).

D. DISEASE AND PREDATION

Although disease and predation do not have substantial impacts throughout the range of the Oregon coast coho, disease may have localized impacts which are exacerbated by hatchery practices. (62 Fed. Reg. 24588, 24594). Freshwater and marine environments expose Oregon coast coho to bacterial, protozoan, viral, and pathogenetic diseases such as bacterial kidney disease, ceratomyxosis, hematopoietic necrosis, columnaris, furunculosis, redmouth, whirling disease, and black spot disease. (*Id.*). Little is known about the mortality rates associated with disease, although it is known that infected hatchery fish may directly transfer the disease or reduce the resistance to the disease from direct interaction or interbreeding. (*Id.*). For example, wild Oregon coast coho in the Nehalem River are resistant to a parasite that is present locally. Coho from the Trask River are not resistant. When hatchery fish from the Trask River Hatchery were planted in the Nehalem River, offspring of hatchery-wild interbreeding were less resistant to the parasite than their non-hybrid counterparts. Lichatowich Declaration ¶10, 2001.

Predation effects may have similarly localized impacts. Exotic warm water introductions in the Tenmile Lake, once one of the largest producers of wild Oregon coast coho, has depleted the salmon population due to predation. (62 Fed. Reg. 24588, 24595 (1997)). Avian predators, such as herons, cormorants and gulls is minimal, although it too may have localized impacts when hatchery releases flood local streams, attracting avian predators to wild and hatchery juveniles, coupled with the disappearance of avian protected habitat and decreases in ocean production, leading to altered diets in the avian predators. (*Id.*). Similar impacts are thought to occur from marine mammals such as sea lions and seals, which may increase predation during low water years as the coho pool at the mouths of the rivers waiting freshets. (*Id.*).

E. INADEQUACY OF EXISTING REGULATORY MECHANISMS

1. Generally

NMFS has previously documented the inadequate protections afforded to wild Oregon coast coho under current state and federal regulatory mechanisms. (62 Fed. Reg. 24588, 24597 (1997)). NMFS must make those same findings of insufficiencies here because not much has changed since then. Federal programs such as the Northwest Forest Plan, the Clean Water Act sections 303 and 404, and harvest management through the Pacific Fisheries Marine Council, have all failed to adequately protect the Oregon coast coho and their habitat. Although conditions are improving, most notably through harvest restrictions, advancements must still be made in these areas in order to adequately protect the coho and their habitat, most notably in the area of forest practices.

The state programs are making advances, but still have significant strides to make. The Oregon Department of Agriculture is still behind schedule in the development of the Agricultural Water Quality Management Plans (AWQMPS), and only recently developed a monitoring program for those plans. (OWEB, 2001). Most of the measures called for in these AWQMPS are also voluntary with no assurances of eventual completion. The development of a revised Native Fish Conservation Policy is woefully behind schedule and will not be completed until 2002, while implementation of the 1995 Wild Fish Management Policy is inconsistent at best (pers. comm. Ed. Bowles, ODFW). Although the Oregon plan for salmon and watersheds (Oregon Plan), has made considerable strides in improving habitat and fish passage, there are literally thousands of projects that still remain undone in the Oregon Plan. (IMST 1999; OWEB 2001). The state plan and recent court cases are highlighted below. .

2. The Oregon Plan for Salmon and Watersheds and Oregon Natural Resources Council v. Daley, 6 F.Supp.2d 1139 (D.Or. 1998)

The Oregon plan for salmon and watersheds (Oregon Plan), was developed in 1995 and 1996, but wasn't fully approved until March, 1997. (OWEB 2001). NMFS relied on the Oregon Plan when they updated the status review for Oregon coast coho, and determined that if the measures were fully implemented, there was a lack of consensus on whether the Oregon coast coho would still be "likely to become endangered" in the foreseeable future. (NMFS 1997a). However, internal documents from NMFS reveal that despite the presence of the Oregon Plan, NMFS personnel did not feel the Plan was satisfactory to protect the Oregon coast coho, and that listing was necessary. ONRC v. Daley, 6 F.Supp.2d 1139, 1149 (D.Or. 1998). Regardless of those misgivings, NMFS determined not to list the Oregon coast coho as threatened based on the anticipated adoption of the voluntary and regulatory measures in the Oregon Plan, despite the fact that NMFS concluded that the Oregon Plan would not secure the necessary environment to ensure coho survival over the long term. (62 Fed. Reg. 24588 (May 6, 1997)).

