The Endangered Species Act and the distinct population segment policy

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Abstract: The US Fish and Wildlife Service has proposed to delist the Yellowstone grizzly bear (*Ursus arctos*) as a distinct population segment, pursuant to the 1996 Distinct Population Segment Policy, on grounds that these bears have achieved their recovery goals. In this paper I discuss the Distinct Population Segment Policy and suggest that it does not provide a workable basis for classifying populations for purposes of delisting or down listing decisions, and I review aspects of the Yellowstone grizzly bear delisting decision.

Key words: delisting, distinct population segment, Endangered Species Act, evolutionarily significant unit, grizzly bear, isolation, significance, *Ursus arctos*, Yellowstone

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Policymakers in the US have long wrestled with the level of generality at which decisions should be made under the Endangered Species Act (ESA; 16 US Code 1531–1544). The title of the statute addresses 'species,' and a species-based approach might seem consistent with the values and rhetoric of conservation and the contrasting bleak finality of extinction. But species-wide determinations can be a blunt instrument for making policy distinctions, and from its inception the ESA has gone below the level of a biological species. There are many reasons for this: an apparently abundant species may contain and mask populations that are threatened or endangered which may have special characteristics (genetic, aesthetic, or symbolic) or value to the species as a whole, or to human communities, history, or heritage. Likewise, a species that as a whole is threatened could contain a population that is sufficiently abundant and well established to merit different treatment; perhaps it has no need for special protection, or perhaps it is different enough to be of less consequence to its species. The breadth and sweep of species-wide determinations make them more difficult to make and implement — they cut across political and ecological boundaries, demand more information and more oversight, and raise issues of coordination and resource allocation.

The distinct population segment (DPS hereafter) concept has long been a key tool for grappling with these issues under the ESA (for vertebrate fish or wildlife). And because of its central role in many debates over listing and delisting, it has taken on some of the same charged political character as those debates.

In November of 2005, the US Fish and Wildlife Service (USFWS) promulgated a proposed rule to classify Greater Yellowstone grizzly bears as a DPS and delist that population. That rule provides an apt occasion for reexamining DPS policy and classification. In this essay, I focus on the DPS policy, starting with its incorporation into the ESA in 1978 and following administrative efforts to articulate coherent classification criteria, culminating in the 1996 policy that laid the foundation for current DPS analysis. I also explore the internal logic of those criteria and argue that they are ill-suited to certain classification decisions. I then examine the proposed delisting rule for the Yellowstone grizzlies, which illustrates the first part of the essay. I also set forth reservations about the rule's approach and reasoning and my qualms about the outlook for Yellowstone grizzly bears.

Discrete population segments

Legislative history and administrative policies

Enacted in 1973 on a wave of public concern for conservation and biodiversity, the ESA intended to ''provide a means whereby ecosystems upon which endangered species and threatened species depend may be conserved'' (16 US Code Section 1531(b)).

The legislative history supports the proposition, cited by administrative agencies in subsequent efforts

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to delineate the scope of the Act, that one of Congress' major motivations was to protect genetic diversity. The House Report (1973) on the original Act describes the rationale: ''From the most narrow possible point of view, it is in the best interests of mankind to minimize the losses of genetic variations…. They are keys to puzzles which we cannot yet solve, and may provide answers to questions which we have not yet learned to ask'' (House Report 1973:4–5).

Under the original ESA, a species was defined to include ''any subspecies of fish or wildlife or plants and any other group of fish or wildlife of the same species or smaller taxa in common spatial arrangement that interbreed when mature'' (ESA, Section 3(15)). In 1978, the Act was amended to eliminate this language and replace it with the current DPS concept. The new definition provides that a species includes ''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'' (ESA, Section 4). The legislative history of the provision provides no guidance as to the meaning of distinct population segment.

The following year, Congress rejected a proposal by the General Accounting Office (GAO) to eliminate the authority to list discrete populations of vertebrates (a draft GAO report stated that the DPS language ''could result in the listing of squirrels in a specific city park….'' [Senate Report 1979:6–7]). The Senate Report recognized, however, that ''…the committee is aware of the great potential for abuse of this authority and expects the USFWS to use this authority to list populations sparingly and only when the biological evidence indicates such action is warranted'' (Senate Report 1979:151).

