One Fish, Two Fish: Suggestions for the Treatment of Hatchery Fish under the Endangered Species Act

*Katy Lum**

Although conservation groups and fishing industries alike have relied on salmon hatcheries to slow the dramatic decline in salmon and steelhead species since the nineteenth century, the proper place of hatchery-raised salmon under the Endangered Species Act remains uncertain. When the hatchery and wild fish intermix, genetic and behavioral differences between the two groups can harm wild fish populations, the precise group the Endangered Species Act is intended to protect. In 2009, the Ninth Circuit upheld a hatchery listing policy that groups hatchery and wild fish and allows an abundance of hatchery fish to effectively prevent wild populations from receiving needed Endangered Species Act protection. Because of ample scientific evidence indicating that hatchery and wild fish should be placed in separate Conservation Units, changing the way that current classification policies are applied to salmon and steelhead species would allow the National Marine Fisheries Service and the Fish and Wildlife Service to formulate a hatchery listing policy that is more closely in line with the goals of the Endangered Species Act.

* J.D. Candidate, University of California, Berkeley, School of Law, 2011; B.A., Political Science, Northwestern University, 2006. Sincerest thanks to my advisor, Holly Doremus, for her wonderful guidance during the writing process, Bob Infelise for co-teaching an excellent writing seminar, the editorial board of ELQ for all their hard work, and A Cuppa Tea for endless supplies of caffeine and study space.

INTRODUCTION

The classification of artificially propagated salmon under the Endangered Species Act (ESA) has proved to be an intractable problem for the responsible agencies. It calls into question the effects of artificial propagation on the species' wild members, the grouping and evaluation of species for ESA listing, and fundamental beliefs about the purposes of the ESA and how best to meet its goals.

As far back as the 1800s, the dramatic decline of wild salmon and steelhead species led to the construction and use of hatcheries to bolster population size,[1] particularly for human consumption. Hatcheries grew in size and number throughout the twentieth century as the construction of dams destroyed salmon habitats and blocked traditional migratory routes.[2] In the past few decades, human activities such as forestry, agriculture, mining, dam construction, urbanization, and water diversions have further decimated salmon and steelhead populations, particularly in the Pacific Northwest.[3] Today, approximately 70 to 80 percent of the fish in coastal salmon and steelhead fisheries are of hatchery origin.[4]

When salmon and steelhead species are considered for listing under the ESA, two questions must be answered: (1) which populations of fish constitute a listable entity (a "Conservation Unit" or "Unit"); and (2) if the biological state of that entity qualifies it for threatened or endangered status. Given the diverse array of species concepts in the scientific literature,[5] these questions are difficult to answer even without introducing the additional complication of hatchery fish, which are artificially bred and reared in captivity before being released into the wild.

Because hatchery fish are bred from wild populations, they may appear to be genetically similar enough to wild fish to be considered the same species; however, they exhibit behavioral and morphological differences that distinguish them from the natural fish with which they might otherwise be grouped. Additionally, interactions between hatchery and natural fish can result in decreased genetic variation in wild fish, increased competition between hatchery and wild fish for scarce

---

1. National Marine Fisheries Service Northwest Regional Office, Hatcheries (Artificial Propagation), http://www.nwr.noaa.gov/Salmon-Harvest-Hatcheries/Hatcheries/Index.cfm [hereinafter Hatcheries] (last visited Feb. 26, 2010).

2. *Id.*

3. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead, 71 Fed. Reg. 834, 855 (Jan. 5, 2006) (to be codified at 50 C.F.R. pts. 223, 224).

4. Hatcheries, *supra* note 1.

5. For a discussion of twenty-six different species concepts in modern literature, see John Wilkins, *Species, Kinds, and Evolution*, 26 REP. OF THE NAT'L CENTER FOR SCI. EDUC. 36 (2006), *available at* http://ncse.com/rncse/26/4/species-kinds-evolution.

resources, and the spread of disease.[6] Thus, it is unclear whether hatchery fish and natural fish should be grouped in the same Conservation Unit and, if so, how hatchery fish and their effects on natural fish should be assessed when determining the status of that Unit for ESA listing purposes.

In 2005, the National Marine Fisheries Service (NMFS) promulgated a policy ("Hatchery Listing Policy") that addressed these issues.[7] The policy allows NMFS to group hatchery fish and natural fish in the same Conservation Unit and gives NMFS considerable discretion in counting hatchery fish for ESA listing purposes.[8] Thus far, NMFS has chosen to exercise this authority in scientifically unsound ways.

In the recent case *Trout Unlimited v. Lohn*, the Ninth Circuit upheld NMFS's policy against attack from both environmental and industry-related groups.[9] The *Trout Unlimited* decision, while legally sound because of the deference owed to agency decisions, had the practical effect of affirming the unwise Hatchery Listing Policy and the questionable species categorization schemes upon which it is based.

In this Note, I discuss the legal landscape surrounding hatchery fish, which imposes few restrictions on the U.S. Fish and Wildlife Service (FWS) and NMFS (collectively, the "Services"), and the relevant science, which suggests that the current policy is unwise. Next, I propose two alternative solutions: one, the Services could, even without changing the current ESU and DPS policies, choose never to group hatchery fish and wild fish in the same Unit; two, NMFS could revise the Hatchery Listing Policy to preclude barring an ESA listing based in substantial part on the abundance of hatchery (as opposed to natural) fish. The total separation of hatchery and wild fish would allow the Services to give wild fish necessary ESA protection without also needlessly protecting the hatchery-raised fish that harm their wild cousins, while not allowing hatchery abundance to bar listing would at least protect the wild fish and force the Services to consider the consequences of grouping hatchery and wild fish in the same Conservation Unit. I will also demonstrate, given the context of the ESA and the framework established by *Trout Unlimited* and its predecessors, why each proposal is feasible, logical, and within the agencies' respective authority.

---

6. *See generally* Karry A. Naish et al., *An Evaluation of the Effects of Conservation and Fishery Enhancement Hatcheries on Wild Populations of Salmon*, 53 ADVANCES IN MARINE BIOLOGY 61 (2008) (addressing ecological consequences of interactions between hatchery and wild fish).

7. Policy on the Consideration of Hatchery-Origin Fish in Endangered Species Act Listing Determinations for Pacific Salmon and Steelhead, 70 Fed. Reg. 37,204 (June 28, 2005) [hereinafter Hatchery Listing Policy].

8. *Id.* at 37,215–16.

9. Trout Unlimited v. Lohn (*Trout II*), 559 F.3d 946 (9th Cir. 2009).

I. REGULATING HATCHERY FISH

A. *The Endangered Species Act*

Congress enacted the ESA in 1973 with the purpose of "provid[ing] a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved . . . ."[10] NMFS and FWS are jointly responsible for the administration of the ESA,[11] under which they share a number of responsibilities. Three of these responsibilities are at issue here.

First, in order to protect a population of fish under the ESA, the Services must decide whether that particular population constitutes or belongs to either a "species" or "distinct population segment" (DPS). The ESA defines a "species" to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."[12] The ESA does not define "distinct population segment." However, courts have recognized that by listing a DPS, an agency can "provide different levels of protection to different populations of the same species."[13]

Second, if the Services define a particular population as a species or DPS, they must then decide whether to "list" that species or DPS as either endangered or threatened.[14] A species or DPS is "endangered" if it is "in danger of extinction throughout all or a significant portion of its range."[15] A species or DPS is "threatened" if it is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."[16] When making its listing determinations, the Services must use the "best scientific and commercial data available . . . after conducting a review of the status of the species."[17]

Third, the Services must provide certain legal protections to a species or DPS listed as endangered or threatened.[18] The ESA prohibits "take" of an endangered species or DPS:[19] no one may "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" it.[20] For a threatened

10. 16 U.S.C. § 1531(b) (2006).

11. The FWS is primarily responsible for terrestrial and freshwater organisms while NMFS is responsible for marine organisms and anadromous fish like salmon. U.S. FISH & WILDLIFE SERVICE, ESA BASICS 1 (2009), *available at* http://www.fws.gov/Endangered/factsheets/ESA_basics.pdf.

12. 16 U.S.C. § 1532(16).

13. Nat'l Ass'n of Home Builders v. Norton, 340 F.3d 835, 842 (9th Cir. 2003).

14. 16 U.S.C. § 1533(a)(1).

15. *Id.* § 1532(6).

16. *Id.* § 1532(20).

17. *Id.* § 1533(b)(1)(A).

18. *Id.* § 1538.

19. *Id.* § 1538(a)(1)(B).

20. *Id.* § 1532(19).

species or DPS, the Services must give whatever protection that they deem "necessary and advisable to provide for the conservation of such species,"[21] which "may include regulated taking" where "population pressures within an ecosystem cannot otherwise be relieved."[22] In other words, "take" of a threatened species is permitted, and thus the "threatened" distinction can be used as a tool when a species needs ESA protection but is threatened by population pressure, though adopting this strategy robs the species of protections available under the "endangered" label.[23]

These three actions—defining a species or DPS, listing it as endangered or threatened, and giving it the legal protections mandated by statute—constitute the core of the Services' administration of the ESA.

B. *Service Policies and Prior Litigation*

Since the ESA does not define DPS, the Services enacted two complementary policies in the 1990s to fill in the details—the ESU Policy and the DPS Policy—both of which are still in force.[24] Around the same time, the Services also implemented an interim policy targeted specifically at hatchery fish;[25] however, the court in *Alsea Valley Alliance v. Evans* rejected this policy. The ESU Policy, the joint DPS Policy, and the *Alsea Valley* decision all provide an important backdrop to the current controversy.

1. *The ESU Policy*

In 1991, NMFS defined a DPS (and hence also a "species") under the ESA as an "evolutionarily significant unit" (ESU) of the biological species.[26] In order to qualify as an ESU, a population must satisfy two criteria: "(1) It must be substantially reproductively isolated from other conspecific population units; and (2) it must represent an important

21. *Id.* § 1533(d).

