A MEANS TO CONSERVE? WILD SALMON AND HATCHERIES UNDER THE ENDANGERED SPECIES ACT

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INTRODUCTION

When is a fish not just a fish? Is there something unique about animals born and reared entirely in their native and wild ecosystems? Beyond genetic distinctions, there is an intangible element to wild animals that is distillable into policy if managers are willing to adopt precautionary, deep ecological approaches to wildlife management. Captive breeding offers a seemingly elegant solution to our wildlife management challenges and has proven successful for some species like the California condor. Nevertheless, it may ultimately do more harm than good if it replaces wild organisms with genetically similar but behaviorally and morphologically dissimilar captive-reared organisms.

In managing Pacific salmon and steelhead, the National Marine Fisheries Service[1] ("NMFS") once espoused a precautionary approach, broadly excluding hatchery-born salmonids from listing determinations under the Endangered Species Act ("ESA") despite close, even identical, genetic heritage.[2] When a federal district court rejected that policy in 2001, NMFS promulgated a new policy on Pacific salmonids, backtracking significantly from its former approach of per se exclusion for hatchery fish.[3] In this process of judicial review and agency reformulation, the 2005 Hatchery Listing Policy reveals both a failure of the law to effectively codify ecosystem-based environmental protection as well as the tried and true policy whiplash common in the transition between ideologically opposed administrations. Now, although the Ninth Circuit has reinstated the 2005 Hatchery Listing Policy, after a lower court invalidated it, NMFS has an opportunity to craft an integrated policy that can survive the constant legal challenges.

The most recent Hatchery Listing Policy reflects anthropocentric, shallow ecological values, in sharp contrast to Congress's intended goals of the ESA. Unlike many other environmental statutes, the ESA is aggressive and absolute. It lacks the discretionary flexibility of a statute like the National Environmental Policy Act and does not allow for balancing economic against environmental interests in making listing decisions. It is the closest thing the U.S. has to an integrated, ecosystem-based, statutory scheme for biological conservation. As society's understanding of environmental problems develops, the interconnectedness between ecosystems and human economies counsels for a deep and comprehensive approach to resource management. The ESA fits within that new paradigm, avoiding the pitfalls of anthropocentric solution-seeking by focusing on longevity, integration, and preservation.

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1 NMFS has recently been rebranded as "NOAA Fisheries." For the purposes of this Article, however, I will still call it "NMFS" to avoid confusion between pre-rebranding work by NMFS and post-rebranding work by NOAA Fisheries.

2 *See* discussion *infra* Part I.D.

3 *See* discussion *infra* Part I.E-F.

Humans tend to overvalue the extractive products of natural resources while simultaneously undervaluing the ecosystems themselves. The ESA, however, seeks to preserve species and their habitat, demonstrating a respect not for the value of a fish in a net, but for the *mere* existence of a fish in its native ecosystem, reproducing successfully and preserving its genetic lineage with little or no human intervention. A sound hatchery policy should recognize the harmony possible in merging anthropocentric with deep ecological values. A healthy ecosystem means healthy forests and rivers, undisturbed nutrient and water cycles, and the ability of all species within that system to ensure their genetic preservation. Plentiful stocks are not enough. Without improved habitat and water quality, the fact that more fish make it to the sea is meaningless, especially if agencies rely exclusively on hatcheries to produce those extra fish.

The long and protracted hatchery experiment has not been a success by ecological or conservation standards. Hatchery releases have increased over the last fifty years while the numbers of returning salmon continue their precipitous decline. This Article argues that we can effectively protect salmon within the language of the ESA as it stands simply because hatchery programs as they exist are inconsistent with the goals of the Act and therefore should not affect listing determinations. These policy decisions should instead focus on the goals the ESA intended to accomplish: preserving species in their native ecosystems and striving to restore them to their once sustainable existence. Salmon restoration efforts need to move beyond an obsession with numbers and recognize that success is contingent on restoring the ecosystems upon which salmon depend. There is no silver bullet. The solutions to this problem, like those for most environmental crises, are complex and difficult, demand caution, and require great human and capital investment. Our approach to salmon management and conservation under the ESA should reflect the inherent, inescapable, and likely incurable differences between hatchery and wild-born fish by adopting a policy of per se exclusion of captive-bred organisms in ESA listing determinations.

I. BACKGROUND

The story of salmon on the Pacific coast is much broader than just the problems posed by hatcheries. Historically, salmon have been overfished while their habitat has steadily been eliminated or fragmented by development and hydropower. A balanced approach to salmon conservation should account for all the threats that salmon face.[4] However, as the entire salmon problem would require many volumes to address, and because hatcheries are highly visible and very timely, this Article limits itself to hatchery policy and NMFS's history of wild salmon conservation.

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[4] For an excellent discussion on how best to restore salmon to their once great numbers, see RETURN TO THE RIVER: RESTORING SALMON TO THE COLUMBIA RIVER (Richard N. Williams ed., 2006).

A. Oncorhynchus

Salmon are a remarkable species. Their distinctive life history has been molded by geologic uplift, alternating ice ages and flooding, while their ecosystems have grown reliant on their regular return to natal streams. Few life histories are as bizarrely complex as the salmon's, involving upstream journeys of hundreds or thousands of miles, the miraculous ability to survive in both fresh- and saltwater, and an impeccable sense of direction and timing that is somehow imprinted on each individual and unmatched by most other organisms. It is no surprise that this unique organism has supported great Native American societies, complicated ecosystems, and modern commercial fisheries.

The genus *Oncorhynchus* comprises the Pacific salmon and trout. Within the genus there are seven species of Pacific salmon.[5] Five are found in the Western Pacific and North America: chum (*O. keta*), chinook (*O. tshawytscha*), pink (*O. gorbuscha*), sockeye (*O. nerka*), and coho (*O. kisutch*).[6] Two are found exclusively in the Eastern Pacific and Asia: masu (*O. masou*) and amago (*O. rhodurus*).[7] In addition, sea-runs of trout also fall within *Oncorhynchus*: the famous steelhead (*O. mykiss*) and cutthroat (*O. clarkii*).[8]

1. The Life History of Salmon

Pacific salmonids are anadromous, spending their first and final days in freshwater and usually migrating to saltwater for a period of time in between. Salmon begin their lives in the gravels of cold, fresh streams, where nutrients are less plentiful but predation pressures are significantly lower than in the ocean.[9] Juveniles spend a few months to a few years in their native streams

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[5] For the purposes of this Article, the discussion is limited to Pacific salmonids. However, Atlantic salmon (genus *Salmo*) is an equally important species, the management of which touches on many of the same conflicts. Further, I have limited most discussion to Pacific Northwest salmon in Washington, Oregon, California, and Idaho ("WOCI"), simply to limit the complexities. Pacific salmonids range throughout the North Pacific, utilizing freshwater streams as far south as Mexico in the Eastern Pacific and Japan and South Korea in the Western Pacific. Indeed, Japan releases more hatchery fish than any other country. XANTHIPPE AUGEROT, ATLAS OF PACIFIC SALMON: THE FIRST MAP-BASED STATUS ASSESSMENT OF SALMON IN THE NORTH PACIFIC 34-35 (2005) (noting that ninety-five percent of salmon in Japan are hatchery derived while eighty percent are in WOCI). Moreover, WOCI represents the highest concentration of high-risk stocks. *Id.* at 66. Finally, there are a number species, not discussed here, within the genus that are not anadramous or are extinct. These include the Mexican Golden Trout, Gila Trout, and the Apache Trout. AUGEROT, *supra*, at 3-4.

[6] JIM LICHATOWICH, SALMON WITHOUT RIVERS: A HISTORY OF THE PACIFIC SALMON CRISIS 9 (1999).

[7] *Id.*

[8] *Id.*

[9] *Id.* at 11-12. Lichatowich notes that "[i]n northern latitudes, the oceans are more productive than the adjacent fresh waters, but in southern latitudes[, where catadromous fishes which breed at sea and migrate to freshwater to feed,] the reverse is true." *Id.* at 12. Biologists believe this was a significant factor in the evolution of anadromy in salmon. *Id.*

before migrating to the sea in search of food between April and July.[10] Migration is a perilous time for salmon and eighty to ninety percent of salmon fry perish from predation alone, providing vital food and nutrients to the ecosystems that have evolved around their natal streams.[11]

Once they reach brackish water, all species of salmon spend critical time in estuaries adapting from fresh- to saltwater. The salmon then enter the sea, where they will spend several months to several years traveling to feeding grounds and growing to maturity.[12] Some pink salmon travel over 2,000 miles in just one year while chum can travel over 10,000 miles in the several years they spend at sea.[13]

Different species of *Oncorhynchus* reach sexual maturity at profoundly different times, and thus return to freshwater at various times of the year.[14] Even within species and Evolutionarily Significant Units ("ESUs"),[15] unique runs return to streams at different times of year, hedging their genetic bets for long-term survival in a diverse ecosystem through heterogeneous life histories.[16] Some species produce very young males that return to their streams within a year while most return after two to five.[17] Regardless of the timing, all salmonids return to their native streams after what is sometimes thousands of miles of traveling up and down the coasts. Some may travel as far as 1,000 miles to their breeding grounds, while others stay very close to the coasts.[18] Once they return to their native streams, often after eating nothing during the

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[10] MICHAEL C. BLUMM, SACRIFICING THE SALMON: A LEGAL AND POLICY HISTORY OF THE DECLINE OF COLUMBIA BASIN SALMON 31-40 (2002). The timing of migration and length of time spent in streams, freshwater nurseries, estuaries, and the sea varies drastically between species. For detailed specifics of the life history of each of the North American salmonids (salmon and trout), see LICHATOWICH, *supra* note 6, at 233 app. B.

[11] BLUMM, *supra* note 10, at 35. "Fry" is the biologists term for the life stage after alevin emerge from the gravel redd and before they begin their migration to the sea as juveniles. AUGEROT, *supra* note 5, at 4-5. Starvation and disease are also substantial factors in fry and juvenile salmon mortality, as are dams. BLUMM, *supra* note 10, at 34-35.

[12] BLUMM, *supra* note 10, at 35.

[13] ANTHONY NETBOY, SALMON: THE WORLD'S MOST HARASSED FISH 33 (1980).

[14] BLUMM, *supra* note 10, at 35-40. Salmon runs are named by the time of their return to native streams: Spring, Summer, Fall, and Winter. *See generally* LICHATOWICH, *supra* note 6, at 233 app. B (cataloguing different life histories of the seven North American salmonids)

[15] The ESU concept is a sub-species unit that reflects the unique life history of salmon runs. *See* discussion *infra* Parts I.A.2, I.D.1, I.D.3.

[16] "In undisturbed rivers, each salmon population is composed of a bundle of several life histories, or several alternative survival strategies. Unlike the salmon raised in a hatchery environment, with its feedlot regime, the salmon in a healthy river do not all do the same thing in the same place at the same time. As the riverscape changes due to natural disturbances . . . some of the salmon's life histories are in survival peaks, while others drop into troughs." LICHATOWICH, *supra* note 6, at 79.

[17] *Id.* at 22.

[18] The Amur and Yukon River runs of chum salmon migrate 1,560 miles from the sea. LICHATOWICH, *supra* note 6, at 22. *See also id.* at 233 app. B (cataloguing different life histories of the seven North American salmonids).

trip, salmon mate and usually die soon after, becoming a vital source of protein and nutrients for local predators and their associated river and forest ecosystems.[19]

This peculiar and remarkable life history is a major reason why salmon are so important, both to their native ecosystems, which rely on the return migration to bring needed nutrients inland, and to humans, who rely on their predictable ocean migrations for commercial and subsistence benefits. Because much of this life history is shrouded in mystery, the hatchery problem is significantly more complex than simply replacing wild with hatchery-reared fish. Among the questions that remain unanswered are: where salmon travel while at sea, why and how they determine to leave their streams and return, and how they know where to go during each phase of their migrations. Because of this uncertainty, and the inadequate ability of hatchery salmon to perfectly mimic it, NMFS has long struggled to determine how best to protect salmon under the ESA.

2. Salmon Genetics and the Stock Concept

The Pacific salmon (*Oncorhynchus*) likely diverged from their Atlantic cousins (*Salmo*) between four and twenty million years ago when the Pacific and Atlantic oceans became separated by a land connection between Eurasia and North America.[20] Fossil evidence suggests the land bridge opened and ancestors of pink, sockeye, and chum ventured to Iceland around six million years ago. Scientists therefore deduce that the Pacific salmonids must have diverged between six and twenty million years ago, starting with the Mexican golden trout.[21]

Because of their unique life histories, salmon posed a special problem to traditional biological systematics. When the Pacific salmon diverged, they began a process of speciation that would produce at least thirteen extant species according to a 1992 study.[22] Today, seven are recognized in the Eastern Pacific. The consistent return to natal streams complicates easy classification because there is often little interbreeding between different runs within each species.[23] To deal with this problem, biologists introduced the stock concept, recognizing that even though traditionally defined as one large species, there can be substantial differences between salmon in different rivers. However, these

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[19] *Id.* at 22. Steelhead trout, and possibly *O. masou*, are the outliers in this equation, often continuing to eat after their return to freshwater and sometimes migrating to the ocean and back to spawn more than once. AUGEROT, *supra* note 5, at 4.

[20] J.D. McPhail, *The Origin and Speciation of* Oncorhynchus *Revisited, in* PACIFIC SALMON & THEIR ECOSYSTEMS: STATUS AND FUTURE OPTIONS 31-32 (Deanna J. Stouder, Peter A. Bisson & Robert J. Naiman eds., 1997).

[21] *Id.* at 32-33.