In 1990, the USFWS and the National Marine Fisheries Service (NMFS) convened a Vertebrate Population Workshop to interpret the DPS language in the ESA. In a memorandum dealing with pacific salmon (*Oncorhynchus* spp.), NMFS proposed its own definition reflecting ''concepts discussed at the workshop'' (NMFS 1991:58612, Waples 1991). The NMFS memorandum provided that a vertebrate population would be considered distinct under the ESA (and hence a species) if representative of an evolutionarily significant unit (ESU) of the biological species. An ESU was defined as a population that (1) is substantially ''reproductively isolated'' from other populations of the species, and (2) represents an ''important component of the evolutionary legacy of the species'' (NMFS 1991:58612). NMFS noted that these dual criteria ''reflect two common meanings of 'distinct': the criterion of reproductive isolation emphasizes the concept of 'separate' or 'apart from,' whereas the criterion of evolutionary importance focuses on characteristics that are 'different' or 'unique''' (NMFS 1991:58612).

However, in addressing this second meaning of the term distinct, the NMFS memorandum goes beyond a neutral effort to measure differentness and mandates an inquiry into the value of the population from an ESA perspective — its importance to the genetic legacy of the species. The requirement that a DPS be valuable from an ESA perspective (NMFS notes in the memorandum that the test would be satisfied if the population contributed substantially to the overall genetic diversity of the species) makes it clear that NMFS was focused, like Congress, on situations where the likely result of DPS classification would be to provide the subject population with more protection than the larger species. The importance test thus restrained overuse of DPS classifications in situations with which Congress and the GAO had been concerned (like the squirrels in a park). This value-based facet of DPS analysis — the requirement that a DPS population must be important or significant relative to policies underlying the ESA to the larger species — creates considerable confusion when DPS classification is sought in the context of a decision to afford the population less protection than the species — to delist or down list.

In 1996, USFWS and NMFS of the National Oceanic and Atmospheric Administration (NOAA) developed a joint policy (the 1996 Policy) to clarify the meaning of DPS for general applications (USFWS and NOAA 1996). The final rule adopting the policy makes it clear that 3 broad principles guided the development of the 1996 Policy: (1) the ESA's authors intended to protect genetic diversity (House Report 1973); (2) the 1979 directive that government agencies list populations ''sparingly, and only when the biological evidence indicates that such action is warranted'' (Senate Report 1979:151), and (3) the stipulation in the ESA (section 4(b)(1)(A)) that listing decisions be ''solely on the basis of the best scientific and commercial data available.'' The final rule setting forth the 1996 Policy states that NMFS's previously annunciated ESU test is ''consistent with the policy outlined in this notice'' (USFWS and NOAA 1996:4722).

The 1996 Policy begins with the following general statement (USFWS and NOAA 1996:4725):

> Three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for addition to the lists of endangered and threatened wildlife and plants, reclassifications, and removal from the lists:
>
> 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; and
> 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?)

The relationship between these 3 elements is unclear. Logically, the third can only come into play after DPS classification, the province of the first 2, has been resolved. Further, a response to a comment during rulemaking states unequivocally that the first 2 tests must both be satisfied to classify a population as a DPS, and other language in the Policy is to the same effect. As will be seen, however, a strong argument could be made that the significance tests should be applied differently depending upon context.

After listing the elements, the 1996 Policy states (USFWS and NOAA 1996:4725)

> A population segment of a vertebrate species may be considered discrete if [either]: 1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors… [or] 2. It is delimited by international governmental boundaries within which differences in control of explication, management of habitat, conservation status or regulatory mechanisms exist….
>
> If a population segment is considered discrete under one or more of the above conditions, its biological and ecological significance will then be considered in light of Congressional guidance … that the authority to list DPSs be used 'sparingly' while encouraging the conservation of genetic diversity. In carrying out this examination, the Services will consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs.

The significance test may be satisfied by (USFWS and NOAA 1996:4725):

1. Persistence of the [DPS] in an ecological setting unusual or unique for the taxon.
2. Evidence that loss of the [DPS] would result in a significant gap in the range of a taxon.
3. Evidence that the [DPS] represents the only surviving natural occurrence of a taxon…. or
4. Evidence that the [DPS] differs markedly from other populations of the species in its genetic characteristics….