22. *Id.* § 1532(3).

23. *Id.* § 1533(d).

24. 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]; Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act, 61 Fed. Reg. 4,722 (Feb. 7, 1996) [hereinafter DPS Policy].

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

26. *See* ESU Policy, *supra* note 24, at 58,612. Although beyond the scope of this paper, there is some debate as to whether an ESU is the appropriate way to define a DPS for ESA listing purposes. For a critique of the ESU Policy, *see* David S. Pennock & Walter W. Dimmick, *A Critique of the Evolutionary Significant Unit as a Definition for "Distinct Population Segment" under the U.S. Endangered Species Act*, 11 CONSERVATION BIOLOGY 611 (1997).

component in the evolutionary legacy of the species."[27] To satisfy the second prong, if the population were to become extinct, that extinction must "represent a significant loss to the ecological and genetic diversity of the species."[28]

2. *The DPS Policy*

In 1996, NMFS and FWS jointly issued a policy to clarify their interpretation of DPS.[29] The Services maintained that the DPS Policy was consistent with the earlier ESU Policy, characterizing the ESU Policy as a "detailed extension" of the newer DPS Policy.[30] Both an ESU and a DPS are valid units for ESA listing purposes. I will use the word "Unit" or "Conservation Unit" when I talk about them together.

Under the DPS Policy, the Services must consider three elements when determining whether a population constitutes a DPS:

> (1) Discreteness 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; (3) The population segment's conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).[31]

The first factor, discreteness, is further defined: a population is "discrete" if it is "markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors."[32] The second and third factors give weight to the population's importance to the species and the threatened or endangered nature of that population, respectively.

The ESU Policy and the DPS Policy are largely similar in their analyses of what constitutes a DPS. The most significant difference is the DPS Policy's decreased emphasis on genetic isolation, which is the result of measuring "discreteness" as a function of "physical, physiological, ecological, or behavioral factors," as opposed to the ESU Policy's

---

27. ESU Policy, *supra* note 24, at 58,618.

28. *Trout II*, 559 F.3d 946, 950 (9th Cir. 2009) (quoting ESU Policy, *supra* note 24, at 58,618).

29. DPS Policy, *supra* note 24, at 4,722.

30. *Id.* at 4,722.

31. *Id.* at 4,725.

32. DPS Policy, *supra* note 24, at 4,725. A Taxon is "[a] taxonomic unit, whether named or not: i.e. a population, or group of populations of organisms which are usually inferred to be . . . related and which have characters in common which differentiate (*q.v.*) the unit (e.g. a geographic population, a genus, a family, an order) from other such units." INTERNATIONAL COMM'N OF ZOOLOGICAL NOMENCLATURE, INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE GLOSSARY, *available at* http://www.iczn.org/iczn/index.jsp?booksection=glossary&nfv=true (last visited Mar. 7, 2010).

emphasis on substantial reproductive isolation.[33] Since the Services have categorized the ESU Policy as a "detailed extension" of the DPS Policy, either is a valid route to listing. For example, NMFS applies the DPS Policy to steelhead populations, but applies the ESU Policy to Pacific salmon populations.[34]

3. *The Interim Policy and* Alsea Valley Alliance v. Evans

In 1993, NMFS promulgated an interim hatchery policy that allowed the Services to group hatchery fish and natural fish in the same ESU.[35] Since hatchery fish are bred from natural runs, the policy reasoned, both hatchery fish and natural fish may contain the same genetic resources that are important to the species' evolutionary legacy.[36] However, the policy also generally concluded that for the purposes of the ESA, only natural fish could be actually listed as endangered or threatened—hatchery fish could only be listed if they were determined to be essential for the recovery of the endangered or threatened natural fish population.[37] From a practical standpoint, the hatchery fish were given no protection, even though they were technically a part of a protected ESU.

In 1995, NMFS completed a status review of coho salmon and proposed to list three ESUs as threatened, including the Oregon Coast ESU.[38] The final rule designated the Oregon Coast ESU as threatened, but pursuant to the Interim Policy, it only listed and protected naturally spawned salmon within that ESU.[39]

In 2001, the Alsea Valley Alliance successfully challenged the Interim Policy in court by challenging its application to the Oregon Coast ESU.[40] In holding for the Alliance, the district court reasoned that NMFS's policy made "improper distinctions, below that of a DPS, by

33. Trout Unlimited v. Lohn (*Trout I*), No. CV06-0483-JCC, 2007 U.S. Dist. LEXIS 42858, at *10 (W.D. Wash. June 13, 2007); *see also* DPS Policy, *supra* note 24, at 4,725; *cf.* ESU Policy, *supra* note 24, at 58,618.

34. *See* DPS Policy, *supra* note 24, at 4,722; Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead; Final Rule, 71 Fed. Reg. 833, 834 (2006) [hereinafter Reevaluation of 10 Steelhead DPSs]. The reason for applying the ESU Policy to pacific salmon and the DPS policy to steelhead is jurisdictional: NMFS is responsible for pacific salmon and the ESU is a NMFS policy, while the DPS policy (a joint NMFS/FWS policy) applies to steelhead because of the Services' concurrent jurisdiction over the steelhead. *See* Reevaluation of 10 Steelhead DPSs, *supra* note 34, at at 834.

35. JEFFERY J. HARD ET AL., PACIFIC SALMON AND ARTIFICIAL PROPAGATION UNDER THE ENDANGERED SPECIES ACT NOAA TECHNICAL MEMORANDUM NMFS-NWFSC-2 5 (1992), *available at* http://www.nwfsc.noaa.gov/publications/techmemos/tm2/tm2.html#IV4.

36. *Id.*

37. Interim Policy, *supra* note 25, at 17,575.

38. Endangered and Threatened Species; Threatened Status for the Oregon Coast Evolutionarily Significant Unit of Coho Salmon, 63 Fed. Reg. 42,587–88 (Aug. 10, 1998).

39. *Id.* at 42,589.

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

excluding hatchery coho populations from listing protection even though they are determined to be part of the same DPS as natural coho populations."[41] Thus, in the wake of *Alsea Valley Alliance*, once NMFS has designated which population(s) of fish constitute a Conservation Unit, it must either list the whole Unit or not list it at all.

C. *The Current Controversy: The 2005 Hatchery Listing Policy and* Trout Unlimited

1. *The Hatchery Listing Policy*

Rather than appeal the district court's ruling in *Alsea Valley*, NMFS decided to revise its hatchery policy to bring it in line with the court's decision.[42] The Hatchery Listing Policy, finalized in 2005, affirmed that hatchery stocks with sufficient genetic similarities to natural populations "(a) are considered part of the ESU; (b) will be considered in determining whether an ESU should be listed under the ESA; and (c) will be included in any listing of the ESU."[43]

The Hatchery Listing Policy emphasized the importance of wild fish and provided that NMFS would apply the policy "in support of conservation of naturally spawning populations" and would include hatchery fish in assessing an ESU's status "in the context of their contributions to conserving self-sustaining populations."[44] NMFS would determine the status of the ESU by considering four elements: abundance, productivity, genetic diversity, and spatial distribution.[45] During the status consideration, NMFS would take into account the effects of hatchery fish, both positive and negative, on these four elements.[46]

Finally, the Hatchery Listing Policy acknowledged that most hatchery programs produce more fish than are useful for conservation.[47] For threatened ESUs, NMFS can exercise its section 4(d) authority to

41. *Id.* at 1162.

42. Endangered and Threatened Species: Findings on Petitions to Delist Pacific Salmonid ESUs, 67 Fed. Reg. 6,215 (Feb. 11, 2002); Trout Unlimited v. Lohn (*Trout I*), No. CV06-0483-JCC, 2007 U.S. Dist. LEXIS 42858, at *25 (W.D. Wash. June 13, 2007).

43. Hatchery Listing Policy, *supra* note 7, at 37,215. Although the Hatchery Listing Policy uses only the term "ESU," the Services have applied it equally to both salmon, which are governed by the ESU policy, and steelhead, which are governed by the joint DPS Policy. *See* 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 (2005) [hereinafter Reevaluation of 16 Salmon ESUs]; Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 833.

44. Hatchery Listing Policy, *supra* note 7, at 37,215.

45. *Id.*

46. *Id.*

47. *Id.* at 32,716; *see also Trout II*, 559 F.3d 946, 952 (9th Cir. 2009).

permit take of the surplus hatchery fish, which the hatchery staff would mark by clipping the fish's adipose fins.[48] On the other hand, NMFS is not permitted to allow take of any species listed as endangered.[49] As such, for threatened ESUs, NMFS retains the power to treat hatchery fish differently from natural fish. This difference in permitted treatment may encourage the agency to list a species as threatened rather than endangered, particularly when the regulated take of a segment of the Conservation Unit has significant economic value.

2. Trout Unlimited v. Lohn

At issue in *Trout Unlimited* was the downlisting of the Upper Columbia River steelhead ESU from "endangered" to "threatened."[50] NMFS originally listed the ESU as endangered in 1997 due to the decline of natural populations, both in absolute numbers and relative to the numbers of hatchery fish in the habitat.[51] After the Hatchery Listing Policy took effect, NMFS conducted a status review of twenty-six species of salmon and steelhead. The application of the Hatchery Listing Policy to the Upper Columbia River steelhead population resulted in the inclusion of six hatchery stocks within the same ESU as the natural fish, despite the fact that those stocks had different characteristics, including an accelerated spawning timetable and an earlier maturation period.[52]

Shortly after re-evaluation of the ESU, NMFS rejected a petition filed by Trout Unlimited to split natural fish and hatchery fish into separate ESUs.[53] Although agency scientists still expressed serious concern about the viability of the natural populations in the Upper Columbia River, NMFS concluded that because the inclusion of hatchery stocks increased overall abundance, they mitigated the immediacy of the extinction risk in the short term.[54] The ESU was then downlisted from endangered to threatened.[55]

48. Hatchery Listing Policy, *supra* note 7, at 32,716; *see also Trout II*, 559 F.3d at 952.

49. 16 U.S.C. § 1538(a)(1)(B) (2006).