[22] *Id.* at 32. Most agree that today there are nine species within *Oncorhynchus*, with four of the species (the redband, Apache, Gila, and golden trouts) uncertain. *Id.*

[23] BLUMM, *supra* note 10, at 41-43.

differences, while many, are often too subtle to allow for classification as sub-species.[24] The stock concept views salmon as small groups of interbreeding fish, reproductively isolated from other fish of the same species, even though they are, for the most part, genetically indistinct from the other stocks within their species.[25] Over the course of several years in the middle twentieth century, informed largely by salmon's instinctive homing to natal streams, scientists constructed the theory that species can be further divided into distinct, smaller, local populations.[26] That theory has in turn given rise to the Evolutionarily Significant Unit ("ESU") policy promulgated by NMFS.[27]

It is important to keep in mind Jim Lichatowich's elegant observation that, though we now classify salmon by population, life history, and genetic diversity, it is inherently difficult to place salmon into generic categories because, within each population, salmon "ha[ve] developed a rich diversity in response to local habitat."[28] The stock concept is our best attempt at classifying salmon for management purposes, considering their genetic lineage as well as their habitat use and reproductive timing. But the stock concept is not exact. Using the Sacramento River Winter-Run steelhead ESU, an independent stock, as an example, some fish may return to breed in early December while others begin the same journey in late January. These two groups potentially may be quite distinct, having significantly different average reproductive fitness or offspring size as a result of stream conditions during spawning. Such differences won't be accounted for by the current stock concept. Nevertheless, further subdivision of salmon into even smaller stocks or sub-ESUs would hardly make the management process any less complicated than it already is.

B. Salmon Hatcheries

Soon after humans settled in the Pacific Northwest, salmon became as integral an element of the human economy as it had been in nature's economy for millennia.[29] Over time, Native Americans of the Pacific Northwest adapted their harvest practices, learning how the salmon's life history was an integral element

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[24] Richard N. Williams, James A. Lichatowich, & Madison A. Powell, *Diversity, Structure, and Status of Salmon Populations*, *in* RETURN TO THE RIVER, *supra* note 4, at 101-02.

[25] *Id.*

[26] *Id.* at 103.

[27] *See* discussion *infra* Parts I.D.1, I.D.3.

[28] BLUMM, *supra* note 10, at 41; *see also supra* note 16 and accompanying text (noting how such diversity is a strategy for long-term survival).

[29] Indigenous people and salmon have coexisted in the salmon's North Pacific range for millennia. AUGEROT, *supra* note 5, at 18-19. Augerot keenly surveys the anthropological connections and offers a strong argument for indigenous people's coevolution with salmon. *Id.* at 20-21 (showing near perfect overlap of Southern Oregon-Northern California Coho Salmon ESU with Klamath-Siskyou forest ecoregion and Northwestern California core cultural province of indigenous North Americans).

for sustainable harvest and implementing catch and seasonal limits.[30] Jim Lichatowich argues that Native American harvest management was sustainable for 1,500 to 4,000 years, enabling their societies to live within the carrying capacity without overharvesting.[31] European settlement in the area quickly put an end to that sustainable relationship. As the perfect storm of an industrialized salmon fishery, increased timber harvests, and rampant dam construction coalesced in the nineteenth and twentieth centuries, salmon stocks were rapidly devastated.[32]

To cope with severely declining stocks, hatcheries were identified as the cure for the human folly of overexploitation. Rudimentary attempts at salmon cultivation and experiments in captive spawning, largely informed by the principles and experiences of terrestrial agriculture, began to appear around the world in the 1830s and 1840s.[33] By 1870, American fishermen in New England had begun to import large numbers of artificially propagated salmon eggs from Canada.[34] Oregon began construction of a major hatchery at Bonneville in 1909, by which time there were hundreds of hatcheries in the Pacific Northwest.[35] Not surprisingly, very little thought was put into the unique and specialized life histories of individual species and stocks of salmon.[36] Managers routinely transferred eggs, not only between rivers up and down the Pacific coast, but also, using special freight cars, between coasts, transferring Pacific salmon eggs to the East coast and bringing Atlantic salmon eggs back in return.[37]

Sadly, the widespread use of hatcheries did nothing to stem the continuing decline of salmon, which were beginning "a century-long slide toward depletion, regional crisis, and extinction."[38] Eventually, managers changed their focus and began to consider biology more closely in managing the hatcheries. They began to stock only species that naturally spawned in the rivers where the hatcheries were located and released salmon only at times the fish normally began their migration. There was at least a rudimentary understanding that salmon needed

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[30] LICHATOWICH, *supra* note 6, at 37.

[31] *Id.* at 37-40. This is not to say that the indigenous North Americans were perfect. Lichatowich notes that archaeologists have uncovered evidence of management mistakes in Alaska. *Id.* at 39. However, he argues that the indigenous cultures learned from these mistakes, for example, by adapting when they saw sea urchins destroy kelp forests after overharvesting otters. *Id.* at 39-40.

[32] AUGEROT, *supra* note 5, at 34.

[33] LICHATOWICH, *supra* note 6, at 114-17 (noting that French, Scottish, Canadian, and American efforts at cultivating salmon occurred simultaneously during the nineteenth century).

[34] *Id.* at 120-21.

[35] *Id.* at 126-29.

[36] Of course, neither the ESU nor the stock concept had even been conceived of yet. *See* discussion *supra* Part I.A.2 and *infra* Part I.D.1.

[37] LICHATOWICH, *supra* note 6, at 124-26. Lichatowich notes that "the transfer of eggs among hatcheries in order to keep all the ponds filled to capacity was a particularly insidious practice [in 1877] that became common and is still practiced today." *Id.* at 125.

[38] *Id.* at 152.

to be imprinted with time, place, and habitat memories if they were to become part of their ecosystem.[39]

Hatcheries generally operate by capturing salmon as they return to spawn.[40] Once captured, managers collect egg and sperm and combine them to create fertilized eggs. Those eggs are then carefully cultivated and incubated until the salmon fry emerge.[41] The juvenile salmon spend between a few months to over a year in holding tanks as they grow to a size at which their wild cousins would normally return to the ocean. Those fish are then released to the river to begin their migration to the ocean.[42] Ideally, the fish then return to the same stream, though this does not occur nearly as much as managers would like.

Today, hatcheries continue to play a major role in salmon management, releasing over five billion salmon fry into the North Pacific ecosystem every year.[43] Over 1.2 billion are released into the Pacific Northwest alone.[44] Eighty percent of the salmon harvest in Washington, Oregon, California, and Idaho is hatchery derived.[45] Hatcheries have long been seen as a boon to salmon fishing and, more recently, as a possible conservation tool to protect and enhance severely threatened stocks.[46] In theory, hatcheries provide a safe harbor from predation, reduce harvest pressures on wild populations, offset natural losses, and, ideally, help improve biodiversity.

Unfortunately, notwithstanding their extensive and continued use, hatcheries may not provide the cure-all many once hoped they would. Despite an increase in hatchery releases, from 79 million to 200 million since 1960, both commercial landings and returning salmon have steadily decreased in that time, down to as low as ten percent of historical levels.[47] In a 1991 survey of U.S. West Coast salmon, scientists found that most chum, pink, and coho stocks are now extinct and identified at least sixty-nine extinct stocks and seventy-six others at risk of extinction in the Columbia River basin alone.[48] Present day

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[39] *See generally id.* at 156-69 (discussing scientific understanding among hatchery managers in early nineteenth century)

[40] NOAA Fisheries, Northwest Fisheries Science Center, Salmon Hatchery Questions and Answers, http://www.nwfsc.noaa.gov/resources/search_faq.cfm?faqmaincatid=3 (last visited Mar. 9, 2009).

[41] *Id.*

[42] *Id.*

[43] AUGEROT, *supra* note 5, at 34-35.

[44] Phillip S. Levin & John G. Williams, *Interspecific Effects of Artificially Propagated Fish: An Additional Conservation Risk for Salmon*, 16 CONS. BIO. 1581, 1581 (2002). 200 million salmon are released annually into the Columbia River watershed alone. *Id.* "80% of remnant runs of adult salmon and steelhead entering the Columbia River were hatched and reared in a hatchery." James A. Lichatowich et. al., *Artificial Production and the Effects of Fish Culture on Native Salmonids, in* RETURN TO THE RIVER, *supra* note 4, at 418-19.

[45] AUGEROT, *supra* note 5, at 34-35. Recent research suggests that

[46] Lichatowich et al., *supra* note 44, at 422-29.

[47] *Id.* at 440.

[48] Willa Nehlsen, Jack E. Williams & James A. Lichatowich, *Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho and Washington*, 16 FISHERIES 4, 11,

abundance of wild stocks in the Columbia River Basin is around one to two percent of historical populations.[49] Clearly, something isn't working in the hatchery or even the general restoration programs.

Regardless of their shortcomings, hatcheries are a substantial, if not central, element in restoration programs for West Coast salmon. While hatcheries have been used for well over a century now, our understanding of their genetic, behavioral, and ecological impacts on wild salmon, as well as their effect on commercial fisheries, has been slow to develop and is woefully uncertain. A large body of work has developed in the last two decades chronicling these impacts, leading to serious doubts about the benefits of hatchery salmon.

The potential problems posed by hatchery salmon are manifold, but generally fall into two categories: (1) genetic, behavioral, and morphological concerns about hatchery salmon that call into question their ability to supplement wild populations and beneficially interact with wild salmon; and (2) genetic impacts on wild salmon due to interbreeding. All of these impacts are relevant in assessing the role of hatchery salmon in assisting population recovery of threatened and endangered wild salmon. A number of recent studies have surveyed the scientific literature and concluded that, on the whole, hatchery salmon pose significant threats to the restoration goals of the ESA.

Robin Waples observed, in his seminal paper on hatchery "myths," that hatcheries are neither absolutely good nor absolutely bad. Rather, the analysis of their relative benefits and costs depends on the framing questions we ask and the purposes we intend to put those hatcheries to.[50] Keeping in mind Waples's warning that evidence of adverse impacts has been overstated at times,[51] recent scientific research suggests that, as applied to conservation goals, hatchery salmon perform significantly worse than wild salmon in natural ecosystems.[52] Hatchery salmon enter a stream on release having spent their initial months or years in a carefully controlled environment devoid of the natural pressures and cues of their natal stream. This causes significant behavioral, morphological, and life history differences[53] that result in hatchery salmon that are less reproductively fit than wild salmon.[54] Hatchery salmon have been found to be

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13-17 (No. 2 1991).

[49] Independent Scientific Group, *Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem* (Northwest Power Planning Council, Portland, Oregon) (2000).

[50] Robin S. Waples, *Dispelling Some Myths About Hatcheries*, 24 FISHERIES 12, 13 (1999).

[51] *Id.* at 12-13.

[52] *See generally* Ian A. Fleming & Erik Petersson, *The Ability of Released, Hatchery Salmonids to Breed and Contribute to the Natural Productivity of Wild Populations*, 75 NORDIC J. FRESHWATER RES. 71 (2001); Kathryn E. Kostow, *Differences in Juvenile Phenotypes and Survival Between Hatchery Stocks and a Natural Population Provide Evidence for Modified Selection Due to Captive Breeding*, 61 CAN. J. FISHERIES & AQUATIC SCI. 577 (2004); R. R. Reisenbichler & S. P. Rubin, *Genetic Changes from Artificial Propagation of Pacific Salmon Affect the Productivity and Viability of Supplemented Populations*, 56 ICES J. MARINE SCI. 459 (1999).

[53] Kostow, *supra* note 52, at 580-85.

[54] Fleming & Petersson, *supra* note 52, at 71.

both heavier and longer, enter and leave saltwater much earlier, and may be less afraid of natural predators than wild salmon.[55] The result is a fish that is less genetically diverse within its population (hatchery salmon seem to exhibit less divergence from each other in life history traits than wild salmon do), which may make it less reproductively fit. These differences led two authors to conclude that hatchery salmon "frequently fail to attain self-sustainability and/or contribute significantly to [wild] populations."[56]

Compounding the decline in reproductive fitness and survival rates found in previous studies, a recent study found that repetitive captive breeding may have devastating effects on a population.[57] Taking returning captive bred fish (hatchery-reared fish born from two wild parents), breeding them with wild fish (resulting in a second-generation captive-reared fish with four wild grandparents but only one captive-reared parent), and comparing them with captive reared fish from two wild parents, the authors found a forty-five percent decline in reproductive success in the second generation captive-reared fish.[58] The authors concluded that a 37.5% fitness decline accompanies each captive-reared generation, suggesting a substantial positive feedback loop from repetitive captive breeding.[59] The proposed causes of such declines included unintentional domestication selection and the absence of natural selection pressures on the captive-reared fish.[60]

Hatchery fish may experience significant domestication selection for traits associated with the hatchery environment such as increased competitiveness, aggressive behavior, fast burst swimming, and reduced response to natural predation pressures.[61] Hatchery salmon thus may be very well adapted to the hatchery environment, but unprepared for success in the wild. They have been found to exhibit less distinct secondary sexual traits and bodies that are less functional for wild reproduction.[62] The result is a less reproductively fit organism on which we have gambled most of our conservation resources in order to save a fitter and better-adapted organism from extinction.

The potential problems with hatchery salmon extend beyond their seemingly poor ability to reproduce in the wild, and therefore to supplement wild populations. Hatchery salmon pose an additional potential threat via their impacts on wild salmon, both through interaction and reproduction with wild fish. Because of the domestication selection pressures on hatchery salmon

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[55] Kostow, *supra* note 52, at 580-83; Reisenbichler & Rubin, *supra* note 52, at 460.

[56] Fleming & Petersson, *supra* note 52, at 71.

[57] Hitoshi Araki, Becky Cooper & Michael S. Blouin, *Genetic Effects of Captive Breeding Cause a Rapid, Cumulative Fitness Decline in the Wild*, 318 SCIENCE 100, 100-03 (2007).

[58] *Id.* at 101.

[59] *Id.* at 102.