Observations regarding the 1996 policy

Although the final rule states that the 1996 criteria are to be applied to decisions to list and delist, and suggests that they are to be applied whether the underlying species or subspecies is listed or not, the vernacular and logic of the rule are, as with the NMFS ESU typology, more suited to analyses where the question is whether to classify a DPS for increased protection — for listing (where the broader population is not listed) or uplisting (where the broader population is listed as threatened). This focus on listing or uplisting emerges often in agencies' supporting argumentation, as in the following passage (USFWS and NOAA 1996:4725):

> Listing, delisting, or reclassifying distinct vertebrate population segments may allow the Services to protect and conserve species and ecosystems upon which they depend before large-scale decline occurs that would necessitate listing a species or subspecies throughout its entire range….

Similarly, responding to a comment that the occurrence of a population in an unusual setting should not be used as evidence for its significance, the agencies wrote (USFWS and NOAA 1996:4724):

> The Services continue to believe that occurrence in an unusual ecological setting is potentially an indication that a population segment represents a significant resource of the kind sought to be conserved by the Act.

Moreover, the significance test, like the importance test espoused by NMFS, reflects a similar focus on (and bias toward) uplisting. A determination that a population is significant or important to a threatened or endangered species is a logical prerequisite to a classification decision that may result in greater protection for that population. But such a determination does not logically support a classification for the opposite purpose — indeed, it is difficult to contend that a population is a better candidate for delisting if it is more, rather than less, significant to a threatened or endangered species.

Of the 4 ways in which the 1996 Policy states the significance test can be satisfied, 2 — the 'significant gap' test and the 'only surviving natural occurrence' test — seem most directly to address the value of the population to the broader species and thus are germane primarily to listing or uplisting decisions. A third, evidence that the population may differ markedly from other populations of the same species in its genetic characteristics, seems at first blush more neutral because one might see marked differences as suggestive that the population is of less

rather than more value to the overall species. However, the ESA's emphasis on the value of genetic diversity (and abundant scientific support for that emphasis) suggests that such differences are, again, more likely to urge protection and conservation than the reverse. Similarly, the first subtest under significance — "persistence of the [population] in an ecological setting unusual or unique for the taxon" (USFWS and NOAA 1996:4724) — might seem to support arguments either way, although it too seems more likely to correlate with a population of usual value (for genetic reasons and because the population's ability to exist in such a setting could protect the larger species from risk of catastrophe).

One might resolve the apparent incongruity of the significance test in the delisting context by reading the 1996 Policy to suggest that (1) discreteness is required for all DPS classifications, (2) once discreteness has been established for a population, "its biological and ecological significance will then be considered" (USFWS and NOAA 1996:4725), and (3) the nature of the significance inquiry depends on whether the population is a candidate for greater protection than the species (in which case a positive finding of significance will be required) or for lesser protection (in which case a finding of little or no significance will be required). I would find such a reading helpful, but it is not faithful to the words of the policy or the way the agencies have implemented it.

Comments to the proposed rule that embodied the 1996 Policy and the Agencies' responses to them (USFWS and NOAA 1996) reinforce the emphasis on listing or uplisting and reflect other important themes and tensions. Some comments sought to restrict ESA protection to entire species notwithstanding the subspecies and DPS language in the statute. Others suggested that conservation of genetic resources was the relevant policy touchstone, while still others suggested that the purpose of the ESA and the DPS policy in particular was to conserve significant ecosystems regardless of the presence or absence of genetically significant resources. The Agencies responded by proposing a somewhat fluid approach: "[We] understand the Act to support interrelated goals of conserving genetic resources and maintaining natural systems and biodiversity over a representative portion of their historic occurrence. The draft policy was intended to recognize both these intentions, but without focusing on either to the exclusion of the other…" (USFWS and NOAA 1996:4723).

A similar difference of views marked comments on the appropriate object of a DPS's significance, with some arguing that the relevant question was significance to the larger species while others asserted that significance to the ecosystem was the appropriate inquiry. The Agencies were unwilling to follow the second course, reasoning that most populations play some role in the environment they inhabit and that such roles would not provide adequate grounds for discriminating among populations. This was an important choice and one that advances the Agencies' efforts to remain faithful to the admonition that DPS classification be used sparingly.

At least one person submitting a comment took the position that a population should only be required to be discrete or significant, not both. The Agencies responded that "The Services believe that both are necessary…. The interests of conserving genetic diversity would not be well served by efforts directed at either well-defined but insignificant units or entities believed to be significant but around which boundaries cannot be recognized" (USFWS and NOAA 1996:4724).

