A Proposed Policy for Interpreting 'Significant Portion of Its Range' for the U.S. Endangered Species Act, 1973

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ABSTRACT

The Endangered Species Act (ESA) defines an endangered species as being "in danger of extinction throughout all or a significant portion of its range. . ." (16 U.S.C. § 1532). The phrase "significant portion of its range" (SPR) has received considerable attention by academics, policy makers, and the courts. The Fish and Wildlife Service has developed five interpretations of SPR over the past two decades. Each interpretation has been rejected by one or more court opinions. We show how the minimum requirements for an acceptable interpretation of SPR emerge from a synthesis of law and science.

An element of this synthesis is science pertaining to the biodiversity crisis, which unambiguously indicates that the biodiversity crisis is fundamentally about the extirpation of most species from alarming portions of their historic range. As a result, a disturbingly large portion of Earth's land has lost significant portions of native fauna. These losses constitute a biodiversity crisis because ecosystem health depends on species manifesting their ecological value (as that phrase, "ecological value," is used in the ESA (16 U.S.C. § 1531)), but they cannot do so in unoccupied portions of their range.

Another element of this synthesis is the ESA's purpose (16 U.S.C. § 1532), which clearly aligns with the aforementioned science. The ESA's purpose also incontrovertibly extends beyond avoiding global extinction to include preventing unacceptable harm to species' ecological value, which cannot be manifest on the portion of a species' range from which it has been extirpated.

The Service may have intended to fulfill this purpose (or some version of this purpose) through § 4(a)(1) of the ESA (16 U.S.C. § 1533), which pertains to the analysis of threats, or through application of the 3Rs (resiliency, redundancy, representation). We explain how these approaches fall short. Court opinions

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have also indicated that the Fish and Wildlife Service has failed in its obligation to develop an adequate standard for determining endangerment. This standard would be objectively measurable, supported by relevant science, flexible enough to accommodate the great variety of endangered species, and comport with existing policy.

The courts also indicate the need to align the interpretation of "significant" more plainly with its dictionary definition. Furthermore, a large class of laws and policies use the idea (if not the word) "significant" to indicate levels of harm, loss, or danger that are unacceptable and beyond which corrective action is required. For example, harm to public health is significant when concentrations of lead in drinking water exceed X ppm; therefore, concentrations of lead should be less than X ppm. Such comparisons are important because the ESA is among the kind of law and policy aiming to limit unacceptable harm and loss.

These considerations require that SPR be interpreted in terms that include the percentage of a species' range no longer securely occupied. SPR may refer to more than that numeric percentage, but it must at least account for that percentage, per se.

Determining what counts as unacceptable loss is an inherently normative judgment. When an agency is obligated to make a normative judgment—as they often are—scholarship in policy development indicates that scientifically-derived understanding of experts' and the public's views are of great importance in assisting the agency's judgment. In this Article, we review recent science that elicited the views of hundreds of conservation experts and American residents with respect to the question, how much of a species' range can be lost beyond which special conservation protections are warranted? This research provides what had been the last missing piece of key insight for developing a robust SPR policy.

We use this synthesis to propose a policy interpretation of SPR that meets all the requirements of court opinions.

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Introduction

An essential element of the U.S. Endangered Species Act of 1973, 16 U. S.C. § 1531 (ESA), is its defining an endangered species as being one "in danger of extinction throughout all or a significant portion of its range. . ."[1] By the turn of the century, it became clear that understanding what an endangered species is requires interpreting the phrase "significant portion of its range" (hereafter, SPR). During the first decade of the Twenty-First century, a series of scholarly papers proposed and defended a set of related interpretations for SPR.[2]

1. 16 U.S.C. § 1532(6).

2. John A. Vucetich et al., *The Normative Dimension and Legal Meaning of Endangered and Recovery in the U.S. Endangered Species Act,* 20 Conserv. Biol. 5 (2006); Nicole M. Tadano, *Piecemeal Delisting: Designating Distinct Population Segments for the Purpose of Delisting Gray Wolf Populations is Arbitrary and Capricious,* 82 Wash L. Rev. 795 (2007); Sherry A. Enzler & Jeremy T. Bruskotter, *Contested Definitions of Endangered Species: The Controversy Regarding How to Interpret the Phrase "A Significant Portion of a Species' Range,"* 27 Va. Env't L.J. 1 (2009); Noah D. Greenwald, *Effects on Species' Conservation of Reinterpreting the Phrase "Significant Portion of its Range" in the U. S. Endangered Species Act*, 23 Conserv. Biol. 1374–1376 (2009); Alexandra Kamel, *Size, Biology, and Culture: Persistence as an Indicator of Significant Portions of Range Under the*

Between 2001 and 2020, the U.S. Fish and Wildlife Service (hereafter, the Service) advanced five interpretations of SPR. Those interpretations have been at odds with principles provided by the aforementioned scholarly papers. Each of the five interpretations has also been either abandoned by the Service or rejected by the courts, with one court writing in 2017 that the Service's interpretation of SPR "impermissibly clashes with the rule against surplusage and frustrates the purposes of the ESA."[3]

These circumstances indicate the need for a robust SPR policy. This analysis informs and guides the development of such policy.