[60] *Id.*

[61] D. E. Campton, *Genetic Effects of Hatchery Fish on Wild Populations of Pacific Salmon and Steelhead: What Do We Really Know?*, 15 AM. FISHERIES SOCIETY SYMPOSIUM 337, 338 (1995).

[62] Fleming & Petersson, *supra* note 52, at 82.

discussed above, they enter streams looking and behaving differently from their wild cousins.[63] Because of this, hatchery salmon can outcompete wild salmon for scarce resources, alter wild salmon's behavior because of their presence, and even have been found eating wild salmon fry. Potentially aggravating such effects, "gene swamping," which occurs when a large number of hatchery fish enter a stream with far fewer wild fish, can potentially drive wild salmon to extinction as hatchery salmon adapt to "novel habitat" and simply outreproduce the wild salmon.[64]

Hatchery salmon also pose a threat to wild salmon when they interbreed, creating hybrids of hatchery-adapted and wild-adapted fish. Research suggests that these offspring are also less reproductively fit than wild fish and tend to experience substantially increased mortality.[65] Additionally, the hybridization can lead to losses in genetic diversity within the populations, leading to homogenization of the stock, and a resulting decline in reproductive performance in subsequent generations.[66] Finally, hatchery salmon can have indirect genetic effects on wild salmon, resulting from behavioral, morphological, or reproductive differences. Differences in run timing, size at maturity, competitiveness, even selective fishing pressure for larger fish can have negative effects on long-term salmon populations by shifting mean character values downwards.[67]

The current body of research is not entirely conclusive, but most studies suggest substantial effects of hatchery salmon on wild salmon, many of them potentially negative. These changes may prove detrimental to the long-term survival of the species, through reductions in reproductive fitness, loss of diversity, and competition. Worse, a positive-feedback loop may be created, with losses in reproductive fitness and diversity leading to further declines in salmon populations leading to associated declines in river habitat from the loss of nutrients, all compounded by the effect of repetitive hatchery reproduction.

In its 2005 report to NMFS, an independent panel of scientists recognized that hatchery fish will likely play an important role in the restoration of wild

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63 *See supra* note 61 and accompanying text.

64 *See* INDEPENDENT PANEL REPORT FOR NOAA FISHERIES, CONSIDERING LIFE HISTORY, BEHAVIORAL, AND ECOLOGICAL COMPLEXITY IN DEFINING CONSERVATION UNITS FOR PACIFIC SALMON, 10-11 (2005) [hereinafter INDEPENDENT PANEL REPORT], *available at* http://www.nwfsc.noaa.gov/trt/regarding_salmon_esus.pdf. (last visited Mar. 9, 2009). The panel of scientists and conservationists, convened in light of the ESU and Hatchery policies, surveyed the literature in investigating the role of non-genetic considerations in defining salmon conservation units.

65 Mark Chilcote, *Relationship Between Natural Productivity and the Frequency of Wild Fish in Mixed Spawning Populations of Wild and Hatchery Steelhead (*Oncorhynchus mykiss*)*, 60 CAN. J. FISHERIES & AQUATIC SCI. 1057, 1060 (2003); Fleming & Petersson, *supra* note 52, at 82; Kostow, *supra* note 52, at 580-83; Lichatowich et al., *supra* note 44, at 447.

66 Robin S. Waples, *Genetic Interactions Between Hatchery and Wild Salmonids: Lessons from the Pacific Northwest,* 48 CAN. J. FISHERIES & AQUATIC SCI. 124, 125 (Supp. 1 1991).

67 Lichatowich et al., *supra* note 44, at 448-50.

populations, especially in cases where habitat restoration is not sufficient and hatcheries can be managed very carefully.[68] However, the panel noted that hatchery conditions are not the same as wild streams, and suggested that proper management should mean integrating hatcheries into natal streams to avoid the problems created by domestication selection.[69] Implicitly recognizing that current hatcheries are not good enough, the panel stated: "as the boundary between artificial propagation and habitat improvement/restoration blurs . . . then the situation can be reevaluated."[70] This statement concisely captures the challenge that arises when hatchery fish intersect with the Endangered Species Act.

C. The Endangered Species Act

The Endangered Species Act, like many major American environmental laws, is a product of the environmental law "renaissance" of the late 1960s and 1970s.[71] Of those statutes, however, the ESA is unique, forgoing the medium-focus of the Clean Water or Clean Air Acts in favor of protecting species by expanding its scope to ensure that entire ecosystems stay healthy and intact.[72] The ESA is an extraordinary law that comprehensively and aggressively protects species and ecosystems and allows for little discretion in decision-making.[73] Perhaps the most surprising aspect of the ESA is that its first purpose is to

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[68] INDEPENDENT PANEL REPORT, *supra* note 64, at 11.

[69] *Id.*

[70] *Id.*

[71] Pub. L. No. 93-205, 87 Stat. 884 (codified as amended at 16 U.S.C. §§ 1531-1544 (2006)); *see, e.g.*, Donald C. Baur & William Robert Irvin, Overview to ENDANGERED SPECIES ACT: LAW, POLICY, AND PERSPECTIVES, at xi (Donald C. Baur & William Robert Irvin eds., 2002); *see also* Reorganization Plan No. 3 of 1970, 50 Fed. Reg. 26,721-01 (June 28, 1985), *reprinted in* 5 U.S.C. App. 1 Reorg. Plan 3 1970 (establishing the Environmental Protection Agency). *See generally* Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1421(h) (2006) (prohibiting taking of marine mammals in most circumstances); National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370(f) (2006) (requiring federal agencies to consider environmental impacts before making final decisions); Clean Air Act, 42 U.S.C. §§ 7401-7671(r) (2006) (creating federal program to reduce air pollution).

[72] 16 U.S.C. § 1531(a), (b) (2006); *see also* Brian E. Gray, *The Endangered Species Act: Reform Or Refutation?*, 13 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 1, 1-5 (2007) (noting unique circumstances surrounding passage of ESA, extraordinary breadth and depth of protection act aspires to provide, and differences from other statutes).

[73] 16 U.S.C. § 1533(a) (listing determinations "shall by regulation [be] promulgated" when any of a number of factors are present); § 1532(6) (endangered species "means any species which is in danger of extinction throughout all or a significant portion of its range"). *But see* § 1539 (listing exceptions that allow for various individuals and agencies to violate terms of ESA); 1536(e)-(o) (creating "Endangered Species Committee," otherwise known as "god squad" which can grant exemptions for proscribed conduct). The "god squad" has only convened three times, however, refusing to grant an exemption in the Snail Darter case, granting a limited exemption that was overturned by the incoming Clinton administration in the Northern Spotted Owl controversy, and granting a contingent exemption to a dam that would harm the Whooping Crane. *See* CONG. RESEARCH SERV., THE ENDANGERED SPECIES ACT: A PRIMER 24-25 (2006), *available at* http://www.ncseonline.org/NLE/CRSreports/06Oct/RL31654.pdf (last visited Mar. 27, 2009)

protect ecosystems, and only then to protect species.[74] This mandate reflects an unusual prescience on Congress's part in recognizing the root causes of, and solutions to, extinction risk.[75]

There are at least five substantive Sections that give the ESA teeth: Sections 4 (setting criteria for listing decisions and critical habitat designations), 7 (mandating federal agency consultation), 9 (prohibiting "taking" of species), 10 (listing exceptions and exemptions), and 11 (detailing civil and criminal penalties).[76] Section 4 is most pertinent in the hatchery salmon context. That section sets out listing procedures and governs recovery plans for threatened and endangered species.[77] Under the listing process, the Secretary[78] must determine whether any species is endangered or threatened "throughout all or a significant portion of its range."[79] The ESA lays out several factors that may cause a species to become endangered or threatened, including harm to its habitat, overutilization, disease and predation, failures of existing regulatory mechanisms, and "other natural or manmade factors affecting its continued existence."[80]

With respect to the listing decision, the ESA mandates that all such decisions be made "solely on the basis of the best scientific and commercial data available."[81] This language is entirely unique even within the ESA; other sections explicitly allow the consideration of other data, such as economic impacts.[82] As a result, the ESA listing process is controlled by a profound mandate for science, reflecting the congressional intent that listing decisions be unclouded by any "totality of the circumstances" type tests, which often allow lobbying efforts by interested parties to influence decision-making.[83] Scholars agree that that use of the phrase "commercial data" was never meant to include

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74 16 U.S.C. § 1531(b) ("The purposes of this Act are to provide a means whereby the *ecosystems* upon which endangered species depend may be conserved, to provide a program for the conservation of such *endangered species and threatened species* . . . .") (emphasis added).

75 *See* Baur & Irvin, *supra* note 71, at xiii.

76 16 U.S.C. §§ 1533, 1536, 1538, 1539, 1540 (2006). Of course, the other sections of the Act are not superfluous; however, the five described are arguably the most significant.

77 16 U.S.C. § 1533 ("Determination of Endangered Species and Threatened Species").

78 *See* 16 U.S.C. § 1532(15). For anadramous salmonids and all marine species, the relevant agency is NOAA Fisheries, formerly NMFS, and "the Secretary" is the Secretary of Commerce. For resident rainbow trout and all other terrestrial species, the relevant agency is the U.S. Fish and Wildlife Service, and therefore "the Secretary" is the Secretary of Interior. *Id.*

79 §§ 1532(6), (20), 1533(a)(1).

80 § 1533(a)(1).

81 § 1533(b)(1)(A).

82 *E.g.*, § 1533(b)(2) ("The Secretary shall designate critical habitat . . . on the basis of the best scientific data available *and* after taking into consideration economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat.") (emphasis added); *see also* Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH U. L.Q. 1029, 1051-56 (1997).

83 *See generally* Doremus, *supra* note 82. Doremus notes that, in the ESA, Congress equated "science" with "biology," seeing "biological information" as the same as scientific data. *Id.* at 1056.

economic impacts or to displace the science mandate but rather reflected Congress's desire to use commercially available data and data on "the impact of commercial trade on species."[84]

Once a species has been listed as either endangered (at risk of extinction) or threatened (at risk of becoming endangered), the Secretary must list critical habitat for that species.[85] The Secretary must also periodically publish lists of all the endangered or threatened species and review those listings at least once every five years.[86] The Secretary may also move to protect any species that is not listed but that so closely resembles a listed species that the listed species would be imperiled by the lack of protection for the similarly appearing species.[87] Finally, the Secretary and relevant agency must create recovery and monitoring plans for the listed species.[88]

Giving rise to the salmon conflict, the ESA defines "species" to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."[89] Because the term "distinct population segment" ("DPS") has no scientific meaning, and was never defined in the Act, it fell on NMFS to define it for the purposes of salmon in 1991.

D. Round 1: The 1991 ESU Policy, 1993 Hatchery Policy, and 1996 Joint DPS Policy

1. The 1991 ESU Policy: Harmonizing the ESA with Salmon's Unique Life History

In 1991, in response to petitions to list a number of stocks of Pacific salmon under the ESA, NMFS was obliged to determine how salmon fit into the definition of "species" in the ESA and the undefined "distinct population segment."[90] Because salmon tend to stay within and return to their natal streams, the DPS concept seemed a good fit for protecting salmon. Developing the stock concept further, the 1991 ESU Policy reflected the agency's determination that a salmon stock or run would qualify as a DPS if it was an "Evolutionarily Significant Unit" of that species.[91] To qualify as an ESU, a

[84] *Id.* at 1043; *see also* Andrew Long, *Defining the "Nature" Protected by the Endangered Species Act: Lessons From Hatchery Salmon*, 15 N.Y.U. ENVTL. L. J. 420, 424 & n.7 (2007).

[85] 16 U.S.C. § 1533(a)(3), (b)(2) (2006).

[86] § 1533(c).

[87] § 1533(e).

[88] § 1533(f), (g).

[89] § 1532(16).

[90] Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon, 56 Fed. Reg. 58,612 (Nov. 20, 1991) [hereinafter ESU Policy].

[91] *Id.* at 58,618.

stock must (1) be "substantially reproductively isolated from other conspecific[92] population units" and (2) "represent an important component in the evolutionary legacy of the species."[93]

NMFS clarified the two criteria, noting that substantial isolation was not absolute, but that isolation had to be "strong enough to permit evolutionarily important differences to accrue in different population units."[94] NMFS defined "evolutionary legacy" as the genetic variability produced by a species' evolutionary history which represents "the reservoir upon which future evolutionary potential depends."[95] NMFS could now list populations of the same species that ran in isolated river systems, reflecting the fact that those populations did very little to further the other's genetic legacy and therefore deserve separate and unique protection.

The new policy revealed NMFS's determination that genetic heritage would be the keystone factor in a listing determination. A salmon stock will qualify as an ESU, then, if the population is genetically distinct from other conspecific populations, occupies unusual or distinctive habitat, or shows evidence of unusual or distinctive adaptation to its environment.[96]

Under its ESU Policy, NMFS has identified fifty-two independent ESUs from six salmon species in Washington, Oregon, California, and Idaho.[97] Of those fifty-two, twenty-five were listed as threatened or endangered at the time the 2005 Hatchery Listing Policy was promulgated.[98]

2. The 1993 Interim Hatchery Policy: Wild Salmon and the Hatchery Component

The ESU Policy was not a sufficient guide for determination of the role, if any, of hatchery fish in ESA listing decisions. Thus, NMFS issued an interim policy ("1993 Hatchery Policy") to address the role of hatchery salmon in Pacific salmon stocks.[99] Reflecting the scientific uncertainty and doubt regarding the benefits of hatchery salmon, as well as additional factors behind

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92 Conspecific means an organism belonging to the same species as another organism. THE AMERICAN HERITAGE DICTIONARY (2006). Thus, two stocks of the same species of salmon that run in different river systems would be conspecific population units that are reproductively isolated from each other.