50. Trout Unlimited v. Lohn (*Trout I*), No. CV06-0483-JCC, 2007 U.S. Dist. LEXIS 42858, at *8 (W.D. Wash. June 13, 2007).

51. *Id.* at *9.

52. *Trout II*, 559 F.3d at 952; Answering Brief of the Plaintiffs-Appellees at 39–40, *Trout II*, 559 F.3d 946 (9th Cir. 2009) (Nos. 07-35623, 07-35750).

53. *Trout II*, 559 F.3d at 953 (referencing petitions filed by Trout Unlimited).

54. Answering Brief for the Plaintiffs-Appellees, *supra* note 52, at 45–49.

55. *Trout II*, 559 F.3d at 953. In between the proposed downlisting and the final listing determinations, the Services concluded that the composition of the Upper Columbia River steelhead ESU should be determined by the criteria set out in the joint DPS Policy. *Trout I*, 2007 U.S. Dist. LEXIS 42858, at *35. This resulted in the exclusion of several nonanadromous forms of the species, but did not have any effect on the incorporation of hatchery stocks or on the listing recommendation. *Id.* This Note will continue to refer to the Upper Columbia River population at issue as an ESU because that is how the court refers to it.

Following the downlisting, Trout Unlimited and other environmental groups brought suit against the agency.[56] Trout Unlimited had two major claims at the district court level. First, it claimed that NMFS's decision to deny its petition to split natural and hatchery fish into separate ESUs was arbitrary and capricious.[57] Second, it claimed that NMFS violated the ESA by downlisting the Upper Columbia River steelhead ESU and that the Hatchery Listing Policy itself was contrary to the ESA's central purpose of protecting self-sustaining natural populations.[58]

The Building Industry Association and others (collectively, the "Building Industry") intervened on opposite grounds, arguing that the ESA required equal treatment of hatchery fish and natural fish at all stages of the ESA process, and that once NMFS defined an ESU, it may not distinguish among the members of that ESU when making listing decisions.[59] Specifically, the Building Industry challenged NMFS's policy to assess hatchery fish "in the context of their contributions to conserving natural self-sustaining populations," as well as NMFS's decision to prohibit take of only natural fish and certain hatchery fish while permitting take of other, marked hatchery fish.[60]

The District Court for the Western District of Washington held that the Hatchery Listing Policy and the downlisting of the Upper Columbia River steelhead ESU violated the ESA.[61] The court reasoned that to assess decisions based on the entire ESU violated the ESA's central purpose, which is to conserve naturally self-sustaining populations.[62] Additionally, the district court held that "the focus on extinction risks faced by the entire ESU, when that ESU consists of both hatchery and wild salmon, is not supported by the best available scientific data."[63]

However, the court granted summary judgment for NMFS on Trout Unlimited's petition to place hatchery and wild fish in separate ESUs.[64] In addition, the court granted summary judgment for NMFS and against the Building Industry on all of the Building Industry's claims.[65]

All parties appealed. After determining that the Hatchery Listing Policy was entitled to *Chevron* deference,[66] the Ninth Circuit reviewed the claims on their merits.

---

56. *Trout I*, 2007 U.S. Dist. LEXIS 42858, at *1.
57. *Id.* at *39.
58. *Id.*
59. *Id.*
60. *Id.*
61. *Trout II*, 559 F.3d 946, 951 (9th Cir. 2009).
62. *Trout I*, 2007 U.S. Dist. LEXIS 42858, at *62.
63. *Id.* at *67.
64. *Id.* at *72.
65. *Id.*
66. *Trout II*, 559 F.3d at 954. Under *Chevron v. Natural Resources Defense Council*, an agency's interpretation of a statute (such as the ESA) is evaluated based on whether Congress

a. The Petition for Separate ESUs

Trout Unlimited argued that lumping hatchery fish and natural fish together in one ESU ran contrary to the best available science because hatchery fish pose threats to wild fish and no hatchery had ever been shown to promote long-term recovery of wild populations.[67] The Ninth Circuit rejected this claim, reasoning that Trout Unlimited had improperly collapsed two phases of the listing process: the decision to group the hatchery fish with the natural fish in one ESU and the decision regarding that ESU's status.[68] The court commented that defining a species is a neutral task and that the ESA did not require NMFS to consider the threats posed by hatchery fish when determining the composition of the ESU; thus, Trout Unlimited's evidence that hatchery fish harmed wild fish was irrelevant during the composition phase.[69] Further, the court also rejected Trout Unlimited's evidence that "hatchery fish exhibit[ed] important differences from wild fish."[70] Stating that there was no scientific consensus and that Trout Unlimited and NMFS were "engaged in a good faith disagreement . . . supported by science on both sides," the court deferred to the "informed discretion of responsible federal agencies."[71]

b. The Listing Policy and Downlisting of the Upper Columbia River Steelhead ESU

On its second claim, Trout Unlimited argued that the Hatchery Listing Policy and the downlisting of the Upper Columbia River steelhead "def[ied] the ESA's direction to protect the ability of species to sustain themselves in their natural environments."[72] In addition, Trout Unlimited maintained that considering both hatchery and natural fish in the listing decision led to artificially healthy population size, when in fact the natural fish were endangered.[73] The Ninth Circuit agreed that the ESA's primary goal was to "preserve the ability of natural populations to survive in the wild," but it held that Trout Unlimited's claims

has "directly spoken to the precise question at issue." Chevron U.S.A., Inc. v. Natural Res. Def. Council, 467 U.S. 837, 842 (1984). If Congress has done so, then the agency's interpretation must reflect Congress's stated intent. *Id.* at 842–43. If, however, the statute is ambiguous, the agency's interpretation is given deference so long as it based on a "permissible construction of the statute." *Id.* at 843

67. *Trout II*, 559 F.3d at 955.

68. *Id.*

69. *Id.*

70. *Id.*

71. *Id.* The court further explained that it would not "second-guess NMFS's resolution of this scientific question." *Id.* at 956.

72. Answering Brief of Plaintiffs-Appellees, *supra* note 52, at 28.

73. *Id.*

oversimplified the Hatchery Listing Policy.[74] Because the Policy mandated that a listing decision consider both the positive and the negative effects of hatchery fish on the viability of natural populations, the court reasoned, the Policy was consistent with the plain language and goals of the ESA.[75] With respect to the downlisting of the ESU, the court, citing numerous scientific documents from the record, held that the downlisting "plainly involved scientific and technical expertise" and that NMFS was entitled to decide between conflicting scientific evidence without being second-guessed by the court.[76]

c. *Equal Treatment*

The Building Industry argued, among other things, that *Alsea Valley* did not permit any separate treatment once the hatchery and natural fish had been grouped into the same ESU.[77] The court rejected this argument, holding that *Alsea Valley* did *not* stand for "equal treatment" of hatchery fish and wild fish, but merely for the "separate and distinct proposition" that once NMFS determines the composition of an ESU, it is faced with a binary decision: either list the whole ESU, or list none of it at all.[78]

The Ninth Circuit thus upheld NMFS's Hatchery Listing Policy against attack from both sides of the environmental spectrum. While the Ninth Circuit's decision was within the bounds of the law, particularly because of the heightened deference courts show to the "informed exercise of agency discretion" in an area of agency expertise,[79] the Hatchery Listing Policy still contains two major flaws: first, it liberally allows hatchery fish and wild fish to be grouped in the same ESU; and second, it allows the abundance of hatchery fish to bar or lessen ESA protection. In the next three Parts, I discuss the scientific evidence in favor of hatchery-wild separation and argue that even if kept in the same Conservation Unit, hatchery fish should never bar ESA listing.

II. HATCHERY FISH AND WILD FISH SHOULD NEVER BE PLACED IN THE SAME CONSERVATION UNIT

Even in the most carefully managed hatchery, differences between hatchery and wild fish are inevitable.[80] Since these differences have

74. *Trout II*, 559 F.3d at 957.
75. *Id.*
76. *Id.* at 958.
77. *Id.* at 960.
78. *Id.* at 961.
79. *Id.* at 955 ("In applying this standard, we defer to the informed exercise of agency discretion, especially where that discretion is exercised in an area where the agency has special 'technical expertise.'" (quoting Marsh v. Or. Natural Res. Council, 490 U.S. 360, 377 (1989))).
80. Hatchery Listing Policy, *supra* note 7, at 37,208.

proved harmful in hatchery-wild interactions and because not all hatcheries are carefully managed, my first suggestion to the Services is that *hatchery and wild fish should never be placed in the same Conservation Unit.* In this Part, I will discuss the genetic, behavioral, and interactive bases for such a distinction and explain how the Services can separate hatchery from wild fish without changing their current ESU or DPS policies, although they will have to alter how those policies are applied. Thus far, the Services have been reluctant to change anything about their classification policies, including their application. So, in the alternative, I suggest a change in the Hatchery Listing Policy so that, if hatchery fish and wild fish are in the same Unit, *the abundance of hatchery fish can never block an ESA listing.* I will also demonstrate that both of these suggestions are consistent with current case law.