A legal challenged in the District Court of Oregon found that the decision by NMFS was arbitrary and capricious, because NMFS did not look to whether the Oregon coast coho would become endangered in the foreseeable future, but rather just in the time it would take to implement the Oregon Plan, estimated to be 2 years. ONRC v. Daley, 6 F.Supp.2d. 1139, 1151 (D.Or. 1998). Part of the problem with NMFS reliance on the Oregon Plan was that many of the measures rely on voluntary actions and NMFS should not have been able to rely on unenforceable measures. ORNC 6 F.Supp.2d, at 1155. Today, it is being implemented in a way that will still not recover the species over the long term. (IMST 1999; Maleki *et al.* 2000). One major disappointment in the Oregon Plan has been the failure to reform the forest practices, as discussed above. Another problem with the Oregon Plan is that agricultural practice reforms are nearly completely omitted, even though commercial agriculture has an enormous impact on coho habitat. Given that the status of the coho has not improved since the original listing in 1998, and particularly given the lack of protections in both key areas of forestry and agriculture, there is no indication that the protections provided by the Oregon Plan are having a notable impact in the recovery. Given that the 2001 spike in coho abundance is predicted to be completely eradicated in 2002, there is growing evidence, five years after implementation, that the Oregon Plan needs considerable strengthening if it is going to lead to the recovery of wild Oregon coast coho.

3. Alsea Valley Alliance v. Evans, 161 F. Supp.2d 1154 (D. Or., 2001)

The listing of the Oregon coast coho was suspended September 10, 2001 pursuant to an order issued by Judge Hogan in Alsea Valley Alliance v. Evans, 161 F.Supp.2d 1154 (D.Or., 2001). That decision essentially determined that the application of NMFS' hatchery policy after making the ESU determination, represented an impermissible subdivision under the ESA. (*Id.* at 1161). The court determined that once NMFS defined a "species" under the Act, it must include all of the components of the defined species or none of them in listing, but because NMFS did not do that for the Oregon coast coho, the court set aside the entire listing. (*Id.* at 1162-63). The initial listing for the Oregon coast coho did not include hatchery coho, although the species definition did include nine Oregon coast coho hatchery stocks. Incidentally, the court pointed out that NMFS could have avoided the problem in Alsea if it had determined that the hatchery stocks and the wild stocks of Oregon coast coho were not the same species. Although the December 17, 2001 order by the Ninth Circuit to temporarily reinstated the Oregon coast coho listing, the courts and NMFS have failed to address the real issue at the root of the controversy: hatchery fish and wild Oregon coast coho are separate and distinct species under the ESA. Such a biologically sound decision would be insulated from many criticisms and controversies surrounding the application of the hatchery policy and the opinion by Judge Hogan in Alsea Valley Alliance.

IX. Request for Listing as Threatened under the ESA

Based on the information provided heretofore in this petition, Trout Unlimited, Oregon Council of Trout Unlimited, Washington Council of Trout Unlimited, Oregon Trout, Washington Trout, Native Fish Society, Oregon Council of the Federation of Fly Fishers, Pacific Coast Federation of Fishermen's Associations/Institute for Fisheries Resources, Oregon Natural Resources Council, Save our *Wild* Salmon, Orange Ribbon Foundation, American Rivers, Audubon Society of Portland, National Wildlife Federation, and Siskiyou Regional Education Project, petition to list the wild Oregon coast coho (*Oncorhynchus kisutch*) as Threatened under the federal Endangered Species Act. Based on the undeniable threats to the genetic integrity from artificially produced coho, the historic impacts of fisheries, and historic and current habitat degradation due to timber, agriculture and urbanization, there is no other scientifically defensible alternative. Oversight by the National Marine Fisheries Service is necessary to ensure that species recovery programs are properly designated, funded and implemented to restore the wild Oregon coast coho throughout its historic range.

X. Request for Critical Habitat Designation

At a minimum, Petitioners request that NMFS redesignate the critical habitat for the original Oregon coast coho listing established in 2000 at 64 Fed. Reg. 24998 (May 10, 1999) and 65 Fed. Reg. 7764 (Feb. 16, 2000).

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