93 ESU Policy, *supra* note 90, at 58,618.

94 *Id.*

95 *Id.*

96 *Id.*

97 Policy on the Consideration of Hatchery-Origin Fish in Endangered Species Act Listing Determinations for Pacific Salmon and Steelhead, 70 Fed. Reg. 37,204, 37,205 (June 28, 2005) [hereinafter Hatchery Listing Policy]. This paper emphasizes Washington, Oregon, California, and Idaho ESUs because this ecoregion comprises some of the most threatened ESUs and is one of the most studied. *See* AUGEROT, *supra* note 5, at 34-35.

98 Hatchery Listing Policy, *supra* note 97, at 37,205.

99 Interim Policy on Artificial Propagation of Pacific Salmon Under the Endangered Species Act, 58 Fed. Reg. 17,573 (Apr. 5, 1993).

the salmon's decline in the Pacific, NMFS rejected the idea of hatchery salmon playing a major role in listing determinations and recovery efforts. The 1993 Hatchery Policy noted that habitat loss, dam construction, and water use conflicts were the most significant problems affecting the survival of salmon. The policy also addressed the serious potential for ecological and genetic harm to wild salmon stocks from hatchery fish and the possibility that hatchery salmon could pose a threat to the recovery of endangered and threatened salmon.[100]

NMFS recognized that the ESA envisions "the restoration of threatened and endangered species in their natural habitats to a level at which they can sustain themselves without further legal protection."[101] The 1993 Hatchery Policy envisions a very limited role for hatchery salmon, allowing for their consideration in listing decisions only to the extent that they meet the criteria stated in the ESU policy and their use promotes the principal tenet of the ESA: to enable a species to recover and become *self-sustaining*.[102] NMFS articulated a three-part test to determine when hatchery fish may be counted as part of a biological ESU: If "(1) the hatchery population is of a different genetic lineage than 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," then hatchery fish will not be counted in an ESU.[103]

Even if a hatchery stock may be considered part of the same ESU as a wild stock, the presumption would still be against counting hatchery salmon as part of a listed ESU unless they are deemed essential to the recovery of the ESU.[104] NMFS counseled that hatchery salmon could be included as part of a listed ESU only if an objective assessment, balancing the genetic and ecological risks and threats to the sustainability of natural populations against the potential benefits of hatchery salmon, shows that the hatchery salmon are necessary for recovery. Examples of such a situation would be when the natural population faces an acute and significant risk of extinction or hatchery salmon are needed to protect the "reservoir" on which future genetic diversity and sustainability depend.[105] Offspring of hatchery salmon of the listed ESU would still be part of the listed ESU under all circumstances.[106]

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100 *Id.*

101 *Id.*

102 *Id.* at 17,575.

103 *Id.*

104 *Id.*

105 *Id.*

106 *Id.*

3. The 1996 Joint DPS Policy: Addressing Discrete Populations Beyond Salmon

Because NMFS has jurisdiction over marine and anadromous species while the U.S. Fish and Wildlife Service ("USFWS") has jurisdiction over terrestrial species and freshwater fish, the two agencies issued a joint policy in 1996 ("Joint DPS Policy") to clarify the meaning of "distinct population segment," which has no independent meaning in science or under the ESA.[107] The Joint DPS Policy affirms and extends the earlier ESU policy, discussing the application of the theory to other species. In identifying a DPS for ESA purposes, the policy directs that the agency should consider three elements: "(1) [The d]iscreteness of the population segment in relation to the remainder of the species to which it belongs; (2) The significance of the population segment to the species to which it belongs; [and] (3) The population segment's conservation status in relation to the Act's standards for listing."[108]

The Joint DPS Policy asks whether a population does not significantly overlap with another of the same species, whether that population is important to the species' genetic legacy, and whether the DPS would be endangered or threatened if it were listed alone. Accordingly, as under the ESU policy, NMFS and USFWS have the ability to look below species and subspecies levels to protect populations that are vital to the long-term self-sustainability of the species. The principal difference is that the Joint DPS policy allows for consideration of other factors besides genetic divergence in finding discreteness of populations.

In promulgating the Joint DPS Policy, the agencies distanced themselves somewhat from the ESU Policy's narrow focus on genetic heritage. The Joint DPS Policy seems to leave room for heightened consideration of ecosystem idiosyncrasies and the relative impacts of a DPS on the rest of the species. Indeed, the Joint DPS Policy defines "discreteness" as "markedly separated from other populations of the same taxon as a consequence of physical, ecological, or behavioral factors."[109] The agencies' responses to public comments further clarify this distancing from a sole focus on genetic heritage. In response to a criticism that the policy should focus either entirely or not at all on genetic distinctness, the agencies state that they recognize two interrelated goals of the ESA: to "conserv[e] genetic resources *and* maintain[] natural systems and biodiversity over a representative portion of their historic occurrence."[110] The response finishes by stating that the Joint DPS Policy is

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[107] Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act, 61 Fed. Reg. 4722 (Feb. 7, 1996) [hereinafter Joint DPS Policy]; *see also supra* note 78 (discussing separation of USFWS and NMFS) and discussion *supra* Part I.C (discussing ESA and lack of definition for DPS).

[108] Joint DPS Policy, *supra* note 107, at 4725.

[109] *Id.*

[110] *Id.* at 4723 (emphasis added).

intended to meet both those goals, without focusing on one to the exclusion of the other.[111] In fact, the agencies say that the Joint DPS Policy was never intended to "require genetic distinctness [to] be demonstrated before a DPS could be recognized . . . ."[112]

The DPS and ESU policies have potentially great impacts on salmon in light of their hatchery components. Under a very strict and conservative reading, such as that promulgated by the Alsea Valley Alliance, hatchery components of wild salmon runs arguably must be counted as part of the wild ESU because the wild salmon are not isolated from the hatchery fish and are genetically very close.[113] Under a more scientifically faithful reading of the policies, though, NMFS and USFWS could ignore hatchery components of fish because only the wild salmon (and hatchery offspring) are important for the long-term survival of the species, and because wild salmon are behaviorally and ecologically distinct from their hatchery brethren. Complicating matters further, if hatchery fish are counted as part of a wild ESU, the ESU may no longer qualify for protection under the ESA. This convoluted state of affairs makes the clarifying policy on hatchery fish a necessity.

The 1993 Hatchery Policy demonstrated a fairly elegant solution to the complex problem outlined above. After careful analysis of ecosystem-based management concerns and the ESA's central purpose, NMFS had arrived at a feasible policy. Nonetheless, the 1993 Hatchery Policy upset many in the conservative camp and was soon challenged in federal district court. In response to a 1998 listing of several ESUs of coho salmon, the Pacific Legal Foundation attacked.[114]

E. Alsea Valley Alliance v. Evans (Alsea I): Striking the Interim Hatchery Policy

In 1998, NMFS listed six ESUs of coho salmon as threatened under the ESA.[115] In the listing decision, NMFS decided to list only naturally spawning coho.[116] Alsea Valley Alliance, a coalition of landowners, challenged the listing of the Oregon Coast ESU, which excluded hatchery fish from the listing, as arbitrary and capricious under the ESA and APA.[117] The plaintiffs did not challenge the ESU Policy, but rather sought judicial intervention to invalidate the 1993 Hatchery Policy. The plaintiffs argued that NMFS could not legally distinguish between hatchery and wild salmon that are part of the same ESU, contending that the ESA did not allow for distinctions below that of "species" or

[111] *Id.*
[112] *Id.*
[113] *See* discussion *infra* Part I.E-H.
[114] Alsea Valley Alliance v. Evans, 161 F. Supp. 2d 1154 (D. Or. 2001) [hereinafter Alsea I].
[115] *Id.* at 1159.
[116] *Id.*
[117] *Id.*

"subspecies."[118] The court agreed, holding that the ESU policy was a permissible construction of the terms "species" and DPS in the ESA, but that the listing determination was arbitrary and capricious.[119]

The district court held that NMFS could not legally make a distinction between naturally and hatchery spawned fish under the terms of the ESA. The court distinguished the ESU and DPS Policies from the 1993 Hatchery Policy. It reasoned that while the former were reasonable constructions of the ESA because they are based in genetics and geography, the latter allowed distinctions below that of subspecies or DPS and was therefore not permissible under the ESA. The listings were set aside as unlawful.[120] The court did not elaborate on why ecology or ecosystem considerations beyond genetics could not factor into a statute expressly focused on preserving the ecosystems on which endangered and threatened species depend. And, in an odd dictum, the court reasoned that NMFS might have been able to call hatchery coho a different ESU and therefore list the native, but not hatchery, coho as threatened, but that this was unlikely given that hatchery salmon are not reproductively isolated from native coho.[121] Thus, the matter was remanded to NMFS to reform the policy consistent with the court's rejection of the 1993 Hatchery Policy, with the implicit direction that ESUs must be listed entirely or not at all.[122]

F. The 2005 Hatchery Listing Policy: Revision and Adaptation after Alsea I

When the Ninth Circuit refused to hear an appeal by intervenors (because NMFS opted not to appeal), ruling that the matter was not final and therefore the intervenors lacked standing, NMFS began to revise its hatchery policy.[123] After issuing a proposed policy and taking public comments, NMFS published a new "Policy on the Consideration of Hatchery-Origin Fish in Endangered Species Act Listing Determinations for Pacific Salmon and Steelhead" ("Hatchery Listing Policy").[124] Regrettably, the policy is very confusing.

The Hatchery Listing Policy incorporates the ESU Policy's goal of preserving genetic diversity and confirms the twin ESU requirements.[125] Finding that important genetic resources "can reside in fish spawned in a hatchery as well as in a fish spawned in the wild," the new policy directs that once hatchery salmon

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118 *Id.* at 1161.

119 *Id.*

120 *Id.* at 1162.

121 *Id.* at 1162-63.

122 *Id.* at 1163.

123 Alsea Valley Alliance v. Dept. of Commerce, 358 F.3d 1181, 1183 (9th Cir. 2004). The Washington Trout Unlimited court, annoyed by NMFS's failure to appeal, noted that "perhaps [their ruling] will have the happy result of instigating needed appellate review." Trout Unlimited v. Lohn, No. CV05-1128-JCC, 2007 WL 1730090, at *5 (W.D. Wash. June 13, 2007).

124 Hatchery Listing Policy, *supra* note 97, at 37,204.

125 *Id.* at 37,215.

are included in an ESU under the 1991 ESU Policy, they should be considered in listing decisions relating to those ESUs.[126] So long as hatchery stocks have "a level of genetic divergence relative to the local natural population(s) that is no more than what occurs within the ESU," they will be deemed part of the ESU and considered and included in all ESA listings.[127]

The caveat to this seemingly per se inclusion of hatchery salmon, aside from the allowance for exclusion of hatchery salmon with genetic divergence greater than that found in the natural population, is NMFS's statement that it will apply the policy with "the conservation of naturally-spawning salmon and the ecosystems upon which they depend" in mind.[128] This statement implies that NMFS is reserving some discretion to exclude hatchery salmon if their inclusion would not comport with the goals of the ESA. The meaning of this part of the policy is unclear, but the subsequent *Trout Unlimited* decision sheds some light on it.[129]

Finally, the Hatchery Listing Policy lists four "key attributes" for status determinations: abundance, productivity, genetic diversity, and spatial distribution.[130] The policy explicitly states that hatchery salmon can implicate all four factors in both positive and negative ways.[131] Thus, if "a hatchery program [is] managed without adequate consideration of its conservation effects[,] . . . [it could] affect a listing determination by reducing adaptive genetic diversity of the ESU, and by reducing the reproductive fitness and productivity of the ESU."[132] By "affect," NMFS seems to indicate that hatchery salmon may be excluded from a listing, or from influencing listing status, if their total effect on the ESU is to reduce diversity, abundance, productivity, or distribution of the ESU. As in many environmental battles, a new policy would not abate a conflict so full of emotional investment and serious implications and challenges soon arose.

G. The Trout Unlimited cases in Oregon and Washington: Invalidation Revisited

In response to the Hatchery Listing Policy, Trout Unlimited and a coterie of environmental organizations filed two major challenges: one facially challenged the policy as contravening the ESA in the context of the Upper Columbia River steelhead ESU downlisting, the second challenged NMFS's failure to list the Oregon Coast coho ESU that was challenged in *Alsea I*.[133] Both challenges

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[126] *Id.*

[127] *Id.*

[128] *Id.*

[129] *See infra* Part I.G.1.

[130] Hatchery Listing Policy, *supra* note 97, at 37,215.

[131] *Id.*

[132] *Id.*

[133] Trout Unlimited v. Lohn, No. 06-1493-ST, 2007 WL 2973568 (D. Or. July 13, 2007)

were initially filed in the U.S. District Court for the Western District of Washington, but the Oregon Coast coho ESU challenge was transferred to the District of Oregon.[134] Along with the subsequent *Alsea II* decision, these cases provide an opportunity for discerning the meaning of the Hatchery Listing Policy and where to go from here.