At least one comment noted tension between the discreteness and significance tests. The Agencies summarized this comment as (USFWS and NOAA 1996:4724): "Requiring that a DPS be discrete effectively prevents the loss of such a segment from resulting in a gap in the distribution of a species. Essentially, if distinct populations are entirely separate, the loss of one has little significance to the others." The Agencies response was once again fluid (USFWS and NOAA 1996:4724):

> If the standard for discreteness were very rigid or absolute, this could very well be true. However, the standard adopted allows for some limited interchange among population segments considered to be discrete, so that the loss of an interstitial population could well have consequences for gene flow and demographic stability of a species as a whole. On the other hand, not only population segments whose loss would produce a gap in the range of a species can be recognized as significant, so that a nearly or completely isolated population segment could well be judged significant on other grounds….

Politics, science, and policy

In many areas of law and policy it is theoretically possible to separate science and fact from values, aesthetics, and political choices. Regrettably, in its present form DPS analysis tends to elude such

principled distinctions. One reason is that politically neutral classifications under the ESA are almost nonexistent, for several reasons. First, except in relatively rare cases, DPS analysis is instantly and recognizably directional — if a species is listed, the DPS analysis leads to a recommendation to list or delist, and both are inherently controversial. Second, the attempt to classify a population as a DPS may be an effort to reopen debate over a prior listing determination. And third, the criteria articulated for determining whether a population constitutes a DPS focus on many of the same questions and values as the ESA itself.

Nonetheless, in the case initially of concern to Congress, then the GAO, then the Agencies — the case of a possible DPS of a species that is not listed — the discreteness and significance tests allow some play for rigorous analysis because they are largely coherent, have some grounding in science, and ask questions relevant in the context of the ESA. Further, it is analytically possible, and may be quite logical, to determine that a population meets the discreteness and significance tests and thus constitutes a DPS, but then decide to not list or uplist that population. However, the reverse case is considerably more perplexing and provides less opportunity for principled analysis because the Agencies' criteria, and the various significance tests in particular, do not seem to ask enough questions that are logically relevant to a decision to delist (or downlist) a population. Consider, for example, 2 populations of a threatened species that have recovered to the same extent. If there are doubts about the extent or sustainability of that recovery, surely the less significant population (in the sense the term is used in the 1996 Policy) is the better candidate for downlisting. Because of this misfit in the DPS classification criteria, a decision to classify and downlist provides less play for science and analysis and permits politics, always present in ESA debate, a freer rein.

Perhaps what is needed is an administrative reevaluation of the appropriate criteria for DPS classifications in the downlisting context. Revised criteria for use in that context might start with the 1996 Policy, but would, I think, quickly diverge from it. Thus, there should likely continue to be some form of relative isolation requirement, although genetic distinctness would tend to argue against classification in that context and genetic redundancy in favor of classification. As to significance, the inquiry might well reverse that set forth in the 1996 Policy. That is, to classify and downlist a DPS of an endangered or threatened species should require that the population not be significant to the threatened or endangered species.

More broadly, to be effective, conservation decisions need some predictability and longevity, some protection from short-term politics, and some underlying rationale that can be applied in a principled fashion notwithstanding differing (or changing) political starting points. The tests set forth in the 1996 Policy provide an acceptable framework for DPS decisions relating to populations of unlisted species or subspecies (or for decisions to classify and perhaps uplist populations of threatened species or subspecies). If applied with scientific rigor and a genuine effort not to reopen the listing debate, they should be able to keep DPS analysis in that context from wavering back and forth with changes in prevailing ideology. The same cannot be said for tests in the opposite context.

Classification and delisting of Yellowstone grizzly bears

Grizzly bears (*Ursus arctos*) in the lower 48 United States were extirpated from 98% of their historical range between 1850 and 1950 (Mattson et al. 1995). In 1973, the Fund for Animals petitioned the Department of the Interior to list the grizzly bear of the conterminous 48 states as an endangered species. In 1982, the Service developed a recovery plan that treated the bear populations occurring in different ecosystems as a single threatened species — when recovery targets were reached for the 3 ecosystems on which information was available (Yellowstone, Northern Continental Divide, and Cabinet–Yaak), all grizzly bears would be delisted. However, the Service's revised 1993 recovery plan states that grizzlies in an ecosystem can be delisted separately (USFWS 1993), without stating the basis for that conclusion, and sets recovery targets for each of the 6 then-recognized ecosystems (Greater Yellowstone Ecosystem [GYE], Northern Continental Divide Ecosystem [NCDE], Bitterroot Mountains, Selkirk Mountains, North Cascades, and Cabinet–Yaak). The 6 ecosystems have since been referred to in some literature as "distinct populations" (MacCracken et al. 1994).