I. UNDERLYING PREMISE

A minimally reasonable interpretation of SPR must be true to the plain language meaning of the phrase; cannot frustrate the purpose of the ESA, including Congress's intent when they added that phrase to the statute; and must harmonize with the language of other operative provisions in the ESA. As such, the ESA's findings provide essential content:

> The Congress finds and declares that (1) various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation; (2) other species of fish, wildlife, and plants have been so depleted in numbers that they are in danger of or threatened with extinction; (3) these species of fish, wildlife, and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people. . .[4]

Based on those findings, Congress expressed the ESA's purpose:

> The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.[5]

To summarize: Although the Director of the Service has discretion in interpreting SPR, the ESA's statutory purpose constrains that discretion.

Endangered Species Act, 37 ECOLOGY L.Q. 525 (2010); Carlos Carroll et al., *Geography and Recovery Under the U.S. Endangered Species Act*, 24 CONSERV. BIOL. 395–403 (2010).

3. Ctr. for Biological Diversity v. Jewell, 248 F. Supp. 3d 946, 958 (D. Ariz. 2017), *amended in part*, No. CV-14-02506-TUC-RM, 2017 WL 8788052 (D. Ariz. Oct. 25, 2017); *see also* Desert Survivors v. U.S. Dep't of the Interior, 336 F. Supp. 3d 1131, 1134 (N.D. Cal. 2018).

4. 16 U.S.C. § 1531(a).

5. 16 U.S.C. § 1531(b).

II. THE BIODIVERSITY CRISIS

The findings and purposes of the ESA describe what scientists now refer to as the biodiversity crisis. Understanding the purpose of the ESA requires understanding the best-available science as it pertains to the biodiversity crisis.

Humans have increased the rate of species extinction by three orders of magnitude or more.[6] Consequently, of ~40,000 known species of vertebrates, 20% are believed to be at elevated risk of extinction.[7] Those statistics are important and grim, but they also represent a deeply inadequate understanding of the biodiversity crisis.

According to best-available science, an adequate description of the biodiversity crisis requires taking account of the widespread loss of species' geographic range for at least three reasons:

- Extinction risk is directly related to the extent of a species' geographic range.[8]
- The essence of being an endangered species is rarity, which is a formal concept in ecology. According to this concept, a species becomes increasingly rare as a result of threats that lead to some combination of just two processes: diminished population density and lost geographic range.[9,10,11] The central importance of range is also represented by ecologists' taxonomy of rarity (Figure 1).[12,13]

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6. Stuart L. Pimm et al., *The Biodiversity of Species and their Rates of Extinction, Distribution, and Protection,* 344 SCIENCE 6187:1246752 (2014).

7. Michael Hoffmann et al., *The Impact of Conservation on the Status of the World's Vertebrates*, 330 SCIENCE 1503, 1505 (2010).

8. *E.g.*, Kevin J. Gaston & Tim M. Blackburn, *Conservation Implications of Geographic Range Size-Body Size Relationships*, 10 CONSERV. BIOL. 638, 642–44 (1996); Andy Purvis et al., *Predicting Extinction Risk in Declining Species*, 267 PROS.: BIOLOGICAL SCIS. 1947, 1947–50 (2000); José Alexandre Felizola Diniz-Filho & Natália Mundim Tôrres, *Phylogenetic Comparative Methods and the Geographic Range Size-Body Size Relationship in New World Terrestrial Carnivora*, 16 EVOLUTIONARY ECOLOGY 351, 362 (2002); Kate E. Jones et al., *Biological Correlates of Extinction Risk in Bats*, 161 AM. NATURALIST 601, 605–08 (2003).

9. Total abundance is also a key determinant of rarity and extinction risk. In this formal conceptualization of rarity, total abundance is an emergent property, rising from the product of local density and size of geographic range.

10. KEVIN J. GASTON, *What is Rarity?*, in RARITY 2–5, 15–17 (1994).

11. The connection between rarity and range further justifies Congress's decision to define endangered in terms of range. The fundamental importance of range to extinction risk is also indicated by range contraction being one of the basic criteria by which the IUCN assesses extinction risk.

12. Deborah Rabinowitz, *Seven Forms of Rarity*, in THE BIOLOGICAL ASPECTS OF RARE PLANT CONSERVATION 205, 205–209 (Hugh Synge ed., 1981).

13. The importance of this taxonomy to conservation biologists is indicated, in part, by its having been cited more than 1500 times. Key examples include Jinping Yu & F. Stephen Dobson, *Seven Forms of Rarity in Mammals*, 27 J. BIOGEOGR. 131 (2000); Paul G. Harnik et al., *Long-Term Differences in Extinction Risk Among the Seven Forms of Rarity*, 279 PROS.: BIOLOGICAL SCIS. 4969 (2012); J. Michael Reed et al., *Linking the Seven Forms of Rarity to Extinction Threats and Risk Factors: An Assessment of North American Fireflies*, 29 BIODIVERS. CONSERV. 57 (2020).