1. The Washington Trout Unlimited Cases: Challenging the 2005 Policy and Steelhead Downlisting

In the Washington court, the Trout Unlimited group filed a programmatic challenge to the Hatchery Listing Policy and an as-applied challenge in regards to the Upper Columbia River steelhead ESU, which was downlisted from endangered to threatened when NMFS reviewed listings after issuing the Hatchery Listing Policy.[135] Strongly impacted by the construction of the Grand Coulee Dam in 1939, the Upper Columbia River steelhead ESU was one of twenty-seven ESUs reviewed during the post-*Alsea I* revision of the 1993 Interim Hatchery Policy.[136] All twenty-seven ESUs reviewed remained on the list or were proposed to be listed (the Lower Columbia River coho, which had been a candidate, was now proposed to be listed as threatened). Two ESUs were downlisted from endangered to threatened in the proposed listing: the Sacramento River Winter-Run chinook ESU and the Upper Columbia River steelhead ESU.[137] Additionally, the Central California Coast coho ESU was proposed uplisted from threatened to endangered, and two ESUs, the aforementioned Lower Columbia River coho and the Oregon Coast Coho, were proposed to be uplisted from unprotected to threatened.[138]

The Upper Columbia River steelhead ESU was first listed as endangered in 1997 after a NMFS status review found that natural steelhead were very low in abundance.[139] The listing noted that natural steelhead were low "both in

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(challenging Trout Unlimited v. Lohn, No. CV06-0483-JCC, 2007 WL 1795036 (W.D. Wash. June 13, 2007)); *see also* Trout Unlimited v. Lohn, No. CV05-1128-JCC, 2007 WL 1730090 (W.D. Wash. June 13, 2007) (companion to No. CV06-0483-JCC, finding that decision to exempt Hatchery Listing Policy from NEPA was valid because ESA sufficiently addresses conservation interests and leaving ESA claims to other case). For purposes of this Article, the second *Trout Unlimited* decision in the Western District of Oregon, No. CV05-1128-JCC, will not be considered at length. However, it is at least notable that the court in that case reaffirmed the ESA goals as "the conservation of endangered and threatened species and the ecosystems upon which they depend." *Trout Unlimited*, 2007 WL 1730090, at *17.

[134] *Trout Unlimited*, 2007 WL 2973568, at *2.

[135] *Trout Unlimited*, 2007 WL 1795036, at *1, 9-11.

[136] *Id.* at *9-10; Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids, 69 Fed. Reg. 33,102 (June 14, 2004) [hereinafter Proposed Listing Determinations].

[137] Proposed Listing Determinations, *supra* note 136, at 33,165-66

[138] *Id.* The Oregon Coast coho ESU was considered unlisted because of *Alsea I*.

[139] Endangered and Threatened Species: Listing of Several Evolutionary Significant Units (ESUs) of West Coast Steelhead, 62 Fed. Reg. 43,937, 43,949-50 (Aug. 18, 1997).

absolute numbers and in relation to numbers of hatchery fish throughout the region," that naturally-spawning steelhead were not self-sustaining, and that hatchery and harvest management were detrimental to the long-term survival of the natural steelhead.[140] NMFS noted that hatchery programs were masking natural declines and "creat[ing] unrealistic expectations for fisheries," resulting in overharvest.[141]

In 2001, after *Alsea I*, NMFS was compelled to review the twenty-six ESUs (and one candidate) listed under ESA in conjunction with its proposed new hatchery policy. The reassessment lent significantly more weight to hatchery programs and included six hatchery stocks, five more than had been included in the 1997 listing, in the Upper Columbia River ESU.[142] As a result, relying on the results of two scientific review teams, NMFS found that the ESU's extinction risk, considered in light of the contribution of the six hatchery stocks, was now "likely to become endangered within the foreseeable future."[143] NMFS thus proposed to downgrade the ESU pursuant to the findings of the two scientific review teams under the new hatchery policy.[144]

The court reviewed the downlisting and Hatchery Listing Policy carefully, looking at the long history behind the controversy, before concluding that the Hatchery Listing Policy was inconsistent with the ESA and setting aside the downlisting.[145] The court first refused to apply *Chevron* deference to the Hatchery Listing Policy because it found the 2005 Policy does not interpret "distinct population segment," which is admittedly ambiguous, but rather reaffirms the 1991 ESU Policy and incorporates that policy's interpretation of Distinct Population Segment.[146] The court then reviewed the ESA, finding that two of the principal goals of the ESA are (1) to afford endangered species the highest of priorities; and, most importantly, (2) to ensure "the viability of naturally self-sustaining populations in their naturally-occurring habitat . . . without human interference."[147] Reviewing legislative history and NMFS's own

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[140] *Id.*

[141] *Id.* at 43,944, 43,949-50.

[142] Proposed Listing Determinations, *supra* note 136, at 33,119.

[143] *Id.* at 33,165.

[144] *Id.* Although this listing determination was made pursuant to the proposed hatchery policy, rather than the final one, as the court notes in *Trout Unlimited*, the review was unchanged despite the alteration of some language in the Hatchery Listing Policy to reflect increased focus on the viability of self-sustaining natural populations. Trout Unlimited v. Lohn, No. CV06-0483-JCC, 2007 WL 1795036, at *11 (W.D. Wash. June 13, 2007).

[145] *Trout Unlimited*, 2007 WL 1795036, at *14-23.

[146] *Id.* at *13. *Chevron v. Natural Resources Defense Council*, 467 U.S. 837 (1984), describes how a reviewing court should defer to an agency's construction of a statute which leaves ambiguous directives for regulation. When Congress has "directly spoken to the precise question at issue," agencies or courts must give that intent the weight it deserves. *Id.* at 842-43. If the court finds, however, that Congressional intent is not clear, it will instead give significant deference to the agency's interpretation, so long as that interpretation is reasonable. *Id.*

[147] *Trout Unlimited*, 2007 WL 1795036, at *14-16.

past statements, and noting the hollowness of the critical habitat designation if natural viability were not the goal, the court found that the primary goal of the ESA is the "protection and promotion of endangered and threatened species to the point of being naturally self-sustaining."[148]

Under the Hatchery Listing Policy, it appears that NMFS believes it must, in most situations, make status determinations based on the entire ESU, including hatchery fish in that determination to the possible detriment of the wild component of that ESU. The Washington court in *Trout Unlimited* found this contrary to the goals of the ESA and invalidated the Hatchery Listing Policy. District Judge Coughenor noted that the policy *requires* that hatchery fish be included in an ESU so long as they are no more genetically divergent than the natural population and that status determinations be made based on the status of the *entire* ESU.[149] This was unacceptably contradictory, the court found, because the policy also states that it is intended to be applied for the benefit of naturally-spawning fish and that hatchery salmon will be viewed in status reviews only to the extent that they contribute to that goal.[150] That final point, that status reviews would consider hatchery salmon narrowly, was actually added to the final Hatchery Listing Policy, creating what the court said is "strong[] textual evidence for interpreting the policy to require that natural populations be the benchmark against which status determinations are made."[151]

Looking to the downlisting, the court found that some of the ambiguities it noted in the Policy were clarified and that the two-step review process reveals that the viability of natural populations is no longer the sole focus of ESA determinations under the Hatchery Listing Policy.[152] Instead, it is obvious that the Hatchery Listing Policy "mandates that status determinations be based on the *entire* ESU, including both natural and hatchery fish."[153] Under this analysis, the court invalidated the Hatchery Listing Policy and restored the Upper Columbia River steelhead ESU to endangered status. In further support of its finding, the court made a final point that considering the entire ESU rather than just natural populations in listing decisions is contrary to the ESA's mandate to use only the best available scientific evidence.[154] The court found that there was no scientific basis for considering the entire ESU rather than natural populations alone in ESA listing determinations.[155]

After the Washington court's decision, the 1993 Interim Policy seemed to have been reinstated, though the court never explicitly said so. However, the

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148 *Id.* at *16.

149 *Id.* at *16-17.

150 *Id.*

151 *Id.* at *17.

152 *Id.* at *18-20.

153 *Id.* at *20.

154 *Id.* at *20-21.

155 *Id.*

Ninth Circuit Court of Appeals recently reversed that part of the Washington court's decision on review and reinstated the 2005 Hatchery Listing Policy.[156] The Ninth Circuit also directed the lower court to reverse its ruling that the downlisting was arbitrary and capricious and to grant NMFS' motion for summary judgment.[157] Tempering these setbacks for the environmental groups, the Ninth Circuit also rejected the building industry challenges to the Hatchery Listing Policy as well, and instead opted to defer to NMFS and "the informed exercise of agency discretion."[158]

As for including hatchery fish in an ESU in the first place, the issue addressed in *Alsea I*, the district court refused to find that NMFS had acted arbitrarily and capriciously in its refusal to accept Trout Unlimited's petition to list hatchery and wild salmon as separate ESUs.[159] The Ninth Circuit upheld that aspect of the decision.[160] The district court did suggest, however, that it is "odd" that *Alsea I* directed that hatchery populations be included in an ESU and that the entire ESU be listed even though the status determination is done only with regard to the natural population.[161]

What is clear from the district court's logic, though, is that there are reasonable differences among the courts as to whether ESA listing decisions ought to be made by considering only the viability of natural populations. What's more, the Ninth Circuit explicitly recognized that the primary goal of the ESA is to restore species to "the point where they are viable components of their ecosystems" — to make them self-sustaining, not just meet abundance goals by replacement with hatchery-bred fish.[162] It appears now that the court-based hatchery battles are over for the time being, although NMFS may nonetheless decide to repair the Hatchery Listing Policy (and the Pacific Legal Foundation may yet appeal).

2. The Oregon *Trout Unlimited* Case: Challenging the Failure to List the Oregon Coast Coho ESU.

After the Oregon Coast coho ESU challenge was transferred to the Oregon court, which had original jurisdiction over the matter, a magistrate judge issued the order, which was recently approved by the district court.[163] Trout Unlimited

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[156] Trout Unlimited v. Lohn, Nos. 07-35623, 07-35750, 2009 WL 650534, at *12 (9th Cir. Mar. 16, 2009)

[157] *Id.*

[158] *Id.* at *12-16.

[159] *Trout Unlimited*, 2007 WL 1795036, at *22.

[160] *Trout Unlimited*, 2009 WL 650534, at *8-10.

[161] *Trout Unlimited*, 2007 WL 1795036, at *22. The court also found it odd that hatchery fish get protection under the ESA because of the decision in *Alsea I. Id.* The Ninth Circuit was silent on this issue, though presumably the panel in that decision does not find this odd.

[162] *Trout Unlimited*, 2009 WL 650534, at *2 (*quoting* H.R. Rep No. 95-1625, at 5 (1978) *as reprinted in* 1978 U.S.C.C.A.N. 9453, 9455).

[163] Trout Unlimited v. Lohn, No. 06-1493-ST, 2007 WL 2973568, at *1. (D. Or. July 13, 2007).

challenged NMFS's decision not to list the Oregon Coast coho ESU after it twice proposed and then withdrew the listing under pressure from the state of Oregon.[164] In *Oregon Natural Resources Council v. Daley*, the court found that NMFS's withdrawal of the first proposal was arbitrary and capricious.[165] In response, NMFS listed the coho as threatened. However, because NMFS relied on the 1993 Interim Hatchery Policy and did not also list as threatened the hatchery stocks that it found were part of the ESU, the listing was found arbitrary and capricious in *Alsea I*.[166]

After the new hatchery policy was proposed, NMFS again proposed listing the coho. In its analysis, a majority of the Biological Review Team ("BRT") voted for threatened status, but did not consider hatchery fish.[167] Because the BRT attributed increased numbers of returning coho to favorable ocean conditions rather than better restoration efforts, NMFS followed with a proposal to list the ESU.[168] NMFS's separate analysis along with this proposal found that hatcheries had neutral or uncertain effects on the ESU, looking at elements similar to those articulated in the Hatchery Listing Policy: abundance, productivity, genetic diversity, and spatial distribution.[169] Again, however, NMFS withdrew the proposal under pressure from the state of Oregon because the state was implementing its own program for coho restoration.[170]

The Oregon court found this withdrawal arbitrary and capricious. The court agreed with NMFS that the "more likely than not" standard applied to determine if a species is threatened or endangered is acceptable under the ESA, but found NMFS had not applied the standard using the best available science.[171] Significantly, the court was willing to focus on best available science and resisted applying strict *Chevron* deference to the agency's choice of science. The court held that it was improper for NMFS to ignore habitat considerations, to use population models that reached the counterintuitive conclusion that lower abundance increases productivity, and to assume that hatchery and harvest programs were adequate.[172]

Though it did not explicitly discuss the Hatchery Listing Policy, the court lent its approval, if not its mandate, to express consideration of ecosystem health and strict review of hatcheries' role in listing decisions. Indeed, the court chided NMFS and the state of Oregon for the withdrawal. The court noted admissions

The district court judge, Garr King, approved of the magistrate's order on October 5, 2007. *Id.*

164 *Id.* at *1-2.

165 Oregon Natural Resources Council v. Daley, 6 F. Supp. 2d 1139, 1150-53, 1160-61 (D. Or. 1998).

166 *Trout Unlimited*, 2007 WL 2973568, at *5.

167 *Id.* at *6-7.

168 *Id.*; *see also* Proposed Listing Determinations, *supra* note 136, at 33,102.

169 *Trout Unlimited*, 2007 WL 2973568, at *6-7.

170 *Id.* at *7-13.

171 *Id.* at *13.

172 *Id.* at *19-25.

by NMFS and Oregon that many of the depressed populations were associated with hatchery programs and that the hatchery programs may have been contributing to the declines, as well as NMFS's earlier conclusion that hatchery programs did not "substantially reduce the extinction risk of the ESU in-total."[173]

H. Alsea II: Upholding ESA Listings Under the New Policy

It wasn't long before the Alsea Valley Alliance and the Pacific Legal Foundation returned to the battle.[174] When the Hatchery Listing Policy was announced, NMFS simultaneously announced listing determinations for sixteen of the twenty-seven formerly listed ESUs.[175] Of those sixteen, four were listed as endangered and the other twelve were listed as threatened.[176] One hundred thirty-two hatchery programs were included among the sixteen ESUs.[177] For all the ESUs listed, NMFS considered the effects of artificial propagation and, in some, concluded that many hatchery programs did "not substantially reduce the extinction risk of the ESU in-total."[178] Both parties agreed that NMFS conducted the status reviews pursuant to and consistent with the Hatchery Listing Policy. But since the Alsea Valley Alliance didn't accomplish its agenda, even under the weakened hatchery policy, they disputed the application. Alsea challenged the listing of the sixteen ESUs and alleged NMFS had violated the Administrative Procedure Act by distinguishing between hatchery and wild populations during the listing process, protecting wild and hatchery salmon differently, and including salmon stocks that don't interbreed in ESUs.[179]

The district court, Judge Michael Hogan again presiding, reviewed NMFS's process for status reviews. The two-step process first involved review by the Pacific Salmonid Biological Review Team of "viability and extinction risk of naturally spawning populations in the ESUs" based on "the assumption that present conditions will continue into the future," but not considering the role of artificial propagation.[180] The BRT review looked at the four "key attributes" under the Hatchery Listing Policy: abundance, productivity, genetic diversity,

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[173] *Id.* at *24.