The proposed delisting rule

In November 2005, the Service formally proposed establishing a DPS for grizzly bears in the GYE and

delisting that DPS (USFWS 2005:69864). The proposed rule analyzes the Yellowstone bears under the 1996 Policy, measuring both discreteness and significance against the balance of the grizzly bears in the lower 48 states, which are listed as threatened under the ESA.

Discreteness. The rule notes that "the nearest population of grizzly bears is found in the NCDE" (about 200 kilometers away; USFWS 2005:69864) and cites authors who commented on the physical separation of the GYE population. Interestingly, however, since bears in the lower 48 states were listed, Yellowstone grizzly bears have dispersed out of the Recovery Zone and the current DPS mapping reflects considerable ability to disperse. Grizzly bears have feeding habits that are highly adaptable (Mattson 2000) and have expanded their range, often into areas where they are not well tolerated.

Observations based on verified tracks, photographs, hair samples, dead bears, and direct observations reveal use by grizzly bears of areas adjacent the GYE such as the Centennial Mountains and the Gravelly Range. In 2005 a grizzly bear that originated in the NCDE was found dead in the Mills Creek drainage south of Anaconda, 38 km northwest of the proposed DPS boundary (M. Haroldson, US Geological Survey, Bozeman, Montana, USA, personal communication, 2006). Indeed, it appears that connections with the NCDE bear population can be established (C. Servheen, USFWS, Missoula, Montana, USA, personal communication, 2006). Further, many barriers to interconnection are rooted more in human conduct — development, transportation corridors, highways — than in natural barriers (other than distance).

A related question is whether the degree of isolation has existed long enough to lead to genetic differences that are sufficient to implicate discreteness as described in the 1996 Policy. In the case of the tri-state trumpeter swans (*Cygnus buccinator*; USFWS 2003), a DPS petition was denied on grounds that not enough time had elapsed for genetic differences to arise among populations. One hundred years of relative isolation is a relatively brief period from a genetic point of view (S. Kalinowski, Montana State University, Bozeman, Montana, USA, personal communication, 2005). In contrast, Kodiak bears (*U. a. middendorffi*) are a recognized subspecies which clearly show genetic differences with respect to grizzly bears, but they have been isolated for about 10,000 years (Paetkau et al. 1998).

In fact, there may simply not be enough data to determine if significant genetic variations exist. Yellowstone grizzly bears share a number of maternal haplotypes with NCDE grizzly bears (Waits and Talbot 1998), although there has been some divergence as a result of low inter-ecosystem migration (Miller and Waits 2003). Proponents of delisting argue that "genetic data also support the conclusion that grizzly bears from the Yellowstone area are markedly separated from other grizzly bears" (USFWS 2005:69864) and point to heterozygosity studies to support that conclusion. However, indications of genetic divergence between Yellowstone grizzly bears and NCDE grizzly bears (heterozygosity estimates at 8 microsatellite loci are 55% in the Yellowstone ecosystem, lower than the 69% observed in the NCDE, Paetkau et al. 1998) provide just a piece of a genetic puzzle: in most DPS analyses, mtDNA and microsatellites from nuclear DNA seem to be used most as genetic markers of divergence for defining the discreteness of a population. In combination, while these data indicate that the Yellowstone grizzly bears have lost some diversity, they do not support genetic distinctness. Moreover, while gene flow involving bears moving across ecosystems has not been documented, only one migrant per generation could re-establish gene flow between the GYE and NCDE populations.

Significance. The Delisting Rule supports its significance finding based on 3 of the 4 types of evidence referenced in the 1996 Policy (USFWS and NOAA 1996). The rule (USFWS 2005:69864) asserts that "Grizzly bears in the Yellowstone area exist in a unique ecosystem that has greater access to large-bodied ungulates such as bison (*Bison bison*), elk (*Cervus elaphus*), and moose (*Alces alces*) and less access to fall berries than any other interior North American, European, or Asian grizzly bear population …the Yellowstone grizzly population also exists in a unique ecological setting because it is able to use whitebark pine seeds as a major food source." However, grizzly bears are opportunistic feeders and eat whatever will increase their fat content. Accordingly, bears in ecosystems with different primary food supplies will always meet this criterion. One might, on this reasoning, have asserted 30 years ago that GYE grizzlies were unique because of the importance of garbage to them as a food supply.