- A common mechanism by which humans have elevated the extinction risk for many species is by having reduced the extent of their geographic range, especially due to habitat loss and overexploitation.[14] In particular, a majority of studied terrestrial vertebrates have been extirpated from approximately two-thirds or more of their geographic ranges.[15] Those losses in geographic range translate to large portions of the Earth's terrestrial surface (including the United States) having lost a significant portion of native species whose presence is required to confer ecological value. That lost value is of critical importance because the findings and purpose of the ESA explicitly highlight protecting the "ecological value" of species (Figure 2).

The scientists who discovered that the average vertebrate species had lost approximately two-thirds their historic range commented on the significance of the finding:

> The strong focus on species extinctions, a critical aspect of the contemporary pulse of biological extinction, leads to a common misimpression that Earth's biota is not immediately threatened, just slowly entering an episode of major biodiversity loss. This view overlooks the current trends of population declines and extinctions. . . we show the extremely high degree of population decay in vertebrates, even in common "species of low concern." Dwindling population sizes and range shrinkages amount to a massive anthropogenic erosion of biodiversity and of the ecosystem services essential to civilization. This "biological annihilation" underlines the seriousness for humanity of Earth's ongoing sixth mass extinction event.[16]

14. Gerardo Ceballos & Paul R. Ehrlich, *Mammal Population Losses and the Extinction Crisis*, 296 SCIENCE 904 (2002). *See also* Andrea S. Laliberte & William J. Ripple, *Range Contractions of North American Carnivores and Ungulates*, 54 BIOSCIENCE 123 (2004); Gerardo Ceballos et al., *Biological Annihilation via the Ongoing Sixth Mass Extinction Signaled by Vertebrate Population Losses and Declines*, 114 PROC. NAT'L ACAD. SCI. U.S. E6089, E6093 (2017).; Christopher Wolf & William J. Ripple, *Range Contractions of the World's Large Carnivores*, ROYAL SOC'Y OPEN SCI. 1, 7 (2017).

15. Ceballos et al., *supra* note 14, at E6093.

16. *Id*. at E6089.

	SMALL RANGE		LARGE RANGE	
	low local density	high local density	low local density	high local density
habitat generalist	*Black robins*	*Various island endemics*	*Gray wolves*	*NOT RARE*
habitat specialist	*Ghost orchids*	*Various island endemics*	*Red-cockaded woodpecker*	*Trillium flowers*

Figure 1. Taxonomy of rarity.[17] One way to understand the taxonomy of rarity is to consider an example, gray wolves. Wolves have three characteristics of this taxonomy. Wolves (i) are habitat generalists (indicated by the label on left side of this taxonomy), (ii) have a large geographic range (indicated by the bold-faced labels on the top of taxonomy), and (iii) exhibit low population density. Each box in this taxonomy represents one of only seven different ways by which a species can be rare. The boxes are also illustrated with heuristic examples.

This taxonomy represents two essential results. First, losses in geographic range are one of two basic mechanisms by which threats can cause a species to become rare (the other mechanism being reduced density). Second, there are only seven basic kinds of rarity. The relevance of that second result is presented later in this Article (Section V.F).

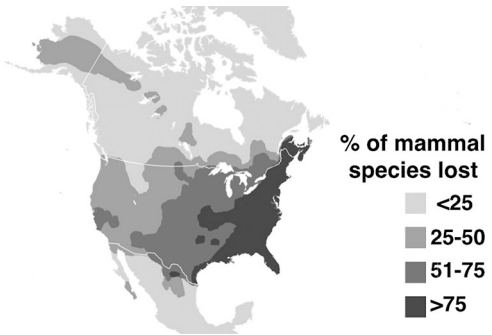

Figure 2. Most mammal species for which sufficient data is available have been driven to extinction from approximately two-thirds or more of their geographic range. The cumulative effect of those losses is that large portions of the United States have lost large portions of their native species, as illustrated here. Redrawn from Ceballos & Ehrlich (2002), *supra* note 14.

The loss of biodiversity is a crisis because species are ecologically valuable to their native ecosystems.[18] But a species cannot manifest its ecological value on

17. Rabinowitz, *supra* note 12.

18. *See, e.g.*, Michael E. Soulé et al., *Ecological Effectiveness: Conservation Goals for Interactive Species*, 17 CONSERV. BIOL. 1238–1250 (2003); John A. Vucetich et al., *A Minimally Nonanthropocentric Economics: What Is It, Is It Necessary, and Can It Avert the Biodiversity Crisis?*, 71 BIOSCIENCE 861 (2021).

portions of range no longer inhabited due to anthropogenic threats. In other words, ecosystem health depends on species occupying their native range at densities that are largely unimpaired by human activities. This best-available science is consistent with the purpose of the ESA where it highlights the *ecological value* of a species.[19]

In sum, interpreting SPR without explicitly accounting for the percentage of historic range that is unoccupied is contrary to both the best-available science and the purpose of the ESA, which is—in scientific parlance—to mitigate the biodiversity crisis.