[174] Alsea Valley Alliance v. Lautenbacher (*Alsea II*), No. 06-6093-HO, 2007 WL 2344927 (D. Or. Aug. 17, 2007).

[175] Endangered and Threatened Species; Final Listing Determinations; Final Rules and Proposed Rules, 70 Fed. Reg. 37,160 (June 28, 2005) [hereinafter Final 2005 Salmon Listing]. All twenty-seven remain listed, but there has been shuffling around from endangered to threatened.

[176] *Id.* at 37,191.

[177] *Id.* ("Informed by the *Alsea* ruling and consistent with the final Hatchery Listing Policy, . . . any artificial propagation programs considered to be part of an ESU will be included in the listing if it is determined that the ESU in-total is threatened or endangered.").

[178] *Id.*

[179] *Alsea II*, 2007 WL 2344297, at *1.

[180] *Id.* at *3 (internal quotations omitted).

and spatial distribution.[181] The second part of the status review was evaluation by the Salmon and Steelhead Assessment Group ("SSHAG"), which explicitly looked at all the data regarding hatchery and wild salmon interactions and comparing hatchery stocks with wild stocks.[182] The SSHAG report to NMFS described how hatchery programs affected each specific ESU.[183] Finally, a workshop was convened to review both reports and assess the extinction risk of each ESU in light of the findings by BRT and SSHAG.[184] NMFS decided to apply ESA protections to natural and hatchery fish with intact adipose fins but not to hatchery fish with clipped adipose fins (reflecting the exclusion of these fish from ESA listing and making them available for harvest) because they are "surplus to conservation and recovery needs."[185]

The district court held first that nothing in the ESA or in *Alsea I* prohibited any part of the status review process.[186] While noting that the Washington court in *Trout Unlimited* had declined to extend *Chevron* deference to the Hatchery Listing Policy, the court held that because Congress never detailed how NMFS should conduct status reviews, and because NMFS explicitly considered hatchery stocks in its review, the challenge to the status review process failed.[187]

The plaintiffs also contended that that the protective regulations for the sixteen ESUs, which allow for the take of hatchery fish but not wild fish, were unlawful.[188] The court rejected this contention, finding that NMFS does not have to treat wild populations and hatchery stocks equally, even if they are in the same ESU.[189] Giving *Chevron* deference to NMFS's interpretation of the "take" provision, the court found that simply because the ESA contemplated taking of threatened species only in special circumstances, it did not mean that NMFS "was required to prohibit taking of threatened species."[190] Indeed, the plaintiffs pointed to congressional history for the ESA that said "conservation might include authority for carefully controlled taking of surplus members of the species[,]" almost exactly tracking what NMFS had done here, allowing for some hatchery salmon to be taken and identifying those fish as "surplus."[191]

Finally, the court dismissed the plaintiffs's contention that NMFS had listed ESUs that did not interbreed when mature and so were not listable under the

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181 *Id.* at *4.

182 *Id.*

183 *Id.*

184 *Id.*

185 *Id.*; *see also* Final 2005 Salmon Listing, *supra* note 175, at 37,194. Managers routinely clip the adipose (finless, dorsal) fins of hatchery-origin fish to allow anglers to identify which fish they may keep and which they must release back into the river.

186 *Alsea II*, at *5.

187 *Id.*; *see also* Chevron v. Natural Resources Defense Council, 467 U.S. 837 (1984).

188 *Alsea II*, at *6.

189 *Id.*

190 *Id.*; *see also Chevron*, 467 U.S. at 844.

191 *Alsea II*, at *6.

ESA.[192] The court agreed with NMFS that "interbreeds when mature" is an ambiguous directive and that NMFS's interpretation was permissible.[193] The court noted that if actual interbreeding was required, the agencies could not list a "United States population of an animal that is abundant elsewhere in the world," a position contrary to Congress's intent.[194] In a memorandum disposition filed concurrently with its decision in *Trout Unlimited v. Lohn*, the Ninth Circuit Court of Appeals affirmed the district court ruling in *Alsea II*, suggesting that *Chevron* deference may rule the hatchery battles from now on.[195]

II. ANALYSIS

As the law stands, courts in Washington and Oregon have found that NMFS's listings under the Hatchery Listing Policy are legitimate, that NMFS does not have to treat fish within an ESU the same, and that the policy itself and downlistings pursuant to it are illegal. The Ninth Circuit has tempered these rulings somewhat, but there is still a serious disconnect between science and policy here. The Oregon court in *Alsea II* found that the two-step scientific review process lends a gloss of credibility to status determinations pursuant to the Hatchery Listing Policy, even if such determinations still treat hatchery and wild fish differently.[196] Meanwhile, the Washington court in *Trout Unlimited* found that the same two-step review process evinces a goal inconsistent with the ESA by considering hatchery fish in listing determinations and not properly focusing on self-sustaining natural populations.[197] The Oregon court in *Trout Unlimited* further expressed its desire to see more consistent use and consideration of science and indicated that at least one court is willing to question NMFS's decisions without extending much *Chevron* deference on the listing issue.[198] Despite the Ninth Circuit's decision to uphold the 2005 Hatchery Listing Policy, the controversy does not feel completely settled. Moreover, the Ninth Circuit's discussion of the significant deference owed to these agency policies suggests that NMFS may be free to interpret these results as a signal that it should take the opportunity to reform the policy and that such a revision will not be overturned by the courts so long as it is consistent with the ESA's goals. Should the agency be so inclined, it must strive to bring to the policy a better integrated, ecosystem-based management strategy that evinces both a cautious approach to hatcheries and a comprehensive understanding of the deep ecological nucleus of the ESA.

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192 *Id.* at *6-7.

193 *Id.* at *7.

194 *Id.*; Alsea Valley Alliance v. Evans, 161 F. Supp. 2d 1154, 1162 (D. Or. 2001).

195 Alsea Valley Alliance v. Lautenbacher, No. 07-35824, 2009 WL 690078, at *1 (9th Cir. Mar. 16, 2009).

196 *See* discussion *supra* Part I.H.

197 *See* discussion *supra* Part I.G.1.

198 *See* discussion *supra* Part I.G.2.

Hatchery programs have been utilized for over a century in an attempt to replenish wild stocks and support commercial fisheries. Today, out of fifty-two ESUs of Pacific salmon and steelhead identified by NMFS, twenty-two are listed as threatened, six as endangered, and three as species of concern.[199] Within those twenty-seven ESUs, the agency lists 170 hatchery stocks (although NMFS has yet to list hatchery programs for the Upper Columbia steelhead ESU).[200] However, substantial problems have been raised about the viability of hatchery salmon as a mitigation measure to enable the recovery of endangered and threatened salmonids. The issue has been explored extensively by federal agencies,[201] independent scientists,[202] and non-profit organizations[203] alike. All have found at least some serious problems with the extensive use of hatcheries as a substitute for comprehensive, ecosystem-based salmon restoration policy.

While hatcheries will likely play a significant role in conservation and recovery efforts in the foreseeable future, they should not cause the undesired effect of restricting or limiting ESA protection for salmon species. It is true that

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199 NOAA FISHERIES, ENDANGERED SPECIES ACT STATUS OF WEST COAST SALMON & STEELHEAD (Sept. 25, 2008), http://www.nwr.noaa.gov/ESA-Salmon-Listings/upload/snapshot-9-08.pdf. The Upper Columbia River steelhead ESU is now listed as endangered after the court order in *Trout Unlimited*. *See supra* Part I.G.1. However, after the Ninth Circuit ruling, the Upper Columbia Steelhead ESU may yet be downlisted. The Oregon Coast coho ESU is now listed as threatened after the decision in Trout Unlimited. *See* Endangered and Threatened Species: Final Threatened Listing Determination, Final Protective Regulations, and Final Designation of Critical Habitat for the Oregon Coast Evolutionarily Significant Unit of Coho Salmon, 73 Fed. Reg. 7816 (Feb. 11, 2008) [hereinafter Oregon Coast ESU listing]; *see also supra* Part I.G.2.

200 Oregon Coast ESU listing, *supra* note 199, at 7843 (listing only one hatchery stock for the ESU); Endangered and Threatened Species: Final Listing Determination for Puget Sound Steelhead, 72 Fed. Reg. 26,722, 26,735 (May 11, 2007) (listing two hatchery stocks for the Puget Sound steelhead DPS); Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead, 71 Fed. Reg. 834, 850-51 (Jan. 5, 2006) (listing thirty-five hatchery stocks for the ten steelhead DPSs listed); Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon and Final 4(d) Protective Regulations for Threatened Salmonid ESUs, 70 Fed. Reg. 37,160, 37,193 (June 28, 2005) (listing 132 hatchery stocks for the sixteen salmon ESUs).

201 *See* NAT'L RES. COUNCIL, UPSTREAM: SALMON AND SOCIETY IN THE PACIFIC NORTHWEST (National Academy Press 1996); Considering Life History, Behavioral, and Ecological Complexity in Defining Conservation Units for Pacific Salmon (June 13, 2005) (An independent panel report, requested by NOAA Fisheries); West Coast Salmon Biological Review Team, NOAA Fisheries, Preliminary Conclusions Regarding the Update Status of Listed ESUs of West Coast Salmon and Steelhead (Feb. 19, 2003); Salmon Recovery Science Review Panel, Report for the meeting held Dec. 4-6, 2000; *see also* Ransom A. Myers, et al., *Hatcheries and Endangered Salmon*, 303 Science 1980 (2004) (lodging of major complaints with NMFS's refusal to follow Salmon Recovery Science Review Panel's findings that hatchery salmon pose significant threats to wild salmon by the members of the SRSRP).

202 *See supra* Part I.B.

203 Patti Goldman, *The Current Attack on the Salmon Listings:* Alsea Valley Alliance *and Its Implications* (Earthjustice 2001), http://www.earthjustice.org/library/references/Salmon-20Listing-20Paper.pdf; Trout Unlimited, Why Wild, http://www.whywild.org/site/c.adKGIRNsEoG/b.2382871/k.BDDF/Home.htm; Earthjustice, Fish Trees Water: Safeguarding and Restoring the Great Northwest, *available at* http://www.earthjustice.org/our_work/campaigns/fish_trees_water.html (last visited Mar. 9, 2009).

hatchery programs release billions of salmon into the North Pacific each year.[204] However, this does not mean that wild salmon stocks comprise billions of individuals. Because of the substantial uncertainty surrounding hatcheries and their effects on wild populations, a prudent approach under ESA, informed by the precautionary principle and ethical interests, counsels for per se exclusion of hatchery salmon from ESA listing decisions, unless and until their use is proven to supplement wild salmon with no significant deleterious effects to their genetic trajectory. This does not mean that hatchery fish must be excluded from ESUs, only from listing decisions, an approach to which the Ninth Circuit granted deference. Once that step is taken, a full review of hatchery salmon and how to avoid the genetic pitfalls that may accompany their use would be in order, including the workability of considering hatchery and wild salmon as different ESUs.

Instead of considering hatchery salmon in ESA listing determinations, NMFS should shift its baseline understanding of salmon so that hatchery salmon may be viewed as wild salmon only when they contribute to the health of the wild salmon being considered. The shortcomings of the legal arguments challenging the policies and decisions in cases like *Alsea I* and *II* are that often the court's opinions rest on extraneous lexical distinctions, rather than the purpose of the ESA. The exception here is the *Trout Unlimited* case in the Western District of Washington, in which the district court did a good job of articulating the standards and goals of the ESA. The Pacific Legal Foundation is correct that when hatchery salmon are counted, there are so many salmon in the Pacific that the ESA probably isn't implicated in most instances. But this simplistic reading ignores the fact that hatchery salmon are not the same as wild salmon. The body of salmon research suggests that hatchery salmon can play a role in recovery, but that there are so many concerns about the negative effects of hatchery fish on wild salmon that it belies logic to see them as the same organism.[205] This conflict is not about the meaning of "species" or "distinct population segment." It is about how to restore a once great ecosystem to a semblance of its former, wild self. It is about how to allow fishermen to make a living, with some restraints, while allowing the salmon ecosystem, including the streams, forests, predators and invertebrates, to recover. And it is about the role of administration ideologies in setting policies that will affect the long-term protection of species under the Endangered Species Act.

In today's political climate it is easy for antagonistic groups like the Pacific Legal Foundation to attack environmental statutes and regulations through tenuous textual arguments. It is increasingly clear, though, that the solution to many environmental problems is through ecosystem-based management, not reactionary policy and politics. Salmon will recover when habitat is improved,

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[204] AUGEROT, *supra* note 5, at 34-35.

[205] *See supra* Part I.B.

the threat of hydropower is reduced, the role of hatcheries is limited or becomes clearly beneficial, and total allowable catch is in line with what fisheries can sustain. After two decades of salmon wars waged in the federal courts, NMFS should see this as an opportunity to reform the hatchery policy with an eye towards real salmon protection and to set standards that will carry over to the restoration of other species. In doing so, the agency should take a careful and neutral approach that stays true to the ESA and its goals.