Moreover, food supplies evolve with climate change and other factors. Whitebark pine (*Pinus albicaulis*) used to be a major food source in the

NCDE 40 years ago (Arno 1986, Tomback et al. 2001). With the current decline of whitebark pine in the Yellowstone region, these ecosystems and populations may be converging from this perspective. Yellowstone bears will have to find alternative food sources to survive and perhaps will have to travel greater distances to find them. Meat, in the form of elk carcasses, elk calves, and usurpation of wolf (*Canis lupus*) kills (Schwartz et al. 2006), is undisputedly important in the GYE and is increased by harsh winters (that increase winter kills) as well as wolf–bear dynamics. Bison meat is also available generally in the form of carcasses and calves. (Reports of predation by grizzly bears on adult bison are rare [Wyman 2002]). However, these distinctions, too, may be short-lived. If warmer winters and high mortality of wolves mean higher elk and bison survival rates, the diminished availability of carcasses could reduce the importance of meat as food for grizzly bears, and the percent in the food intake of grizzly bears may vary. In such event, bears will do what they have done in the past — range further and seek additional sources of food, if they are available. Accordingly, it is far from clear that these traits of the ecological setting are sufficiently pronounced or enduring to serve as a predicate for a finding of significance.

Turning to the 'gap in range' test, the rule states (USFWS 2005:69865): ''Loss of the proposed Yellowstone DPS would be significant because it would substantially curtail the range of the grizzly bear by moving the range approximately 4 degrees of latitude to the north. Thus, the loss of this population would result in a significant gap in the current range of the taxon….''. Given the grizzly bear's historic occupancy of the conterminous States and the portion of the historic range the conterminous States represent, recovery in the lower 48 States where the grizzly bear existed in 1975 when it was listed has long been viewed as important to the taxon (40 FR 31734). The proposed Yellowstone DPS is significant in achieving this objective as it is 1 of only 5 known occupied areas and constitutes approximately half of the remaining grizzly bears in the conterminous 48 States.

This analysis is troubling in 2 respects. First, it makes a strong case for a finding of the significance — both as that word is commonly understood and with respect to the remaining grizzly populations in the lower 48 states. But the incongruity of that strong case to the Delisting Rule's conclusion eloquently demonstrates that such a finding of significance to a threatened species is a strange criterion to apply in a decision to classify and delist. And second, I doubt the significance finding is actually as solid as it feels. Consider, as a test, how the gap in range argument would fare if the facts were inverted — if the northern populations were not listed and were faring better than the Yellowstone bears, and conservationists sought to find and protect a GYE DPS. Would a gap in range argument really carry the day when there were other bears a mere 210 km north?

The rule's discussion of the third significance test — differences in genetic characteristics — repeats in large measure the discussion which was included in the discreteness section of the Delisting Rule (analyzed above).

Conclusion: The DPS policy and Yellowstone bears

The Service has proposed to delist the Yellowstone grizzlies at a time, and in a setting, of considerable controversy. The Delisting Rule raises 2 important questions regarding DPS criteria and analysis: (1) How persuasive is the conclusion that GYE bears constitute a DPS under the 1996 Policy; and (2) Do the enunciated DPS criteria seem relevant and workable in the context in which classification of the Yellowstone bears arises?

I have argued that isolation was less pronounced than the rule suggests and was in many respects a result of human activity. In addition, I argued that the determination that Yellowstone bears exist in a unique ecological setting is overdrawn — many of the differences are ones of degree, not of kind, and others are transitory. In addition, in considering the 'gap in range' test, I reversed the facts and asked whether this branch of the significance test would be satisfied if the NCDE populations were healthy and unlisted and it was sought to classify and protect a GYE DPS. My purpose was to probe the extent to which the test was being applied neutrally and to raise the question whether current proponents of the rule would be as convinced by their claims of unique ecological setting, or genetic distinctiveness, if the facts were reversed.

Taking a step back, if DPSs are to be used to list and delist, the oft-cited Congressional admonition to apply DPS sparingly needs to be understood as a caution that only rarely should populations be treated differently than the species or subspecies to which they belong. I believe it is difficult to square

the classification of Yellowstone bears in with such an admonition.