A. Hatcheries Create Unique Problems for the Composition of Conservation Units

Hatchery fish pose a particularly thorny problem for the composition of listable Units under the ESA because of their complex relationship to their wild relatives. In a typical hatchery process, returning wild fish are captured in traps; female eggs are harvested and fertilized with male sperm after which the fish are humanely killed.[81] The fertilized eggs are incubated and kept in a tank to hatch.[82] Young fish are tank-reared until they reach a certain size, at which time they are tagged or fin-clipped and released into the river.[83] The fish migrate to the ocean where they spend one to three years before migrating back upstream.[84] Those fish that are not harvested return to the hatchery to begin the process over again.[85]

Because hatchery fish are derived from wild populations, they share many genetic similarities and are recognized as a potential bank for the genetic resources of wild populations that are in danger of extinction.[86] However, because hatchery fish are artificially mated and because of the captive environment in which they are reared, the genetic make-up of hatchery fish can rapidly diverge from their wild parent population.[87]

81. Northwest Fisheries Science Center, Salmon Hatchery Questions & Answers, http://www.nwfsc.noaa.gov/resources/search_faq.cfm?faqmaincatid=3#faqid43 (last visited Mar. 8, 2010) [hereinafter How Hatcheries Work].

82. *Id.*

83. *Id.*

84. *Id.*

85. *Id.*

86. Hatchery Listing Policy, *supra* note 7, at 37,208; NAT'L MARINE FISHERIES SERV., SALMONID HATCHERY INVENTORY AND EFFECTS EVALUATION REPORT: AN EVALUATION OF THE EFFECTS OF ARTIFICIAL PROPAGATION ON THE STATUS AND LIKELIHOOD OF EXTINCTION OF WEST COAST SALMON AND STEELHEAD UNDER THE FEDERAL ENDANGERED SPECIES ACT 2-2 (2004); HARD ET AL., *supra* note 35.

87. *See infra* Part III.B for discussion of genetic differences between hatchery and wild fish.

Those differences can cause harmful interactions between hatchery and wild fish when hatchery fish are released.[88] Finally, although hatchery fish are bred and raised for the first part of their lives in captivity, they are released at a young age and spend time with wild fish migrating downstream and upstream without human interference.[89] Thus, in relation to wild salmon, hatchery fish are both similar and dissimilar; helpful and harmful; wild and domestic. Taken together, these apparent dichotomies leave the Services unsure as to how they are supposed to "count" hatchery fish for ESA listing purposes.

B. *Hatchery Fish Are Genetically Distinct from Wild Fish*

Despite the fact that hatchery fish are derived from wild fish, ample genetic evidence indicates that hatchery and wild fish should be placed in separate Conservation Units. Hatchery fish are subject to artificial selection pressures that can rapidly drive differentiation from their wild parents.[90] First-generation hatchery fish may appear genetically indistinguishable from wild fish;[91] however, three types of artificial selection affect all hatchery fish: intentional selection by humans (such as breeding for size), relaxed selection (natural selection forces are relaxed in the hatchery environment), and domestication selection ("natural" adaptation to a hatchery environment).

The intentional selection process begins during mating: the fish selected for breeding are not necessarily random.[92] Many steelhead hatcheries intentionally select for accelerated growth rates so that the fish have improved chances of survival upon release.[93] Moreover, even if accelerated growth is unintentional, studies have found a tendency for larger fish to be spawned in hatcheries and for the spawned fish to have earlier reproductive timing.[94]

Relaxed selection occurs during the same time frame as intentional selection. Selection is relaxed for natural breeding ability: the artificial mating of hatchery fish eliminates competition for the fittest mates, as the

---

88. In wild fish, these harms include loss of adaptive genes, depletion of food resources, and spread of disease. Naish et al., *supra* note 6, at 100–16.

89. How Hatcheries Work, *supra* note 81.

90. Naish et al., *supra* note 6, at 101.

91. *Id.*

92. Northwest Fisheries Science Center, Risks to Wild Populations from Hatchery Fish, http://www.nwfsc.noaa.gov/resources/salmonhatchery/risks.cfm#ecological (last visited Mar. 8, 2010) [hereinafter Risks to Wild Populations]; *see also* How Hatcheries Work, *supra* note 81.

93. 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 CANADIAN J. FISH. AQUATIC. SCI. 577, 578 (2004).

94. Jennifer E. McLean, Paul Bentzen & Thomas P. Quinn, *Nonrandom, Size- and Timing-Biased Breeding in a Hatchery Population of Steelhead Trout*, 19 CONSERVATION BIOLOGY 446, 449 (2005).

artificially selected fish are not necessarily the fittest natural breeders.[95] Other natural selection mechanisms such as nest preparation ability are absent from the hatchery environment.[96] Selection is also relaxed for egg size. In the wild, there are competing selection pressures for larger eggs (which favor survival) and smaller eggs (which are an indicator of female fecundity).[97] The selection pressure for larger eggs is relaxed in the hatchery environment, leading to rapid selection for smaller eggs in captive-reared Chinook salmon.[98] This difference persists into wild populations that are supplemented with the hatchery-reared fish.[99] Finally, since hatchery fish are treated for disease, it is also possible for the fish to develop less disease resistance than their wild counterparts.[100]

Domestication selection, or natural adaptation to a thoroughly unnatural environment, also forces a genetic wedge between hatchery and wild fish. Tank rearing features a lack of ground or surface cover; hand feeding; treatment for disease; different water velocity, depth, chemistry, temperature, and turbidity; and an absence of predators.[101] These pressures can lead to genetically-based differences in behavior and physiology.[102] Studies have found that artificially selected differences lead hatchery fish to continue to experience different selection pressures even after they are released and that those differences are inheritable.[103] Based on these findings, hatchery and wild fish are expected to diverge genetically within a few generations, even if the hatchery fish and wild fish came from the same parent gene pool.[104]

The following table shows P.R. Reisenbichler and S.P. Rubin's synopsis of studies demonstrating genetic differences in the behavior (B) and/or physiology (P) between hatchery (H) and wild (W) populations of anadromous salmonoid fishes. Factors limiting the application of the studies to other populations are listed on the right.

95. Risks to Wild Populations, *supra* note 92; *see also* How Hatcheries Work, *supra* note 81.

96. McLean, Bentzen & Quinn, *supra* note 94, at 452.

97. Daniel D. Heath et al., *Rapid Evolution of Egg Size in Captive Salmon*, 299 SCI. 1738, 1739 (2003).

98. *Id.* at 1738, 1740.

99. *Id.* at 1740.

100. Naish et al., *supra* note 6, at 146.

101. *Id.* at 104–06; Michael Lynch & Martin O'Hely, *Captive Breeding and the Genetic Fitness of Natural Populations,* 2 CONSERVATION GENETICS 363 (2001); R.A. Myers et al., *Hatcheries and Endangered Salmon*, 303 SCI. 1980 (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 JOURNAL OF MARINE SCI. 459, 461 (1999).

102. Reisenbichler & Rubin, *supra* note 101, at 461.

103. Kostow, *supra* note 93, at 588 (explaining that artificially selected differences lead to different selection regimes in the wild); Reisenbichler & Rubin, *supra* note 101, at 461.

104. Kostow, *supra* note 93, at 588.

Table 1. Genetically Based Differences in Hatchery and Wild Fish[105]

Study; trait type; species	Description	Limitations
Lannan, 1980. P—embryo and larval development rate. *Oncorhynchus keta.*	Thermal units from fertilization to emergence increased from 1800 to 2350 during 1972–1977 in H established in 1969 from local W. Higher temperatures in hatchery than in stream initially resulted in early, apparently mal-adaptive time of entry to estuary. Presumably, natural selection acted to retard development rate so that entry period of H coincided more closely with original entry period of W.	No parallel data presented for W. No control.
Nickelson et al., 1986. P—spawning time. *Oncorhynchus kisutch.*	Fed H fry released into natural streams and allowed to spawn naturally with W when they returned. H spawned substantially earlier than W. From subsequent juvenile abundances, the authors inferred that reproductive success for H was almost zero, and attributed this largely to the early spawning time.	H did not originate from W. H and W did not share common environment their entire lives. Artificial selection at least partially responsible for advanced spawning time. Reproductive success not measured directly.
Norman, 1987 (as cited by Utter et al., 1993). B - territoriality. *Salmo salar.*	Progeny of H displayed weaker territorial behavior than did progeny of W.	H did not originate from W.

105. *See* Reisenbichler & Rubin, *supra* note 101, at 461.

Study; trait type; species	**Description**	**Limitations**
Swain & Riddell, 1990. B—aggression. *Oncorhynchus kisutch.*	Juveniles from two H more aggressive in mirror-image stimulation tests than W from geographically proximate populations. Each H compared with two W.	H did not originate from W.
Berejikian et al., 1996. B—aggression. *Oncorhynchus mykiss.*	Progeny of W more aggressive at emergence than of locally derived H. Progeny of H more aggressive than of W after rearing for 3 months in natural stream channel or in tanks at low densities and low rations.	None obvious.
Berejikian, 1995. B—predator avoidance. *Oncorhynchus mykiss.*	Juveniles of W survived predation from prickly sculpin (*Cottus asper*) better than did size-matched progeny from locally derived H, both in laboratory and natural stream enclosures.	None obvious.
Johnsson et al., 1996. P/B—growth, predator avoidance. *Salmo trutta.*	Progeny of W less susceptible to a trout predator than were progeny from a locally derived H. Progeny of H grew faster in hatchery, and had lower RNA levels.	None obvious.
Kallio-Nyberg & Koljonen, 1997. P—growth and maturity. *Salmo salar.*	Progeny of H grew faster in hatchery and at sea, and more frequently matured as grilse [young salmon] than did progeny of W.	H only partially derived from W.

Table 1 shows that even where the hatchery fish stocks were derived from the wild fish to which they were compared (which does not happen in every hatchery), the genetic differences caused by selection pressures in the hatchery environment are likely to be inheritable and cause behavioral and physiological changes in the descendants of hatchery fish.