III. CORRECTING A LEGAL MISUNDERSTANDING ABOUT ECOLOGICAL SCIENCE

The scientific review of the biodiversity crisis, as presented in the previous section, corrects an objectively inaccurate impression of scientific knowledge that had been expressed in a prior court opinion which stated, essentially as a musing that "a more thorough analysis, however, suggests that a flat percentage of geographic area is not the *sole* determinant of significance. . ."[20] (emphasis added). The more complete context of that quotation is:

> A more thorough analysis, however, suggests that a flat percentage of geographic area is not the sole determinant of significance. As a general rule, species are not evenly distributed across their ranges, but rather tend to concentrate in certain areas where habitat is particularly suitable. Thus, the percentage of geographic area would not linearly correlate to the percentage of a species' population. One-third of a species' geographic range may be found to contain a disproportionately greater or lesser percentage of the total number of individuals. It does not seem fair or sensible, then, to point to some arbitrary geographic percentage as constituting a "significant" portion of a species' range.[21]

The science agrees that "a flat percentage of geographic area is not the *sole* determinant of significance" (emphasis added). Further, any minimally reasonable interpretation of SPR must take account of determinants of significance aside from a flat percentage. But the need to account for such forms of significance does not preclude the importance of a flat percentage, as evidenced by Section II.

The court's view misunderstands other important scientific principles as well. Specifically, portions of a species' range with low density are not, in general or as a matter of principle, less valuable to the species or with respect to the ecological value provided by a species. Gray wolves provide an important example. The

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19. 16 U.S.C. § 1531(b). In other words, what the ESA refers to as species' ecological value corresponds to what ecologists refer to as species' ecological function. A species' ecological function cannot be manifest in places where it is not present at densities unimpaired by anthropogenic threats.

20. Sw. Ctr. For Biological Diversity v. Norton, Civ. No. 98–934, 2002 WL 1733618, at *16 (D.D.C. July 29, 2002).

21. *Id.*

density of wolves on the Brooks Range of northern Alaska is five times greater than in Wisconsin. But the Wisconsin portion of wolf range is no more or less important than the Brooks Range portion of wolf range. Furthermore, important differences in density typically arise for ecological reasons such as the differences in prey density or prey type or differences in the ecosystem's abiota (e.g., Normalized Difference Vegetation Index, NDVI). If two portions of a range differ in such a manner, that would be important evidence for concluding that the two portions of range represent distinct population segments.[22]

Additionally, portions of range where density is lower and less stable are likely important portions of range for contributing to the long-term health of the species, due to their role in maintaining genetic diversity.[23]

The court is also correct in stating that it would not be fair or sensible "to point to some arbitrary geographic percentage as constituting a 'significant' portion of a species' range." We explain how to make such a decision in a non-arbitrary manner in Sections V.A through V.D of this Article.

IV. PREVIOUS INTERPRETATIONS

The history of the Service's interpretations of SPR is effectively conveyed in episodes, pertaining especially to (i) a brief filed in a 2001 court case about the flat-tailed horned lizard, (ii) a Solicitor's opinion issued in 2007, and (iii) a final SPR policy issued in 2014.

A. FLAT-TAILED HORNED LIZARD

In 1993, the Service proposed listing the flat-tailed horned lizard due, in part, to widespread habitat loss.[24] In 1997, the Service withdrew that proposed listing.[25] In 2001, Defenders of Wildlife challenged the Service's decision to withdraw the proposed listing in court.[26]

In briefs submitted by the Secretary of the Department of Interior (and subsequently quoted in the court's decision), the Secretary proffered an interpretation of an endangered species that takes account of the SPR phrase. Specifically, the Secretary interpreted an endangered species as one that "faces threats in enough key portions of its range that the *entire species* is in danger of extinction."[27] This

22. Section VI.A for details.

23. John A. Vucetich & Thomas A. Waite, *Spatial Patterns of Demography and Genetic Processes Across the Species' Range: Null Hypotheses for Landscape Conservation Genetics,* 4 CONSERV. GENET. 639 (2003).

24. Proposed Rule to List the Flat-Tailed Horned Lizard as Threatened, 58 Fed. Reg. 62624 (Nov. 29, 1993).

25. Withdrawal of the Proposed Rule to List the Flat-Tailed Horned Lizard as Threatened, 62 Fed. Reg. 37852 (July 15, 1997).

26. Defenders of Wildlife v. Norton (*Flat-tailed Horned Lizard*), 258 F.3d 1136, 1140 (9th Cir. 2001).

27. *Id.* at 1141.

SPR-related interpretation has been referred to as the "clarification interpretation."[28]

The court rejected the clarification interpretation because it resulted in the SPR phrase being reduced to surplusage and was contrary to the ESA's legislative history.[29] That legislative history includes, but is not limited to, the House Report accompanying the bill, which highlighted how the ESA replacing a predecessor law would be a "significant shift in the definition [of an endangered species] in existing law which considers a species to be endangered only when it is threatened with worldwide extinction" because the ESA would include as endangered species any species that is in danger of extinction "in *any* portion of its range."[30] Furthermore, the court indicated that, although the Secretary has broad discretion in interpreting SPR, it must explain how its interpretation is consistent with statutory text and purpose of the ESA.