I believe the Delisting Rule quite clearly demonstrates the unsuitability of many of the criteria in the 1996 Policy to decisions to classify populations of listed species and down or delist them. Frequently those criteria seem backward or upside down in the delisting context — the more one is persuaded of the significance of the population to a threatened species, the less one believes it makes sense to delist that population. In short, the criteria need to be refined and adjusted if DPSs are to be used as an intelligent and effective tool to identify, classify, and delist populations of threatened or endangered species.

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Literature cited

ARNO, S.F. 1986. Whitebark pine cone crops—a diminishing source of wildlife food? Western Journal of Applied Forestry 1(3):92–94.

HOUSE REPORT. 1973. No. 93-412, 93rd Congress, First Session, July 27, 1973. US Government Printing Office, Washington DC, USA.

MACCRACKEN, J.G., D. GOBLE, AND J. O'LAUGHLIN. 1994. Grizzly bear recovery in Idaho. College of Natural Resources Policy Analysis Group, University of Idaho, Moscow, Idaho, USA.

MATTSON, D.J., R.G. WRIGHT, K.C. KENDALL, AND C.J. MARTINKA. 1995. Grizzly bears. Pages 103–105 *in* E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. US National Biological Service, Washington, DC, USA.

———. 2000. Brown bear (*Ursus arctos*). Pages 66–71 *in* R.P. Reading and B. Miller, editors. Endangered animals: a reference guide to conflicting issues. Greenwood Press, Westport, Connecticut, USA.

MILLER, C., AND L. WAITS. 2003. The history of effective population size and genetic diversity in the Yellowstone grizzly (*Ursus arctos*): Implications for conservation. Proceedings of the National Academy of Sciences 100:4334–4339.

NATIONAL MARINE FISHERIES SERVICE. 1991. Policy on the definition of species under the Endangered Species Act. 56 Federal Register November 20, 1991:58612–58618.

PAETKAU, D., L.P. WAITS, P.L. CLARKSON, L. CRAIGHEAD, E. VYSE, R. WARD, AND C. STROBECK. 1998. Variation in genetic diversity across the range of North American brown bears. Conservation Biology 12:418–429.

SCHWARTZ, C.C., R.B. HARRIS, AND M. HAROLDSON. 2006. Impacts of spatial and environmental heterogeneity on grizzly bear demographics in the Greater Yellowstone Ecosystem: a source–sink dynamics with management consequences. Pages 72–96 *in* C.C. Schwartz, M.A. Haroldson, G.C. White, R.B. Harris, S. Cherry, K.A. Keating, D. Moody, and C. Servheen, editors. Temporal, spatial and environmental influences on the demographics of grizzly bears in the Greater Yellowstone Ecosystem. Wildlife Monographs 161.

SENATE REPORT. 1979. No. 96-151, 96th Congress, First Session. Government Printing Office, Washington, DC, USA.

TOMBACK, F.D., S.F. ARNO, AND R.E. KEANE. 2001. Whitebark pine communities: Ecology and restoration. Island Press, Washington, DC, USA.

US FISH AND WILDLIFE SERVICE. 1993. Grizzly bear recovery plan. Missoula, Montana, USA.

——— AND NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION. 1996. Policy regarding the recognition of distinct vertebrate population segments under the Endangered Species Act. 61 Federal Register 7 February 1996:4722–4725.

———. 2003. 90-day finding for a petition to list the tri-state area flock of trumpeter swans as threatened. 68 Federal Register, January 28 2003:4221–4228.

———. 2005. Designating the Greater Yellowstone Ecosystem Population of grizzly bears as a distinct population segment; removing the Yellowstone distinct population segment of grizzly bears from the federal list of endangered and threatened wildlife. 50 Federal Register November 17 2005:69854–69884.

WAITS, L., AND L. TALBOT. 1998. Mitochondrial DNA phylogeography of the North American brown bear and implications for conservation. Conservation Biology 12:408–417.

WAPLES, R.S. 1991. Pacific salmon, *Oncorhynchus* spp. and the definition of "species" under the Endangered Species Act. Marine Fisheries Review 53:11–22.

WYMAN, T. 2002. Grizzly bear predation on a bull bison in Yellowstone National Park. Ursus 13:375–377.

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