A. The Hatchery Listing Policy is Inconsistent with the Purposes and Goals of the Endangered Species Act and Should Not be Revived

> The purposes of this Act are 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 the purposes of the treaties and conventions [to which the United States has committed itself.][206]

The ESA has long been a target of unhappy landowners and the extractive industry. It is one of the only statutes that protects nature as nature, with only secondary considerations for incidental economic or anthropocentric effects. The Act's focus is on enabling organisms to return to their wild, self-sustaining selves, and to ensure that the ecosystems of which those organisms are a part are healthy enough that the species can proliferate on their own. Despite the Ninth Circuit's order to reinstate the Hatchery Listing Policy, NMFS can still abandon the Policy, as it is inconsistent with the express goals of the ESA. Indeed, NMFS should aim to prevent further decline of salmon stocks by crafting a new policy that seeks to downlist ESUs only when stocks have recovered, not because stock numbers are artificially inflated with hatchery salmon that offer little restoration value.

The ESA does not logically allow for the inclusion of hatchery-reared fish under its protections. The ESA envisions self-sustaining populations and healthy ecosystems as its end goal. Hatchery salmon pose serious threats to the long-term sustainability of salmon populations, both directly and indirectly. Hatchery salmon also rely on significant and substantial human intervention into the natural order for their survival and propagation. This directly contradicts the *self-sustaining* goal of the ESA. While hatchery programs may be continued as a possible mitigation measure, despite possible problems with their success,[207]

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[206] 16 U.S.C. § 1531(b).

[207] An argument can be made that hatchery programs may qualify as federal agency actions (if run by federal agencies rather than states) that are "likely to jeopardize the continued existence" of endangered or threatened species and would therefore violate section 7(a)(2) of the ESA. 16 U.S.C. § 1536(a)(2) (2006). This argument would require substantially more than this Article purports to cover and is not discussed further.

they should be limited to such and not considered at all as a part of an ESU or in listing determinations.

The ESA does not conceive of artificial propagation and hatcheries as long-term solutions for species loss. The point of the statute is to restore populations. Hatcheries do not seem to be fulfilling that goal, and may in fact be more detrimental than once thought to the long-term restoration of salmon. The ESA does not contemplate captive breeding as a sole replacement for restoration policy. In the *Trout Unlimited* case in Washington, the court pointed out that the ESA:

> mentions artificial propagation just once, as a possible method of conservation which can be used 'to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.' By its very definition, then, artificial propagation is a temporary measure designed to bring a species to the point where the species no longer requires the protection of the ESA.[208]

This is hardly a ringing endorsement for artificial propagation. The court is correct; the ESA views artificial propagation with a certain amount of distrust. The concept of a self-sustaining population is logically incompatible with a human-sustained population.

A second problem is that NMFS argues the ESU concept emphasizes, and in fact can only focus on, genetic diversity. Therefore, ecosystem considerations (which NMFS denigrates as "aesthetic"[209]) do not play a part in listing determinations because they "are not directly related to the long-term survival of the species."[210] NMFS is entirely wrong in this regard. Hatcheries have been the preferred solution to the Pacific salmon crisis for a long time, with little to show besides a continued decline in the health of all Pacific salmon stocks. This blind focus on genetic diversity, and the resulting per se inclusion of hatchery fish, misses the critical problem that genetic diversity may be declining precisely because of the inclusion of hatchery fish. It also fails to account for the problems caused by too many dams, too little water, and increasingly compromised habitat. The ESA seeks to protect ecosystems and species, not generic genetic assemblages.

While by no means absolutely certain, there is substantial scientific evidence that hatchery salmon simply are good replacements for wild salmon. Hatchery salmon seem to pose a serious threat to the long-term restoration of wild salmon due to their generally low fitness in the wild and maladaptation to natural conditions. The members of the Salmon Recovery Science Review Panel, in their stinging rebuke of NMFS's failure to heed their warnings about hatchery

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[208] Trout Unlimited v. Lohn, No. CV06-0483-JCC, 2007 WL 1795036, at *15 (W.D. Wash. June 13, 2007).

[209] Hatchery Listing Policy, *supra* note 97, at 37,208.

[210] *Id.*

fish, suggest that, because the effectiveness of hatchery salmon "has not been shown[,] . . . even conservation hatcheries should be strictly temporary and should not prevent protection of wild populations under the Endangered Species Act."[211] The World Conservation Union has also weighed in, arguing that "long-term reliance on artificial propagation is imprudent because of the impossibility of its maintenance in perpetuity."[212]

In addition to substantial differences in behavior and migration, which can cause serious declines in reproductive fitness, hatchery salmon also pose a threat of unwanted genetic drift, which runs counter to NMFS's argument against considering "aesthetic" values in listing determinations.[213] Only ecosystem-based management can provide a mechanism to avoid genetic drift and gene swamping. NMFS's blind focus on genetic dissimilarity could result in homogenization of salmon populations up and down the Pacific coast if genetic drift became rampant. Ecosystem concerns are validly part of the listing determination, and should begin to play a larger part. This should guide NMFS should it chose to revise the Hatchery Listing Policy. As the Independent Panel convened by NMFS concluded in its discussion on hatchery and wild salmon interaction, "as long as artificial propagation can be recognized as such, then there is biological justification for exclusion of artificially propagated fish from ESUs."[214]

B. *The Precautionary Principle Suggests Hatchery Salmon Should Be Excluded from ESA Listings*

> "As we know, there are known knowns. There are things we know we know. We also know there are known unknowns. That is to say, we know there are some things we do not know. But there are also unknown unknowns; the ones we don't know we don't know." — Donald Rumsfeld (Feb. 12, 2002).[215]

Much has been said about the role of science in environmental law and regulation. Both sides of any given "debate" on environmental or scientific issues are often guilty of demanding "sound science" or claiming that the science supports only their position. And yet, scientific research involves so much uncertainty that antagonists often jump on the levels of uncertainty as proof that the scientific conclusions are not supportable. Indeed, the uncertainty

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211 Myers et al., *supra* note 201, at 1980.

212 *Id.* (citing IUCN website that is no longer live).

213 *See supra* note 209 and accompanying text.

214 INDEPENDENT PANEL REPORT, *supra* note 64, at 11. It is interesting to note that (possibly by coincidence only) the report was issued on the same day NMFS released its new hatchery policy and status review of the sixteen salmon ESUs.

215 Stephen J. Hedges & Mark Silva, *A Fighter, But Out of Moves; "It's Been Quite A Time," Defense Secretary Says in Emotional Look Back After Decades Close to Nation's Seat of Power*, CHICAGO TRIB., Nov. 9, 2006, at A17.

inherent in understanding the natural world can seem oppositional to the absolutism often seen, or at least aspired to, in the law.

What should be done about uncertain but potentially harmful problems facing the natural world? The precautionary principle is often invoked "where there are threats of serious or irreversible damage."[216] In these situations, the precautionary principle counsels against using a "lack of full scientific certainty . . . as a reason for postponing cost-effective measures to prevent environmental degradation."[217] The precautionary principle is now widely viewed as comprised of six basic concepts: "Preventative anticipation" (taking or avoiding action despite uncertainty); "safeguarding ecological space" (leaving margins of error in our use of natural resources); "proportionality of response or cost-effectiveness of margins of error" (weighting ignorance in traditional cost-benefit analyses); "duty of care or onus of proof on those who propose change"; "promoting the cause of intrinsic natural rights" (altering legal view of ecological harm to protect all life on earth); and "paying for past ecological debt" (forward looking precaution as well as penalizing past wrongs).[218]

In the context of hatchery salmon, the version of the precautionary principle that might be invoked would fall under the umbrella of Cass Sunstein's "Prohibitory Precautionary Principle."[219] Under that rubric, when "evidence of harm is clear and if the outcome would be particularly bad[,]" taking the less harmful route may be justified.[220] With hatcheries, the potential for harm is significant. Wild salmon ESUs are already steadily declining and face serious risks of extinction. Adding the potential harms that hatchery salmon may cause results in greater risk of extinction, with little to no chance of restoration if the potential costs of hatcheries prove correct. As the U.S. Commission on Ocean Policy articulated, "[w]here threats of serious or irreversible damage exist, lack of full scientific certainty shall not be used as a justification for postponing action to prevent environmental degradation."[221]

Hatchery salmon most likely will continue to be used for supplementation and possibly for conservation efforts well into the future.[222] If that is what we can expect, a precautionary approach would best meet the goal of conserving species

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[216] Rio Declaration on Environment and Development, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I), princ. 15 (June 14, 1992), *reprinted in* 31 I.L.M. 874, 879 (1992). The Rio Declaration is often cited as a foundational document for the precautionary principle. *See* Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 Wash. L. Rev. 547, 550-51 (2007). Its roots, however, are older and often traced to German economic and legal thinkers of the 1930s. *See generally* INTERPRETING THE PRECAUTIONARY PRINCIPLE 16 (Timothy O'Riordan & James Cameron eds., 1994).

[217] INTERPRETING THE PRECAUTIONARY PRINCIPLE, *supra* note 216, at 16-18.

[218] *Id.* at 17-19.

[219] CASS R. SUNSTEIN, LAWS OF FEAR: BEYOND THE PRECAUTIONARY PRINCIPLE 121 (2001).

[220] *Id.*

[221] U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21[ST] CENTURY 65 (2004).

[222] Waples, *supra* note 50, at 16.

and the ecosystems upon which they depend. In "Dispelling Some Myths About Hatcheries," Robin Waples notes that "[a]t best, one can hope to minimize the extent of the[] genetic differences [between captive and natural populations.]"[223] On the risks of using hatchery salmon to restore wild salmon populations, Waples offers a quantitative analysis of a hypothetical hatchery program to assess these risks. Calculating risks and benefits as a "distribution of possible outcomes rather than a single point estimate," he looks at the possible straying rate in the hypothetical hatchery program.[224] The hatchery program, informed by current scientific understanding, would likely lead to a straying rate of eleven to twenty percent.[225] This rate would in turn be likely to cause a six to ten percent reduction in the fitness of the natural population, with a concomitant fifty to one hundred percent increase in the chance the natural population will go extinct within one hundred years.[226] This sort of risk assessment is a vital tool in the hatchery salmon discussion.

While still uncertain, there is substantial evidence suggesting that hatchery programs have serious deleterious impacts on wild salmon. If hatchery salmon are seen as indistinguishable and therefore identical to wild salmon under the ESA, they will be both considered in listing decisions and ultimately listed alongside wild salmon under the ESA. The result will likely be that some runs end up delisted or downlisted, pulling protection away from the wild components of those ESUs. If the impact of hatcheries on wild salmon turns out to be minimal, then under most policy choices, it is unlikely wild salmon would suffer to any great extent. However, if hatchery salmon ultimately prove harmful to wild salmon, per se inclusion spells disaster for wild salmon restoration efforts.

The best alternative under this analysis presents itself immediately: the precautionary per se exclusion of hatchery fish from listing determinations. Even in the (unlikely) scenario where hatchery salmon provide a net benefit to wild salmon, per se exclusion would not result in serious harm to wild salmon, though, in this case, the precautionary approach might cause marginally more harm to salmon than had managers included hatchery salmon per se. However, contrasted with the other extreme, per se inclusion of hatchery fish which ultimately cause net harm, the per se exclusion approach is far preferable. The precautionary approach therefore counsels towards per se exclusion. Deep

[223] *Id.*

[224] *Id.* at 20-21. Straying rates are only one of many potential negative effects caused by hatchery salmon. *See supra* Part I.B. The straying rate is the rate at which salmon "stray" to streams other than their natal streams. While straying may play a significant role in repopulating streams after individual stocks go extinct, when hatchery salmon do this, it has negative consequences for the wild populations in both the natal stream (which as a result has fewer returning adults) and for the strayed-to stream, which may suffer loss of genetic diversity from the interbreeding with an outside-stream fish. Williams, Lichatowich, & Powell, *supra* note 24, at 108.

[225] Waples, *supra* note 50, at 20.

[226] *Id.*

ecological philosophy offers further support for per se exclusion of hatchery salmon. Simply because hatchery salmon are "different" (and likely in a negative way), a deep ecologist would exclude them, possibly even placing them in separate ESUs.

C. A Deep Ecological Approach to Salmon Conservation

> There are two great streams of environmentalism in the latter half of the twentieth century. One stream is reformist, attempting to control some of the worst of the air and water pollution and inefficient land-use practices in the industrialized nations and to save a few of the remaining pieces of wildlands as "designated wilderness areas." The other stream supports many of the reformist goals but is revolutionary, seeking a new metaphysics, epistemology, cosmology, and environmental ethics of person/planet.[227]

In 1972, Norwegian philosopher Arne Naess introduced the concept of "deep ecology" to the ecological and philosophical traditions.[228] The foundation of his theory was that the existing environmental movement subscribed to a "shallow" ecological philosophy that was myopically focused on avoiding resource depletion and environmental pollution and principally intended to protect anthropocentric interests in the environment.[229] Naess recognized that many of our environmental goals could ultimately be interpreted as promoting the long-term viability of human society, rather than long-term ecological viability.[230] In its stead, Naess offered a "deep ecology," a philosophy dedicated to the rejection of human-oriented and materialistic notions of environmental protection. Deep ecology focuses on the "relational, total-field image" of nature of which humans are just one part.[231] It posits that humans are a part of nature instead of external adversaries from which nature must be protected. Naess's theory is a logical predecessor to modern ecosystem-based management concepts that seek to protect biodiversity, preserve all organisms's right to live, and ensure that species can sustain themselves without long-term human intervention.

The ESA is a reflection of the deep ecological movement, with its systematic focus and concentration on harmonizing the human role within ecosystems rather than on protecting resources from the dangers of human action. The

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227 Bill Devall, *The Deep Ecology Movement*, 20 NAT. RES. J. 299 (1980), *reprinted in* ECOLOGY: KEY CONCEPTS IN CRITICAL THEORY 125 (Carolyn Merchant ed., Prometheus Books 1999).

228 Arne Naess, *Deep Ecology*, 16 INQUIRY 95 (1972), *reprinted in* ECOLOGY: KEY CONCEPTS IN CRITICAL THEORY, *supra* note 227, at 120.