Finally, while we are accustomed to thinking of genetic change as a slow process, evolution can occur in decades or years in a phenomenon known as contemporary evolution.[106] Hunting and fishing pressures have driven the rapid evolution of "tuskless elephants in Africa and Asia, small-horned bighorn sheep in the Rocky Mountains, and fish that mature without growing big."[107] If animals can respond quickly to hunting and fishing pressures, it is likely that they can also respond rapidly to different conditions in the hatchery environment. The evolution of smaller egg size in hatchery populations is an example of how quickly these forces can act, influencing hatchery populations and even the wild populations into which they are released.[108] For this reason, the genetic distinctions between hatchery and wild fish, both as demonstrated and as yet to be discovered, should not be overlooked.

C. *Hatchery Fish Are Behaviorally, Morphologically, and Ecologically Different from Wild Fish*

Behavioral, morphological, and ecological differences between hatchery fish and natural fish are well documented.[109] First, hatchery fish differ morphologically from wild fish, displaying reductions in head size and snout curvature, and increases in head depth, trunk depth, and dorsal and anal fin lengths.[110]

Second, hatchery fish have been shown to be more aggressive than their wild counterparts.[111] In part, abundant food and lack of habitat structure in hatcheries contribute to a lack of prior "losing experience," which would otherwise dampen aggression in fish.[112] Similarly, hatchery fish have also been found to be more aggressive in the presence of predators, emerging sooner from cover after the introduction of a predator into the environment.[113]

---

106. Holly Doremus, *The Endangered Species Act: Static Law Meets Dynamic World*, WASH. U. J. L & POL'Y (forthcoming 2010).

107. *Id.*

108. Heath et al., *supra* note 97, at 1738, 1740.

109. Genetics is often suspected to play a role in the behavioral differences, but most behavioral studies do not directly address that relationship.

110. Jeffrey J. Hard et al., *Evidence for Morphometric Differentiation of Wild and Captively Reared Adult Coho Salmon: A Geometric Analysis*, 58 ENVTL. BIOLOGY OF FISHES 61, 69 (2000).

111. It should be noted, however, that one study did find that although the progeny hatchery fish were more aggressive after three months, progeny of wild fish were more aggressive at birth. *See supra* Table 1.

112. J.S. Rhodes & T.P. Quinn, *Factors Affecting the Outcome of Territorial Contests Between Hatchery and Naturally Reared Coho Salmon Parr in the Laboratory*, 53 J. OF FISH BIOLOGY 1220, 1227 (1998); Ian A. Fleming & Matt R. Gross, *Breeding Success of Hatchery and Wild Coho Salmon (*Oncorhynchus Kisutch*) in Competition*, 3 ECOLOGICAL APPLICATIONS 230, 235 (1993) (also found that hatchery females had delayed onset of breeding due to competition); S. Einum & I.A. Fleming, *Genetic Divergence and Interactions in the Wild Among Native, Farmed, and Hybrid Atlantic Salmon*, 50 J. OF FISH BIOLOGY 634, 645 (finding farmed fish more aggressive).

113. Einum & Fleming, *supra* note 112, at 648 (confirming studies done on steelhead).

Hatchery fish differ behaviorally with respect to feeding and foraging habits,[114] homing ability,[115] and timing of upstream migration and spawning.[116] Hatchery fish can also influence their naturally spawned counterparts to migrate and spawn earlier than normal. Differences in breeding success have been observed as well: hatchery fish exhibit comparatively less success breeding than wild fish, as females appear poorer at acquiring and defending nests, and in studies, tend to lose "a larger proportion of their initial fecundity through unspawned eggs and nest destruction."[117]

D. Hatchery Fish Harm Wild Fish When the Populations Intermix in the Wild

Hatchery fish are primarily harmful to wild fish in two ways: hatchery fish reduce both fitness and adaptive characteristics of wild populations through genetic interaction; and hatchery fish compete with wild fish for food and space.

1. Hatchery-Wild Genetic Interaction Reduces Fitness of Wild Populations

When hatchery fish interbreed with wild populations, they can reduce the fitness and the adaptive characteristics of those wild populations. Interbreeding can occur from either straying or intentional supplementation, where hatchery fish are released and then allowed to breed in the wild so as to incorporate them into wild stocks.[118] Due both to the artificial rearing environment and the timing of release, hatchery salmon stray more into other rivers than do wild salmon during upstream migration.[119] In one study, the proportion of hatchery-produced Chinook salmon returning to the Elk River Hatchery in Oregon averaged 22.8 percent over nine years, indicating that in most years, the majority of hatchery fish (77.2 percent on average) returned to spawn outside the hatchery.[120]

114. L. Reiriz, A.G. Nicieza & F. Braña, *Prey Selection by Experienced and Naive Juvenile Atlantic Salmon*, 53 J. OF FISH BIOLOGY 100, 109 (1998).

115. B. Jonsson, N. Jonsson & L.P. Hansen, *Atlantic Salmon Straying from the River Imsa*, 62 J. OF FISH BIOLOGY 641, 644, 651-52 (2003).

116. Nina Jonsson, Lars P. Hansen & Bror Jonsson, *Juvenile Experience Influences Timing of Adult River Ascent in Atlantic Salmon*, 48 ANIMAL BEHAV. 740, 742 (1994); Bror Jonsson, Nina Jonsson & Lars P. Hansen, *Does Juvenile Experience Affect Migration and Spawning of Adult Atlantic Salmon?*, 26 BEHAV. ECOL. & SOCIOBIOLOGY 225, 228 (1990).

117. Fleming & Gross, *supra* note 112, at 239.

118. Naish et al., *supra* note 6, at 69.

119. Jonsson, Jonsson & Hansen, *supra* note 115, at 644, 651.

120. Naish et al., *supra* note 6, at 131.

The interbreeding of large numbers of hatchery fish with wild fish can disrupt the fine-scale population structure and local adaptations that are important to the survival of a Conservation Unit as a whole, even where the hatchery fish are drawn from the Unit to which they "belong."[121] Because salmon are highly adapted to particular environments, breeding between hatchery salmon that have undergone domestication selection and wild salmon results in an offspring that has only half the "adapted" alleles from either parent and is not as fit as either parent population.[122] This phenomenon is known as outbreeding depression.[123] The intentional release of hatchery fish to supplement wild populations exacerbates this issue,[124] and the resulting homogenization of the populations causes a loss of genotypic variance in the natural populations of fish.[125] This loss "destroys a necessary reservoir of genetic variation [without which] . . . the species becomes highly vulnerable to environmental changes or to epidemics from which it may be incapable of recovering."[126]

Though genetic results have varied, a survey of studies supports the expectations of negative impact on wild populations as a result of genetic interactions with hatchery fish. Fisheries have attempted to manage the deleterious genetic effects by regularly integrating wild fish into hatcheries; however, studies also show that "substantial phenotypic changes and fitness reductions can occur even if a large fraction of the captive broodstock is brought in from the wild every generation."[127] Thus, the integration of wild fish into hatchery populations not only drains the natural system by removing natural fish from the reproductive cycle, but it may also be insufficient to eliminate the effects of inadvertent domestication selection.[128]

---

121. ROBIN S. WAPLES, DEFINITION OF "SPECIES" UNDER THE ENDANGERED SPECIES ACT: APPLICATION TO PACIFIC SALMON, NOAA TECHNICAL MEMORANDUM NMFS F/NWC-194 (1991).

122. Naish et al., *supra* note 6, at 108.

123. *Id.* at 108, 112. Salmon that spend one-fourth of their life or more in a hatchery experience substantial genetic change in fitness, and as a result, supplementation will lead to reduced fitness of wild populations. Reisenbichler & Rubin, *supra* note 101, at 464. Additionally, when captive breeding programs result in relaxed selection, the build up of alleles that are harmful in nature can have a negative effect on natural populations within a few dozen generations. Lynch & O'Hely, *supra* note 101, at 375.

124. WAPLES, *supra* note 121.

125. Kjetil Hindar, Nils Ryman & Fred Utter, *Genetic Effects of Cultured Fish on Natural Fish Populations*, 48 CANADIAN J. FISH. & AQUATIC SCI. 945, 952 (1991).

126. Hindar, Ryman & Utter, *supra* note 125, at 953.

127. Michael J. Ford, *Selection in Captivity during Supportive Breeding May Reduce Fitness in the Wild*, 16 CONSERVATION BIOLOGY 815, 823 (2002).

128. Myers et al., *supra* note 101, at 1980.

2. *Hatchery Fish Outcompete Wild Fish for Food and Space*

Streams and oceans have a limited carrying capacity, which is constantly in flux.[129] The large numbers of hatchery fish released into the wild strain the food production capabilities of the streams where they are released and the oceans to which they migrate.[130] Wild fish must then compete with hatchery fish for scarce resources. Because hatchery fish are fed by hand, they are often larger than wild fish upon release.[131] Larger size combined with increased aggression[132] can lead to hatchery fish dominance in food and space competition. For example, while hatchery releases increased the overall density of juvenile coho salmon, they actually *decreased* the abundance of *wild* juvenile coho.[133] A similar study in oceanic conditions found that during low ocean-production years, hatchery releases had a strong negative effect on the survival of wild Chinook salmon, and that there was no relationship between hatchery release and wild survival in years with average ocean-production.[134] Because recent projections point to a decreasing trend in ocean productivity due to the release of greenhouse gasses and a phenomenon known as ocean acidification,[135] this study indicates that hatchery fish will out-compete wild fish for survival in the coming years.

Related to food and space competition are risks to wild fish from predation. Large salmon are known to eat smaller salmon in the smolt stage, and the larger size of hatchery fish as well as their early run time could enable them to eat newly emerged members of other salmon species.[136] Large numbers of hatchery fish may also correspondingly increase the number of other predators of salmon, such as cutthroat trout,[137] consequently increasing predation. While the hatchery

---

129. Risks to Wild Populations, *supra* note 92; HATCHERY SCIENTIFIC REVIEW GROUP, MARINE CARRYING CAPACITY, IN HATCHERY REFORM: PRINCIPLES AND RECOMMENDATIONS B41 (2004).