The clarification interpretation was rejected for similar reasoning in a second case, involving the Canada lynx.[31]

Shortly after those rejections, the Service held a meeting at Marymount University, where it developed a more elaborate—but effectively identical—interpretation of SPR (Figure 3). The so-called Marymount interpretation of SPR was rejected in two court opinions in 2005.[32]

28. Kristyn Judkins, *Deciphering the ESA's Enigmatic SPR Phrase*, LEWIS & CLARK L. SCH.: ENV'T, NAT. RES., & ENERGY BLOG (Aug. 19, 2020), https://perma.cc/5P8X-KW67.

29. *Flat-tailed Horned Lizard*, 258 F.3d at 1142.

30. ENDANGERED AND THREATENED SPECIES CONSERVATION ACT OF 1973, H.R. Rep. No. 93-412 at 10 (1973).

31. Defenders of Wildlife v. Norton, 239 F. Supp. 2d 9 (D.D.C. 2002).

32. Nat'l Wildlife Fed'n v. Norton, 386 F. Supp. 2d 553, 566 (D. Vt. 2005); Defenders of Wildlife v. U.S. Dep't of the Interior, 354 F. Supp. 2d 1156, 1164–65 (D. Or. 2005).

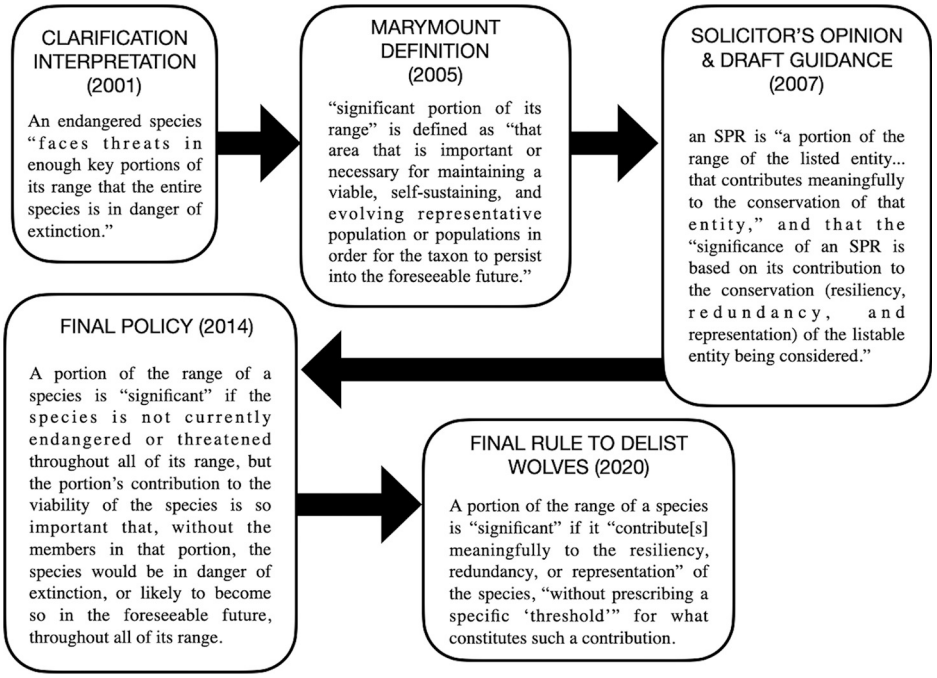

Figure 3. Evolution of the Service's interpretation of "significant portion of its range." Although the courts have consistently indicated that the ambiguous phrase entitles the Service to deference with its interpretation, the Service must explain itself and the interpretation must be reasonable. The diagram suggests that the Service has increasingly explained what is essentially the same interpretation. This pattern, and other evidence provided in the main text, suggests that the Service's underlying interpretation (explanations notwithstanding) has been unreasonable. A robust and minimally reasonable SPR policy will almost certainly be a substantial departure from the Service's previous interpretations. Each interpretation is cited in the main text, except for the Marymount definition, which is found in *National Wildlife Federation v. Norton* (2005) (note 30 at 565) and the Final Rule (2020), which is from 85 Fed. Reg. 69,778 (Nov. 3, 2020).

B. SOLICITOR'S OPINION (2007)

The failure of those SPR interpretations led the Service to issue a Solicitor's opinion in 2007 on the interpretation of SPR, which explicitly rejected the clarification interpretation and stated:

> The SPR phrase is a substantive standard for determining whether a species is an endangered species . . . and the protections of the ESA [are to be] applied to

> [a] species in that portion of its range where it is specified as an "endangered species"[33]

The Solicitor's opinion also indicates that the Secretary has discretion to interpret SPR in terms other than size, including for example, in terms that further the ESA's purpose of protecting the values of a species (*i.e.*, aesthetic, ecological, educational, historical, recreational, and scientific) that would be lost if the species were to become extinct in either that portion or the whole range.[34]

In 2008, the Service issued draft guidance that elaborated on the Solicitor's opinion. It stated that an SPR is "a portion of the range of the listed entity . . . that contributes meaningfully to the conservation of that entity," and that the "significance of an SPR is based on its contribution to the conservation (resiliency, redundancy, and representation) of the listable entity being considered."[35] The Service indicated that the concepts of resiliency, redundancy, and representation were to be the "indicators of the conservation value of portions of the range."[36]

The Service withdrew the Solicitor's opinion after facing strong public opposition[37] and the judicial rejection of its fundamental premise: that the ESA permits SPRs to be listed or delisted as discrete entities, separate from the species or subspecies within which they exist.[38]

C. FINAL SPR POLICY (2014)

The core feature of the Service's 2014 Final SPR Policy is its definition of "significant":

> A portion of the range of a species is "significant" if the species is not currently endangered or threatened throughout all of its range, but the portion's

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33. Memorandum from Dep't of Interior, Office of the Solicitor to Dir. of U. S. Fish and Wildlife Serv., *The Meaning of "In Danger of Extinction Throughout All or Portion of its Range"* (March 16, 2007) (available at https://perma.cc/JD9K-Q4R2) [hereinafter USDOI (2007).]