229 *Id.*

230 Of course, critics may argue that these values may overlap and that ecological viability can support human society, at least to some extent. Naess's point, though, was that our principal focus should be on the systems themselves, not on what the systems can do for us if maintained.

231 Naess, *supra* note 228, at 120-22.

imperative to preserve "the ecosystems upon which endangered and threatened species depend" neatly integrates with the holistic and spiritual imperatives of deep ecologists. "Diversity enhances the potentialities of survival, the chances of new modes of life, the richness of forms."[232] Naess, in this statement, articulates one of the principal goals of the ESA: preserving biodiversity.[233] His statement also echoes the complexities in the life history of salmon.[234]

The ESA's roots run to deep ecological beginnings. The Act was born during a prolific time of environmental concern, closely linked to Rachel Carson and the very first Earth Day. The Act's unique language, focusing on ecosystems and the interdependence of species, makes it the only deep ecological environmental statute of that, or perhaps any, era. The ESA stands to protect wild species, the "true" organisms, not specimens, collections, or economically beneficial systems.[235] As Holly Doremus puts it, in her meditation on the intrinsic value of wild organisms, "[d]omestication deprives wild creatures of their aura, their magic, the essence for which we should be protecting them."[236] Hatchery salmon are the equivalent of tigers in zoos, capable of meeting our selfish aesthetic, cultural, and economic needs and providing undoubtedly valuable services, but entirely lacking the important underlying value of wildness. If a tiger only existed in the zoo, our visceral and spiritual connection to his "complete" wild self would be lacking and our fuller experience of a tiger would not coalesce. The same goes for salmon.

The ESA was meant to ensure that we continue to have the experience of a tiger in a zoo, but that the experience is always informed by our understanding that he is only an example of a greater thing, the species. It is intended to allow a species to survive, despite humanity's profound ability to alter its ecosystem and deplete its numbers. In its report during the ESA hearings, the Committee on Merchant Marine and Fisheries, noting that species come and go all the time, told Congress that the disappearance of a species is nevertheless:

> an occasion for caution, for self-searching and for understanding. Man's presence on Earth is relatively recent, and his effective domination over the world's life support systems has taken place within a few short generations. Our ability to destroy, or almost destroy, all intelligent life on the planet became only apparent this generation. A certain humility, and a sense of

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[232] *Id.* at 121.

[233] *See e.g.*, 16 U.S.C. § 1541(b) ("The purposes of this Act are to provide a means whereby the *ecosystems* upon which endangered species depend may be conserved, to provide a program for the conservation of such *endangered species and threatened species* . . . .") (emphasis added).

[234] *See supra* note 16 and accompanying text (discussing diversity of salmon life histories to avoid over-investment in one strategy).

[235] *See supra* notes 74-75 and accompanying text.

[236] Holly Doremus, *Restoring Endangered Species: The Importance of Being Wild*, 23 HARV. ENVTL. L. REV. 1, 3 (1999).

urgency, seem indicated.[237]

In these statements, the Committee suggested that the ESA is different, that it is an opportunity for society to at last consider its profound power and strength and to seek to protect the defenseless species by considering our impacts.

In its hearings, the Senate recognized that wild species provide services and goods to humans (the traditional notion of ecosystem services) but that they also "perform vital biological services to maintain 'a balance of nature' within their environments."[238] Avoiding anthropocentric rhetoric, the House noted that the goal of the ESA was to return "species to the point where they are valuable components of their ecosystems."[239]

These statements, combined with the express goal of protecting the ecosystems on which species depend, show that Congress and the agencies that supported the ESA were increasingly aware of how interconnected man and planet are, and that species could not be protected simply through artificial propagation, replenishment, or collection in protected zoos. Congress passed a law unlike any law before or after it, a law that sought to protect the interconnectedness of things, and in doing so, to protect the things themselves. Relying on artificial propagation will do very little or nothing to accomplish the goals of the ESA, as expressed in the document itself or in the deep ecological statements of Congress.

Even if the ESA lacked such strong support for a deep ecological approach, as science and policy adopt a more deep ecological structure, the ESA ought to follow. Jane Lubchenco argued in 1998 that society was on the cusp of a "Century of the Environment."[240] Recognizing that the planet is "human-dominated," Lubchenco argued that our improved understanding of the interconnectedness of species, ecosystems, and human impacts lends itself to more integrated policy.[241] Lubchenco was identifying the progression of environmental policy towards cleaner integration with ecosystem science. Environmental change has become so significant in magnitude and scope that we need to change our approach. We ought to redefine the environment to encompass the integrated system that it is, rather than the pretty thing we like to enjoy on the weekends and clean up once in a while. The ESA is the precursor to this new century of the environment, where we will focus not only on the impacts of our actions, but on how to best integrate society with ecology to the point that the ecosystems we rely on can sustain themselves. As she assumes her new role as head of NOAA under the Obama administration, perhaps

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237 H.R. REP. NO. 93-412, at 4 (1973).

238 S. REP. NO. 93-307, at 2 (1973).

239 H.R. Rep. No. 95-1625, at 5 (1978).

240 Jane Lubchenco, *Entering the Century of the Environment: A New Social Contract for Science*, 279 SCIENCE 491, 491 (1998).

241 *Id.* at 491-93.

Lubchenco herself can lead the way.[242] A conscientious and accomplished scientist, she now has the extraordinary and unique opportunity to guide that agency towards a hatchery policy consistent with her holistic view of the world.

Hatcheries, in their current incarnation, are irreconcilable with the deep ecology of the ESA. They are the equivalent of domestication in theory and effect. The original impetus of salmon hatcheries was to supplement and replace an overharvested resource. They were a short-sighted cure for one of humanity's recurring problems. Until only very recently, little thought was ever put into the idea of unifying hatcheries with ecosystems. Despite some reform, hatcheries still show their shallow ecological roots, born of the "preoccup[ation] with . . . resource depletion, and concerned mainly with 'the health and affluence of people in developed countries.'"[243] The Hatchery Listing Policy and, more generally, the approaches taken by NMFS on the hatchery issue over the past decades, are inconsistent with the deep ecological underpinnings of the ESA and should be altered to adopt a closer theoretical basis with deep ecological thought.

To be consistent with the ESA, agency interpretations of the statute should maintain theoretical harmony with its deep ecological reasoning. NMFS's policies must reflect society's view of the "ultimate value" in salmon, which, from a deep ecologist's perspective, prefers complexity to complication and unity over dualism.[244] The "ultimate value" in salmon envisioned by the ESA is a self-sustaining salmon-based ecosystem that supports many ESUs which face no danger of extinction. This is not to say that hatcheries couldn't theoretically be integrated into that "ultimate value." A hatchery system that incorporates the concepts of interrelatedness and complexity inherent in the ESA and deep ecological thought could potentially meet the goal of sustainability. The current hatchery policy and system at large do not, however, reflect these ideas.

Deep ecology supports a definition of species or subspecies that is informed by the ecosystem in which it is found and the wildness inherent in that existence. The ESU and stock concepts for salmon fit within that notion and were a foundational step towards a general ESA policy focused on ecosystems and wildness. Naess saw organisms as "knots in a biospherical net or field of intrinsic relations."[245] Under this view of the natural world, we can't simply add a "knot" and call it the same as a preexisting "knot," even if the two "knots" are technically equivalent under our current understanding of genetics and we have taken pains to fashion the new "knot" from our best guess at how the old "knot"

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[242] Juliet Eilperin, *NOAA Set for Larger Policy Role Under First Female Chief*, WASH. POST, Mar. 21, 2009, at A06.

[243] George Sessions, *Introduction to Deep Ecology*, *in* ENVIRONMENTAL PHILOSOPHY: FROM ANIMAL RIGHTS TO RADICAL ECOLOGY 161-62 (Michael E. Zimmerman et al. eds., 1993) (quoting Naess, *supra* note 228, at 120).

[244] Devall, *supra* note 227, at 132; Naess, *supra* note 228, at 120-22.

[245] Naess, *supra* note 228, at 120.

evolved. A deep ecological definition of a species, subspecies, or ESU sees species as relational, so that a species is defined not just by its genetic makeup, but also by where it is found and how it behaves. Under that definition, a hatchery-born Chinook salmon in the Sacramento River is not the same as a wild Winter-Run Chinook in the same river because of differences in the habitat they initially use and their behavior in the natal stream, as well as their ocean habitats, after release. Because the hatchery salmon has potentially lower reproductive fitness and may cause harm to the wild fish, they cannot share the same definition. If they did, the wild Winter-Run Chinook would eventually cease to exist if the threats of hatchery salmon prove correct.

Current research suggests that hatchery fish pose a threat to wild salmon. A deep ecologist would look at the current hatchery programs and policies and see a reactionary paradigm, a shallow ecology that will fail in the way that so many reactionary approaches fail: because they do not account for the inherent interrelatedness of nature and the consequences of short-sighted approaches to ecological problems. When reactionary policies govern, we fix one problem only to create another. The alternative is an integrated action that aims for unity in its solution to ecological problems, which celebrates interrelatedness and aims to restore complexity to the altered systems.[246] In the salmon restoration context, this approach begins with a habitat-based restoration policy and, necessarily, the per se exclusion of hatchery salmon from ESA listings absent compelling evidence of significant benefits for salmon restoration.

CONCLUSION

There is an appreciable body of scientific literature calling into question the efficacy and impacts of hatchery salmon as a restoration or mitigation strategy for endangered and threatened salmon. Despite the Ninth Circuit's decision, NMFS now has an opportunity to move beyond its narrow genetic focus and to consider how hatcheries fit into the larger ecosystem that the ESA is intended to protect and restore. Salmon need healthy rivers and ecosystems to survive, not just abundance. If Jane Lubchenco's NMFS chooses to revise the Hatchery Listing Policy in the post-*Trout Unlimited* era, that policy should reflect this sentiment and integrate salmon management with deep ecological concepts.

Salmon management has traditionally focused on water availability, riverine habitat, hatcheries, and commercial harvest, but usually all in isolation. As Trout Unlimited, the organization, and NMFS scientists have both noted, responsible salmon management and restoration policy need to go beyond the four H's (Hatcheries, Habitat, Harvest, and Hydropower) and begin to consider how these four major problems interact, as well as the increasingly important element of ocean conditions.[247] The Pacific Decadal Oscillation ("PDO") and El

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[246] *See generally* Naess, *supra* note 228; Devall, *supra* note 227.

[247] Mary H. Ruckelshaus et al., *The Pacific Salmon Wars: What Science Brings to the*

Nino increasingly are seen as major elements in the productivity and success of salmon.[248] Some have attributed recent gains in the Snake River summer steelhead to good hatchery practices and better harvest management. However, the PDO is now seen as a major driving force in those gains and has been closely linked to salmon productivity, such that when plotted together, salmon productivity nearly mirrors the PDO.[249] This is only one example of how we must move to an integrated management regime and adopt the view that salmon restoration can only succeed when we seek to manage them within their entire ecosystem.

Today, there is a listed ESU with associated habitat covering almost every mile of U.S. coastline between the Mexican and Canadian borders and extending deep into the country to the Idaho-Montana border.[250] Slightly more than fifty percent of all salmonid ESUs identified on the Pacific coast are threatened or endangered.[251] This represents a massive failure to restore salmon to self-sustaining levels. It is time for NMFS and USFWS to return to the ecosystem-based, deep ecological roots of the ESA. Hatcheries are not saving the salmon under the current regime.[252] They are failing to meet the basic standards of the Act and therefore cannot logically be considered in ESA listing determinations. Absent clear and convincing proof that an individual hatchery program has beneficial, not just neutral, effects on a given ESU of wild salmon, the agencies should exclude hatchery fish from listing determinations. Despite the Ninth Circuit's deference to the Hatchery Listing Policy, NMFS and USFWS ought to revisit their position on hatcheries. The agencies should also reconsider their position on ESUs, perhaps leaning towards the Joint DPS policy, which arguably allows for exclusion of hatchery fish from a given ESU.

At a larger scale, wildlife management and restoration policy should continue its progression towards ecosystem-based management, and stay true to the goal of the ESA to conserve and restore wildlife and ecosystems, not resources. Salmon is that perfect organism that is incredibly valuable to human extractive interests as well as to wide-ranging and important ecosystems. Wild salmon declines and the hatchery problem represent an excellent test case for how to

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Challenge of Recovering Species, 33 ANN. R. ECOLOGY & SYSTEMATICS 665, 679-85 (2002); RICK WILLIAMS, JIM LICHATOWICH, PHIL MUNDY, & MATT POWELL, TROUT UNLIMITED, A BLUEPRINT FOR HATCHERY REFORM IN THE 21ST CENTURY (2005), *available at* http://www.tu.org/atf/cf/%7B0D18ECB7-7347-445B-A38E-65B282BBBD8A%7D/landscapemedia.pdf (last visited Mar. 9, 2009).

248 Ruckelshaus et al., *supra* note 247, at 683-84.

249 Lichatowich et al., *supra* note 44, at 441-44.

250 Ruckelshaus et al., *supra* note 247, at 671.

251 *See supra* notes 199-200 and accompanying text.

252 In fact, current research suggests that hatcheries may simply be replacing wild fish at astounding proportions. *See, e.g.*, Rachel Barnett-Johnson, et al., *Identifying the Contribution of Wild and Hatchery Chinook Salmon (*Oncorhynchus tshawytscha*) to the Ocean Fishery Using Otolith Microstructure as Natural Tags*, 64 CAN. J. FISHERIES & AQUATIC SCI. 1683, 1688-91 (2007).

bring ESA policy, and environmental policy in general, into the new century. Our perspèctives must broaden to see the value of salmon in a stream, living and dying as they have for millennia, contributing to healthy forest and riverine ecosystems as well as to the human economy.