130. Naish et al., *supra* note 6, at 128; HATCHERY SCIENTIFIC REVIEW GROUP, *supra* note 129, at B41; Risks to Wild Populations, *supra* note 92.

131. Naish et al., *supra* note 6, at 128.

132. Rhodes & Quinn, *supra* note 112, at 1227; Einum & Fleming, *supra* note 112, at 645 (finding farmed fish more aggressive).

133. T.E. Nickelson et al., *Use of Hatchery Coho Salmon (Oncorhynchus kisutch) Presmolts to Rebuild Wild Populations in Oregon Coastal Streams*, 43 CANADIAN J. FISHERIES & AQUATIC SCI. 2443, 2447 (1986).

134. P.S. Levin et al., *The Road to Extinction is Paved with Good Intentions: Negative Association of Fish Hatcheries with Threatened Salmon*, 268 PROCEEDINGS: BIOLOGICAL SCI. 1153, 1155 (2001).

135. *Id.* at 1157; *see also* Richard A. Feely et al., *Impact of Anthropogenic CO_2 on the $CaCO_3$ System in the Oceans*, 305 SCI. 362 (2004) (showing the decrease of calcium carbonate in oceans is bad for plankton); Victoria J. Fabry et al., *Impacts of Ocean Acidification on Marine Fauna and Ecosystem Processes*, 65 ICES J. MARINE SCI. 414 (2008) (decreased ocean production due to CO_2 is bad for salmon).

136. *See* Naish et al., *supra* note 6, at 132.

137. *Id.* at 133.

populations can handle an increase in predation because of sheer numbers, wild populations cannot, which could lead to their decline.[138]

In sum, ample reasons exist for the separation of hatchery fish and wild fish into different Conservation Units. Hatchery fish are genetically and behaviorally distinct from wild fish. These differences, combined with high straying rates,[139] can harm wild populations by reducing their fitness and by destroying local genetic adaptations. In addition, attempts by the hatchery to cancel out harmful genetic interactions by infusing the hatchery populations with wild fish do not work and in fact result in a drain on the natural system. Even if hatchery fish do have a "neutral" effect on the genetics of wild populations, the wild fish may still be affected by competition, increased predation, and harvest pressures because of hatchery presence.

III. DO NOT CHANGE THE CLASSIFICATION POLICIES—JUST CHANGE THEIR APPLICATION

Placing hatchery and wild fish into separate ESUs can be done without changing either the ESU or DPS policies. However, the Services must change how the policies are *applied* to hatchery fish. This will entail changing part of the Hatchery Listing Policy in order to ensure that the ESU and DPS Policies are not merely being applied on a genetic level and that the ecological differences between hatchery and wild fish are given their proper weight.

A. NMFS Does Not Need to Alter the ESU Policy in Order to Separate Hatchery Fish from Wild Fish

The ESU Policy defines a Conservation Unit by the degree of reproductive isolation and its importance relative to the evolutionary legacy of the species.[140] In laying out criteria, the ESU Policy leaves ample room, based on genetic and behavioral differences, to exclude hatchery fish from the Conservation Units made up of natural fish.

1. Reproductive Isolation

The first criterion of defining an ESU is reproductive isolation.[141] At first, this seems to prohibit the separation of hatchery fish and wild fish because hatchery fish are bred from wild fish and because they can escape to breed in the wild. However, reproductive isolation does not

---

138. *Id.* at 133.
139. *See supra* notes 119–120 and accompanying text.
140. ESU Policy, *supra* note 24, at 58,618.
141. *Id.*

have to be absolute. In fact, the Services consider absolute isolation to be an "impracticably stringent standard."[142]

Instead, the Services require isolation to be "strong enough to permit evolutionarily important differences to accrue in different population units."[143] Studies have demonstrated that hatcheries produce genetically traceable differences in hatchery fish that affect their ability to compete for food and to reproduce, two important evolutionary traits.[144] The language of the policy permits a forward-looking evolutionary perspective recommended by Professor Holly Doremus: while hatchery fish are derived from wild fish and thus share an evolutionary past, their isolation during the early part of their lives has been shown to lead to different evolutionary futures.[145] Nothing in the ESU Policy forbids looking for the "evolutionarily important differences" that may occur a few generations from now.[146] Such a forward-looking policy would encourage long-term thinking about the survival of Conservation Units and better align with the purposes of the ESA.

2. *Important Component in the Evolutionary Legacy of the Species*

A population must also represent an important component in the evolutionary legacy of the species in order to be included in an ESU.[147] According to the ESU Policy, this criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole: in other words, "if the population were to become extinct, would this event represent a significant loss to the ecological [or] genetic diversity of the species?"[148]

Important genetic resources can reside in fish spawned in a hatchery.[149] Studies indicate, however, that keeping a hatchery population totally separate creates extreme genetic divergence, changing or wiping out any genetic resources that may have existed from the start;[150] and interbreeding hatchery with wild fish can wipe out local, natural adaptations through gene swamping,[151] which essentially destroys the fine-scale population structure of the ESU by propagating the outrageous

142. DPS Policy, *supra* note 24, at 4,724.

143. ESU Policy, *supra* note 24, at 58,618.

144. *See supra* Table 1 and accompanying note.

145. Doremus, *supra* note 106.

146. *Id.* (quoting JODY HEY ET AL., CONSIDERING LIFE HISTORY, BEHAVIORAL, AND ECOLOGICAL COMPLEXITY IN DEFINING CONSERVATION UNITS FOR PACIFIC SALMON: AN INDEPENDENT PANEL REPORT, REQUESTED BY NOAA FISHERIES (2005)).

147. ESU Policy, *supra* note 24, at 58,618.

148. *Id.*

149. Hatchery Listing Policy, *supra* note 7, at 37,209.

150. HEY ET AL., *supra* note 146, at 10; *see also* discussion *infra* Part III.A–B.

151. HEY ET AL., *supra* note 146, at 10.

success of one of its members.[152] Because separation causes a hatchery population to diverge so wildly it loses its utility as a genetic bank, and the result of integration is the loss of natural adaptations through gene swamping, hatchery fish clearly should not be included in the same Unit as wild populations.

The data are not complete regarding the genetic value of separation or integration. Precisely because these genetic resources are so important, the composition of the ESUs should take a precautionary outlook. The NMFS should only revisit the inclusion of hatchery populations in wild ESUs if and when there is concrete evidence indicating that hatchery fish can maintain genetic resources without threatening wild adaptations.

B. The Services Do Not Need to Alter the DPS Policy in Order to Separate Hatchery Fish from Wild Fish

The DPS Policy allows FWS and NMFS to take into account more of the non-genetic differences between hatchery fish and wild fish than does the ESU Policy. Under the DPS Policy, a population constitutes a listable Unit if it is both "discrete" and "significant" in relation to the remainder of the species to which it belongs.

1. Discreteness

Discreteness is measured by a separation in physical, physiological, ecological, or behavioral factors.[153] Morphological and/or genetic differences may be used to provide evidence of that separation.[154] There is ample evidence of both morphological and genetic difference between hatchery and wild fish, as in Part III.B–C, *supra*. The language of the DPS Policy also allows differences in aggression, predator response, run-timing, and foraging behavior, whether they prove to have a genetic component, to be taken into account when determining Conservation Units.

2. Significance

Significance under the DPS Policy is similar to the ESU Policy's criterion for evolutionary importance. The DPS Policy lists the factors that the Services may consider:

1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;

152. "Like what happened to the Jackson Five when Michael Jackson got really famous." Personal communication with Dr. Ryan Kelly, in Berkeley, Cal. (Sept. 22, 2009).
153. DPS Policy, *supra* note 23, at 4,725–25.
154. *Id.*

2. Evidence that the loss of the DPS would result in a significant gap in the range of the taxon;

3. Evidence that the DPS represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside of its historic range;

4. Evidence that the DPS differs markedly from other populations of the species in its genetic characteristics.[155]

That a DPS could be significant because it represents the only surviving *natural* occurrence of a taxon that may be more abundant elsewhere indicates the value that the Services place on natural occurrences of populations, providing evidence that artificial populations should be kept out of the DPS in the first place. Additionally, as in the analysis of the ESU Policy above, because hatchery fish are genetically distinct from wild fish and because the mixture of hatchery and natural fish results in the destruction of genetic diversity among different wild populations in the same Unit, the Services could refer to "significance" factor four (genetic differentiation) to justify excluding hatchery fish from wild Conservation Units.

C. *The Services Need to Change How the Classification Policies Are Applied to Hatchery Fish*

Although neither the ESU nor the DPS Policy would have to be altered, the way in which the policies are applied must change. Currently, the Services assign hatchery fish a category based on three axes: "degree of genetic divergence between hatchery and natural populations, . . . origin of the hatchery stock, . . . and the status of the natural population in the wild."[156] It is then at the discretion of the agency whether the hatchery population will join the ESU.[157]

The Hatchery Listing Policy uses the first of the three axes, degree of genetic divergence, as a guideline for whether a given hatchery population will be incorporated into the ESU. The policy states, "Hatchery stocks with a level of genetic divergence relative to the local natural populations that is no more than what occurs within the ESU . . .

155. *Id.* at 4,725.

156. Degree of genetic divergence is the primary factor that influences which category a hatchery stock is assigned to, with category 1 characterized by "minimal divergence" and category 4 characterized by "extreme divergence." Categories 1–4 are further subdivided based on the hatchery stock's parent population and the state of the wild fish in the stream into which they are released. SALMON AND STEELHEAD HATCHERY ASSESSMENT GROUP, HATCHERY BROODSTOCK SUMMARIES AND ASSESSMENTS FOR CHUM, COHO, AND CHINOOK SALMON AND STEELHEAD STOCKS WITHIN EVOLUTIONARILY SIGNIFICANT UNITS LISTED UNDER THE ENDANGERED SPECIES ACT 5–6 (2003) [hereinafter SSHAG REPORT].