34. *See id.*, *supra* note 33 at 11 ("According to the Act's findings. . . fish, wildlife, and plants are worthy of conservation because they are of "esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people." ESA § 2(a)(3). Thus, in defining what portion of a range will be considered "significant," it is appropriate for the Secretary to consider factors other than just the size of the portion in relation to the current range as a whole. He may define "significant" in such a way as to insure [sic] conservation of the species protected by the Act. For example, the Secretary could consider, among other things, the portion of the range in terms of the biological importance of that portion of the range to the species and in terms of the various values listed in the Act that would be impaired or lost if the species were to become extinct in either that portion of the current range or in the current range as a whole.")

35. Memorandum from Dept. of Interior, Fish and Wildlife Service to Reg. Dir., Regions 1-8, *Draft Guidance Regarding Identifying Significant Portions of a Species,* (May 2, 2008) (available at https://www.regulations.gov/document?D=FWS-R9-ES-2011-0031-0008) [hereinafter USDOI (2008).]

36. *Id.* at 8.

37. *See* Noelle Struab, *Scientists Call for Ending Bush-Era Endangered Species Listing Policy*, N.Y. TIMES, Dec. 10, 2009.

38. Defenders of Wildlife v. Salazar, 729 F. Supp. 2d 1207 (D. Mont. 2010); Wild Earth Guardians v. Salazar, No. CV-09-00574-PHX-FJM, 2010 WL 3895682, at *6 (D. Ariz. Sept. 30, 2010).

> contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range.[39]

That interpretation is similar to the clarification interpretation offered in 2001 that was subsequently rejected by the courts. In *Center for Biological Diversity v. Jewell* (2017), the Service's interpretation of SPR was vacated by the District of Arizona on the grounds that it "impermissibly clashes with the rule against surplusage and frustrates the purposes of the ESA."[40] Furthermore, the interpretation of "significant" in the 2014 policy was vacated nation-wide in *Desert Survivors v. U.S. Dept. of Interior* (2018) for largely the same reason that the clarification interpretation had been rejected in 2001.[41]

D. subsequent interpretations

In subsequent actions, the Service has continued to rely on an interpretation very similar to that provided in the 2014 final policy. Specifically, in November 2020, the Service published a final rule delisting gray wolves throughout the coterminous United States.[42] In that final rule, the Service stated that it had "not yet determined the best way to interpret 'significant' in light of the decision in *Desert Survivors*," but that it was applying "'significant' in a way that is consistent with [the court's opinion in *Desert Survivors*], and with other relevant case law."[43] The Service's interpretation of SPR in its final rule is summarized in Figure 3. The court rejected the Service's decision to delist gray wolves on grounds that its interpretation of SPR was arbitrary and capricious. The court's rationale for rejecting the Service's interpretation of SPR is especially clear, important, and instructive for what is required of an adequate SPR interpretation. We review that rationale in section V.A of this Article.

E. range

The Service also made important claims about the interpretation of the word "range" in the Solicitor's Opinion (2007) and the Final SPR Policy (2014). The specific concern is whether that word refers to "current range" or "historical range." We discuss this concern later in this Article, where it is easier to explain how that judgment may or may not affect the interpretation of SPR.

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39. Final Policy on Interpretation of the Phrase "Significant Portion of Its Range' in the Endangered Species Act's Definitions of 'Endangered Species' and 'Threatened Species'. 79 Fed. Reg. 37,577 (July 1, 2014). [hereinafter USFWS (2014).]

40. Ctr. for Biological Diversity v. Jewell, 248 F. Supp. 3d 946, 958 (D. Ariz. 2017).

41. Desert Survivors v. U.S. Dep't of the Interior, 336 F. Supp. 3d 1131, 1136 n.2 (N.D. Cal. 2018).

42. Removing the Gray Wolf (Canis Lupus) From the List of Endangered and Threatened Wildlife. 85 Fed. Reg. 69,778 (Nov. 3, 2020). [hereinafter USFWS (2020).]

43. This circumstance was also highlighted (nearly verbatim) in Defenders of Wildlife v. U.S Fish and Wildlife Service, 584 F. Supp. 3d 812 (N.D. Cal. 2022).

In sum, the Service advanced a series of interpretations of SPR over the past two decades (Figure 3). The courts have repeatedly rejected these interpretations. The repetitive features of this cycle indicate the need for a substantively different and improved SPR policy.