157. *Id.* at 6.

are considered part of the ESU."[158] While this is consistent with the three axes outlook described above,[159] delineating an ESU solely based on level of divergence raises a number of problems.

First, genetic testing and the conclusions drawn from it can be inaccurate. The artificial selection regime that hatchery fish experience can drive different allele frequencies that are not readily detectable by randomly selected or neutral genetic markers.[160] Studies have also found that ecologists and conservation scientists often assume that populations are identical and then test to find statistically significant differences.[161] When they fail to find any differences, they accept their assumption as true when in fact the only appropriate conclusion is that the assumption simply *cannot be rejected*.[162] When statistical tests are applied to genetics (such as a test for genetic difference between hatchery and wild fish), researchers often interpret results showing "no significant difference" as evidence that there is no genetic difference.[163] This is an inappropriate conclusion—absence of proof is not proof of absence in this case.[164] Both the errors in testing and the errors in conclusion could lead to the assumption that hatchery fish and wild fish are genetically similar, when in fact they may not be. Due to these potential inaccuracies, an independent panel report prepared for NOAA concluded that genetic relatedness "should not be considered a sufficient condition for supposing that two groups are ecologically or physiologically exchangeable or equivalent."[165]

Second, the *level* of genetic divergence is a purely quantitative measure that fails to account for equally important qualitative

---

158. Hatchery Listing Policy, *supra* note 7, at 37,215.

159. While the Hatchery Listing Policy only uses one of the three named axes, the origin of the hatchery stock contributes to its level of genetic divergence, and the status of the natural population in the wild is taken into account during the actual listing. SSHAG REPORT, *supra* note 154, at 6.

160. HEY ET AL., *supra* note 150, at 6. Neutral genetic markers, meaning those that are not subject to selection pressure, diverge *over time* simply by the accumulation of random mutations. Those are therefore the best markers for understanding the length of time populations have been reproductively isolated from one another, and they carry the added benefit of being relatively easy to look at. Therefore, they are an obvious choice for use in the context of the ESU or DPS policies. However, neutral markers won't show rapid divergence, which occurs under heavy selection pressure, as in a hatchery, creating a "false negative" for genetic differences between hatchery and wild fish. Interview with Holly Doremus, Professor of Law, University of California, Berkeley, School of Law, in Berkeley, Cal. (Feb. 7, 2010).

161. Berry J. Brosi & Eric G. Biber, *Statistical Inference, Type II Error, and Decision Making Under the U.S. Endangered Species Act*, 7 FRONTIERS IN ECOLOGY & ENV'T 487, 487 (2009).

162. *Id.*

163. *Id.*

164. *Id.* at 488.

165. HEY ET AL., *supra* note 150, at 6. NMFS is a division of NOAA (National Oceanic and Atmospheric Administration). See NOAA Fisheries Service, http://www.nmfs.noaa.gov/ (last visited Mar. 18, 2010).

differences. The genetic divergence resulting in, and from, unique adaptation to the natural environment is qualitatively different from genetic divergence resulting from domestication and artificial selection. While naturally occurring genetic divergence enhances the fitness of the species overall, the same level of difference resulting from the hatchery environment has actually proved to reduce the fitness of wild populations.[166] It is inappropriate to compare the two, as the current practice does. A wild population—more genetically distant yet sharing a life history and behavioral characteristics—is more likely to restore a self-sustaining wild population than a hatchery population that has been evaluated solely based on genetic markers.[167]

The way in which the classification policies are applied to hatchery fish underscores the overemphasis that the Services place on genetics. This overemphasis is not entirely surprising, given that the prominence of genetics in a categorization scheme "emphasizes [the agencies'] expertise and disguises the inevitable role of value judgments" in determining Conservation Units.[168] The more science and expertise are emphasized in the decision-making process, the greater the chance that a reviewing court will be deferential toward agency policies.[169] While expertise is absolutely necessary for environmental regulation, overemphasis on scientific evidence, particularly genetics, results in the creation of policies that do not take into account the limits of scientific testing to the detriment of the species.

The Services do not need to change the actual words of the ESU and DPS policies—both policies allow a future-oriented perspective and allow different characteristics to be taken into account. However, the application of those policies to hatchery fish as worded in the Hatchery Listing Policy needs to be changed to move away from genetics and toward a forward-looking approach about the ecological significance of population segments.

D. *The Decision to Separate Hatchery Fish from Wild Fish Would Be Given Deference under Current Case Law*

The only firm case law on this issue comes from *Alsea Valley*: if hatchery fish and wild fish are included in the same ESU, the Services

166. *See, e.g.*, Ford, *supra* note 127, at 823.

167. HEY ET AL., *supra* note 150, at 7; this issue was also expressed in the comments to the final hatchery policy; NMFS's only "response" was that the concern was valid and that they try to balance the risks of being overly inclusive and overly restrictive. Hatchery Listing Policy, *supra* note 7, at 37,208.

168. Doremus, *supra* note 106, at 20.

169. *See, e.g.*, *Trout II*, 559 F.3d 946, 955 (9th Cir. 2009) ("[W]e defer to the informed exercise of agency discretion, especially where that discretion is exercised in an area where the agency has special 'technical expertise.'").

have to list the whole Unit as endangered or threatened or not list it at all.[170] When evaluating the question of separation of wild and hatchery populations in *Trout Unlimited*, the Ninth Circuit did not weigh the scientific evidence, but rather deferred to NMFS' interpretation.[171] Specifically, the court stated that there was a good faith disagreement between scientists on both sides.[172] The scientific evidence discussed in Part III, *supra*, provides ample justification to separate hatchery and wild fish. As in *Trout Unlimited*, it is highly likely that the court would defer to the Services' expertise if the Services decided to embrace a policy of separation based on this scientific evidence.[173]

IV. THE ABUNDANCE OF HATCHERY FISH SHOULD NEVER BAR ESA LISTING

If the Services are reluctant to change the way their policies are applied to hatchery fish,[174] they should at least ensure that the abundance of hatchery fish does not affect the Unit's status determination. This can be accomplished by changing the Hatchery Listing Policy.[175]

In the most recent review of salmon and steelhead ESA status, ESUs and DPSs were first assessed by a biological review team (BRT), composed of scientists from several federal agencies, including NMFS, FWS, and the U.S. Geological Survey.[176] The BRT assessed the status of the naturally spawning fish alone.[177] The ESUs and DPSs were evaluated on the basis of four Viable Salmonid Population (VSP) factors: abundance, spatial distribution, productivity, and diversity.[178] The BRT decided whether the Unit was "in danger of extinction" (endangered), "likely to become in danger of extinction in the foreseeable future" (threatened), or "not likely to become in danger of extinction in the foreseeable future."[179] Because the BRT's conclusions did not include hatchery populations, the Services did not take the conclusions as recommendations for listing.[180] Instead, the Salmon and Steelhead Assessment Group (SSHAG), composed of NMFS scientists, added

170. Alsea Valley Alliance v. Evans, 161 F. Supp. 2d 1154, 1162 (D. Or. 2001).
171. *Trout II*, 559 F.3d at 956.
172. *Id.*
173. *Cf. id.* at 956.
174. NMFS and FWS have repeatedly stated that they do not wish to categorically separate hatchery fish from wild fish in the ESU/DPS composition process. *See* Hatchery Listing Policy, *supra* note 7, at 37,208; Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,165; Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 840.
175. HEY ET AL., *supra* note 150, at 12.
176. Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,162.
177. *Id.*
178. *Id.*
179. *Id.* at 37,179.
180. *Id.* at 37,162.

hatchery populations to an ESU or DPS based on the level of genetic divergence from the ESU.[181] NMFS then assessed the effects of in-ESU hatchery programs in the Salmonid Hatchery Inventory and Effects Evaluation Report.[182] NMFS then convened the Artificial Propagation Evaluation Workshop (APEW), composed of federal scientists and managers with expertise in artificial propagation, to assess the overall risk to the Unit based on the contributions of the included hatchery populations.[183] The APEW then made the final recommendations for listing.[184]

Although the majority of final listing decisions did not differ from the BRT's conclusions for natural salmon (usually threatened),[185] in several cases, such as the decision to downlist the Upper Columbia River steelhead DPS, the abundance of hatchery fish led to a final listing determination of lower risk than the BRT recommendations.[186] During the status review, the BRT had concluded that the Upper Columbia River steelhead DPS was endangered, citing the overall decline of the original, wild natural spawners and the presence of hatchery-origin natural spawners as a significant source of concern for diversity, natural abundance, and productivity.[187] The Services, however, listed the DPS as threatened, concluding that the presence of hatchery programs mitigated the immediacy of extinction risk by having a positive effect on abundance and spatial structure and a neutral or uncertain effect on diversity and productivity.[188]

The Services' conclusion fails under scrutiny. First, although hatchery fish increased *total* DPS returns, their contribution to the abundance of *naturally spawning* fish is uncertain.[189] Second, large numbers of hatchery fish may actually have decreased the DPS's overall productivity.[190] Third, although the APEW claimed that the effects on diversity are neutral or uncertain, they also stated that the high proportion of fish from one particular hatchery, which spawn naturally,

---

181. *Id.*

182. *Id.*; *see also* discussion *supra* Part IV.C.

183. Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,162–63.

184. *Id.* at 37,163.

185. *See generally* Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,160; Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 833.

186. Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 854–55.

187. *Id.* at 854.

188. *Id.* at 855.

189. NATIONAL MARINE FISHERIES SERVICE, SALMON RECOVERY AND PROTECTED RESOURCES DIVISION, ARTIFICIAL PROPAGATION EVALUATION WORKSHOP REPORT 58 (2004) [hereinafter APEW REPORT].

190. Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 854; APEW REPORT, *supra* note 189, at 58; NATIONAL MARINE FISHERIES SERVICE, SALMONID HATCHERY INVENTORY AND EFFECTS EVALUATION REPORT 14-9 (2004) [hereinafter SHIEE REPORT] (finding no evidence that hatchery programs had increased productivity).

may decrease diversity.[191] Additionally, two "increases" in diversity claimed by the Services are merely mitigation for negative effects. One increase is attributable to efforts to separate certain hatchery programs that have not yet contributed to any increase in diversity but are "expected to [do so] over time." [192] The second increase resulted from the transfer of early-spawning components away from an area where they were thought to be a threat to population diversity, again merely mitigating an earlier concern.[193] In their final listing determination, the Services highlighted the purpose of the hatcheries, the monitoring efforts in place, and best professional practices.[194] In so doing, they seemed to base their conclusion on what the hatcheries were designed to do rather than what had actually been observed.

Admittedly, with so many populations to study, obtaining concrete evidence on the contribution of hatchery fish is a difficult task, and abundance becomes the easiest criterion to evaluate. In a number of listings, abundance was the only criterion for which hatchery fish played any discernible role.[195] The goal of a hatchery is to increase overall abundance, and hatchery fish were found to reduce the risk to a Unit with respect to that factor. In many cases, however, the increase was measured Unit-wide—that is, hatchery fish increased the *total* number of fish but had unknown and possibly negative effects on the number of *wild* fish.[196] The Upper Columbia River steelhead DPS was downlisted in large part because hatchery fish increased its total abundance even though the effects on wild fish were unknown.[197]

In order to avoid listing determinations like the Upper Columbia River DPS, the Hatchery Listing Policy should, at the very least, include a

191. Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 854–55.

192. *Id.*

193. *Id.*

194. *Id.* at 854.

195. For listings for the Central California Coast Steelhead, California Central Valley Steelhead, and Northern California Steelhead, see Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 852–53. For listings for the Snake River Sockeye, California Coastal Chinook, and Puget Sound Chinook, see Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,179–82, 37,184–85.

196. *See, e.g.*, Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 854 ("The within DPS hatchery programs substantially increase total DPS returns. . . [but] [t]he contribution of hatchery programs to the abundance of naturally spawning fish is uncertain."); Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,182 ("There have been no demonstrable increases in natural abundance from the five cooperative hatchery programs . . . ."); *id.* at 37,185 ("Any potential benefits from these [hatchery] programs to abundance likely are offset by increased ecological and genetic risks.").

197. While hatchery programs substantially increased total abundance (with effects on natural fish unknown), their benefit to spatial structure was limited to a slight improvement because the hatchery fish were found spawning in small tributaries. APEW REPORT, *supra* note 189, at 39; SHIEE REPORT, *supra* note 190, at 14-9. Therefore, it is likely that without the increased total abundance, the DPS would not have been downlisted.

provision that does not allow the sheer number of hatchery fish to downlist a Unit. Apart from the ease of manipulating the "abundance" criterion, "counting" hatchery fish may also interfere with the purposes of the ESA. The purpose of the ESA is to protect endangered species and the ecosystems upon which they depend.[198] For salmon, the hatchery conundrum gives agencies an easy way to bolster the species numbers without taking the steps necessary to protect the corresponding ecosystems. For this reason, hatchery numbers should not be allowed to figure into which listing protection a species will receive.

Most importantly, the intrinsic value of wild populations should be protected by changing the Hatchery Listing Policy. Allowing the sheer number of artificially raised fish to block a listing under the ESA essentially asserts that the "wildness" of wild fish does not matter as long as there is enough volume to satisfy our harvest needs. ESA section 2(a) says that species are of esthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. By allowing the number of hatchery fish to block a listing, the contributions of "wildness" to ecological, esthetic, historical, educational, and scientific value will be lost. Professor Doremus points out that animals in zoos (or hatcheries) may provide us with monetary and food value but will never "capture our hearts or engage our minds as fully as their wild cousins."[199]

Current case law supports a change in the Hatchery Listing Policy. As the Ninth Circuit explained to the Building Industry in *Trout Unlimited*, there is no statutory requirement in the ESA for hatchery and wild fish to be evaluated equally in making status determinations in an ESU.[200] In fact, the court, in giving deference to NMFS's construction of the ESA, acknowledged that "failing to account for these and other distinctions between hatchery and naturally spawned salmon might violate the ESA's mandate that status reviews be conducted 'on the basis of the best scientific and commercial data available.'"[201] As such, should the agency choose to adopt a new policy that would prevent the abundance of hatchery fish from blocking ESA listing, the courts would not be likely to stand in the way.

Disallowing abundance of hatchery fish as a reason for downlisting is likely to cause a number of problems for the Services, however, which in turn may point them toward separating wild and hatchery fish in the Unit composition stage instead. First, listing a species as "endangered" despite apparently high production and large numbers will likely upset both the fishing industry and landowners affected by the accompanying

198. 16 U.S.C. § 1531(b) (2006).

199. Holly Doremus, *Restoring Endangered Species: The Importance of Being Wild*, 23 HARV. ENVTL. L. REV. 1, 12 (1999).

200. *Trout II*, 559 F.3d 946, 960 (9th Cir. 2009).

201. *Id.* at 961 (citing 16 U.S.C. § 1533(b)(1)(A)).

designation of critical habitat and prohibition of take. Second, because take is not permitted with endangered species, the Services will have no way to control hatchery numbers through selected harvest, thus trapping wild fish in a Conservation Unit where they can be harmed by their hatchery-raised kin. This catch-22 should motivate the Services to adopt this Note's first suggestion to separate hatchery and wild fish from the outset.

CONCLUSION: LOOKING FORWARD TO A MORE INFORMED APPLICATION

When the Ninth Circuit upheld NMFS's Hatchery Listing Policy in *Trout Unlimited*, they illustrated perfectly why the solution to an imperfect policy must be at the agency level. Because agencies have expertise in their particular fields, the court will continue to defer to NMFS policies regarding the definition of Conservation Units and the place of hatchery fish within those Units. NMFS and FWS should use their grant of discretion wisely and ensure that they take the most informed approach in the formulation of their policies.

During the Hatchery Listing Policy process and in nearly every Federal Register notice regarding ESU listing following the promulgation of the policy, commentators have suggested that hatchery and wild fish exist in separate ESUs.[202] Each time, the Services have refused, responding that they prefer to designate hatcheries on a case-by-case basis.[203] It is clear, however, that the Services do not have enough information to perform such an analysis. For example, in the Lower Columbia River coho ESU, nine out of the twenty-five hatchery programs included in the ESU were either not in the SSHAG Report or lacked genetic or behavioral data.[204] When the contributions of those populations were assessed for status, their effects on genetic diversity and ESU productivity were uncertain, yet the "contribution" of hatchery

202. *See* Hatchery Listing Policy, *supra* note 7, at 37,208; Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,165; Reevaluation of 10 Steelhead DPS, *supra* note 174, at 840.

203. *See* Hatchery Listing Policy, *supra* note 7, at 37,208; Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,165; Reevaluation of 10 Steelhead DPSs, *supra* note 34, at 840.

204. In order to obtain this information, I cross-referenced the list of hatchery programs included in the ESU in the final listing with the SSHAG Report on the hatchery stocks potentially associated with the ESU. The nine programs that were not included or that were missing data were the Big Creek, Astoria High School, Warrenton High School, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, Fish First Wild Coho Program, Eagle Creek NFH, Sandy Hatchery, and Bonneville/Cascade/Oxbow Complex. *See* Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,178; SSHAG REPORT, *supra* note 156, at 76–96.

stocks resulted in a "threatened" listing rather than the "endangered" listing recommended by the BRT.[205]

This situation is hardly the exception. Many hatchery stocks analyzed by the Hatchery Inventory and Assessment Report were missing information on genetic, behavioral, morphological, or phenotypic relatedness to their wild cousins.[206] Further, when analyzing the contribution of hatchery fish to the four viability criteria, "abundance" was the only criterion upon which hatchery fish had a definitive effect. Out of the twenty-three analyzed ESUs/DPSs, the APEW recorded uncertain effects on productivity in 100 percent of the cases, on spatial structure in slightly over 50 percent of the cases, and on diversity in approximately 75 percent of the cases.[207]

Basing decisions regarding protections for salmon and steelhead upon abundance relies on far too much uncertainty. If hatchery fish are to be included in a Conservation Unit, the burden of proof should lie in showing that the inclusion will be consistent with recovery objectives—the inclusion of hatchery fish should not be a neutral task. To this end, more and better data are certainly required.

This skepticism toward the inclusion of hatchery fish in Conservation Units is not to say that hatchery fish have no part to play in salmon recovery. Rather than including them in the Unit, the Services should view hatcheries as potential tools for recovery, particularly where habitat conditions are inadequate for wild populations to sustain themselves. These hatcheries must be carefully designed and monitored in order to eliminate, as much as possible, the genetic and behavioral differences that can create harmful interactions with wild fish. Existing and future data must constantly be taken into account to ensure that the information helps more than it harms. With careful management, hatcheries can meaningfully contribute to salmon recovery and further the goals of the ESA.

205. Reevaluation of 16 Salmon ESUs, *supra* note 43, at 37,188–89; APEW REPORT, *supra* note 189, at 44.

206. *See generally* SSHAG REPORT, *supra* note 154.

207. *See generally* APEW REPORT, *supra* note 189.

We welcome responses to this Note. If you are interested in submitting a response for our online companion journal, *Ecology Law Currents*, please contact ecologylawcurrents@ boalt.org. Responses to articles may be viewed at our website, http://www.boalt.org/elq.