V. ESSENTIAL CONSIDERATIONS FOR INTERPRETING SPR

An essential preliminary for developing a robust interpretation of SPR is to explain details pertaining to the meaning of two words: "significant" and "range." Another essential preliminary is to explain how and why normative judgments (such as what counts as significant) must also be associated with objectively measurable standards. These preliminaries are the focus of section V.

A. THE MEANING OF "SIGNIFICANT"

We begin by focusing on the word "significant," which the Service has conceptualized in the following way:

> a portion of the range of a species is "significant" if the species is not currently endangered or threatened throughout all of its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range. . . We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation (the three Rs).[44]

Here, the meaning of "significant" depends on what are known as "the 3Rs," for which the most recent interpretation appears to be:

- Redundancy: The ability of a species to withstand catastrophic events by spreading risk among multiple populations or across a large area.
- Representation: The ability of a species to adapt to changing environmental conditions over time as characterized by the breadth of genetic and environmental diversity within and among populations.
- Resiliency: The ability of a species to withstand stochastic disturbance; resiliency is positively related to population size and growth rate and may be influenced by connectivity among populations. [45]

This conceptualization of "significant"—when focused on the "ability of a species" to survive—relegates SPR to surplusage, which the courts have identified as problematic with the Service's SPR policies. A heuristic example illuminates this concern: Suppose that a species is lost from some portion of its range, but the

44. USFWS (2014), *supra* note 39 at 37,581, 37,609.

45. David R. Smith et al., *Development of a Species Status Assessment Process for Decisions under the U.S. Endangered Species Act*, 9 J. FISH AND WILDLIFE MGMT. 1 302, 304 (2018).

species still inhabits enough range to withstand stochastic disturbance. According to the Service's SPR policy, this species is not endangered because it still exhibits *resiliency*. Now, suppose the species is subsequently lost from more range and can no longer withstand stochastic disturbance. According to SPR policy, the species is no longer resilient and therefore becomes endangered. The concern is that this resiliency-based trigger is also the point at which the species simply becomes "in danger of extinction." In this way, the SPR phrase becomes redundant and relegated to surplusage. While we used resiliency as an example, the same point stands with respect to representation and redundancy.[46]

The same concern, expressed differently, is: The Service uses the 3Rs to help answer the question, "what portion of a species' range is significant to the entire species' viability?" However, the SPR phrase requires the Service to answer the more basic question, "*what portion of a species' range is significant?*" This simple and subtle misalignment of question and answer may explain why courts have consistently ruled that the Service's interpretation of SPR is surplusage.

While it may seem excessive to give so much attention to concerns about surplusage, we do so because the Service has had perennial difficulty accommodating the courts' instructions concerning surplusage.[47]

The concern is reinforced by *Defenders of Wildlife v. USFWS* (2022), which reversed the Service's decision to delist wolves in January 2021 and faulted the Service's interpretation of SPR, stating that the Service's rule to delist wolves:

> suggests that wolves that contribute to the resiliency, redundancy, and representation of gray wolves still may not be considered meaningful and thus, do not satisfy the "significant portion" standard. But the Service has not sufficiently explained how it draws that line. Because the Service has not provided any threshold for meaningfulness, the Court cannot assess whether the Service's interpretation gives independent meaning to the phrase or has again implemented an interpretation that renders it redundant or superfluous. Accordingly, the Court finds the Service's interpretation is not a reasonable construction of the phrase "significant portion of its range" and GRANTS Plaintiffs' motion on this basis. [48]

When the court states the Service "has not sufficiently explained how it draws that line," the court is effectively saying that the Service has not interpreted the legal definition of an endangered species with sufficient precision to know

46. For emphasis, there is nothing fundamentally wrong with the 3Rs as a tool for thinking about the mechanisms of extinction. The concern is that the Service has yet to employ the 3Rs in a manner that answers the unresolved policy question, "what is an endangered species?" While the 3Rs are valuable as general principles, those concepts have not been adequately developed by the scientific community to be of particular use in answering the question with the kind of measurable specificity required by the ESA.

47. USFWS (2020), *supra* note 42 at 69,854, 69,880. Smith et al., *supra* note 45.

48. Defenders of Wildlife, 584 F. Supp. 3d at 828. Also, the preceding text of section V.A was written before (and therefore independently of) the court's decision.

whether—at least in the case of gray wolves—the species is endangered or not. Section II indicates that cases like gray wolves are common.

A substantial portion of the Final SPR Policy (2014) is a section entitled, "The Threshold for 'Significant.'" Regardless of what questions one might hope that section addresses, the Final SPR Policy fails to answer the question, "by what standard does one define an endangered species?"

The Service's relegation of SPR to surplusage is also likely associated with interpreting "significant" beyond its use in everyday language and its dictionary definitions. More than one court has highlighted the appropriateness of minding such interpretations.[49]

Common understandings of "significant" are also central to a wide swath of laws and policies pertaining to levels of acceptable risk, acceptable loss, and acceptable danger. Examples of parsimonious uses of "significant" in policy-related contexts include:

- The loss of life that occurs when highway speed limits exceed *X* is significant; therefore, speed limits should be less than *X*.
- The risk to public health is significant when concentrations of lead in drinking water exceed *Y* ppm; therefore, concentrations of lead should be less than *Y*.

In those cases, "significant" follows dictionary definitions of the word, like the American Heritage Dictionary definition of significant:[50]

> Having or likely to have a major effect; important: *a significant change in the tax laws . . .*
>
> Fairly large in amount or quantity: *significant casualties; no significant opposition*.

In those examples (about speed and lead regulation) and in many others, such as the ESA, the word "significant" carries an important and inescapable normative judgment about what counts as a "major effect" or a "fairly large amount." Furthermore and no less important, a "significant" risk or loss is judged to be an unacceptable risk or loss that demands corrective action.[51]

Consider this analysis of "significant," the fundamental role it plays in giving meaning to the ESA's definition of an endangered species, and the best-available science pertaining to the biodiversity crisis. This tripartite consideration leads to the conclusion that the Service has not interpreted the legal definition of an

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49. *See, e.g.*, Defenders of Wildlife v. Norton, 239 F. Supp. 2d 9 (D.D.C. 2002); Ctr. for Biological Diversity v. Everson, 435 F. Supp. 3d 69, 89 (D.D.C. 2020).

50. *Significant*, THE AMERICAN HERITAGE DICTIONARY (5th ed. 2022).

51. This analysis is not claiming that the word "significant" is used universally in law or policy pertaining to unacceptable risk, harm, or danger. Rather the preceding analysis refers to an underlying logic and meaning, which is broadly employed.

endangered species with enough precision to adequately answer the question, "what is an endangered species?" Certainly, we know that pandas and tigers are endangered and that American red squirrels and American robins are not endangered. However, and at no risk of hyperbole, there is a large and growing class of cases for which the Service has yet to provide a robust standard.

B. Significance Beyond Percentage of Range, Per Se

The percentage of lost geographic range, *per se*, is fundamental to the meaning of SPR. But it is not the only meaning that can arise from SPR. The need to account for more than percentage, *per se*, is illustrated by analogy with the "pound of flesh" demanded by Shakespeare's Shylock. While a pound of flesh is only less than a percent of most humans' flesh, to lose a pound of heart muscle is fatal (i.e., significant to persistence), while losing some other pound of flesh may not be significant to persistence. However, losing say 30% of one's flesh may not threaten one's persistence, but that loss would unquestionably be "significant"—regardless of which 30% was lost.

We apologize for the gruesome analogy. But it seems important to draw ample and memorable attention to the simple, but easily overlooked point: Significance must refer to a flat percentage and may also refer to other aspects of significance—such as some particular portion of range being significant in some other way.

We are not the first to acknowledge the importance of both aspects of significance. In particular, the courts have written, "A more thorough analysis, however, suggests that a flat percentage of geographic area is not the *sole* determinant of significance" (emphasis added).[52] The word "sole" clearly indicates that other elements of significance may also be important.

The Service has also acknowledged the importance of both aspects of significance, where the Solicitor's Opinion (2007) states that "the Secretary . . . may consider factors other than simply the size of the range portion in defining what is 'significant.'" This is a clear acknowledgment that percentage, *per se*, is important, in addition to other possible considerations.

C. Objectively Measurable Standards and Normative Judgments

That extinction risk and the biodiversity crisis are directly linked to the gradual loss of geographic range is a basic fact of ecological science. Furthermore, the statutory findings and purpose of the ESA highlight the ecological value of a species, which cannot manifest on unoccupied portions of a species' range. The loss of ecological value and growth in extinction risk that arise from range loss are gradual processes, and the ESA's purpose is unquestionably to arrest those fundamentally interrelated processes.

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52. Sw. Ctr. For Biological Diversity v. Norton, Civ. No. 98-934, 2002 WL 1733618, at *16 (D.D.C. July 29, 2002).

Because those processes involving loss, risk, or danger[53] are continuous (as opposed to discrete), ESA administrators are in the inescapable position of having to make normative judgments about what *objectively measurable* level of loss, risk, or danger is unacceptably high and therefore in need of corrective action (i.e., federal protection of a species).

Identifying and justifying these normative judgments are required to prevent courts from concluding that the judgments are arbitrary and capricious. This requirement is not a foreign idea. A wide swath of policies pertaining to public health and environmental protection require agencies to judge the point at which loss, risk, or danger becomes unacceptably high and therefore deserves corrective action. Two examples are:

- The requirement for employers to "assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air (50 ug/m^3) averaged over an 8-hour period."[54]
- The requirement for automakers to limit CO2 emission in light-duty vehicles to 205 grams of CO2 per mile.[55]

These objectively measurable standards represent normative judgments about acceptable loss, risk, or danger. There is no robust reason to think that policy pertaining to acceptable loss, risk, or danger in biological species differs in this regard (i.e., the need for developing such standards). Indeed, the court's recent decision in the case of wolves explicitly indicates the lack of such a standard as the central problem (see section V.A.).

Setting such a standard (even providing guidance for such a standard) is an inescapably normative judgment that depends on understanding the best-available science but also transcends the scope of science. Furthermore, scholarship indicates that, in the arena of public policy, there are four basic influences on judgments of unacceptable loss, risk, or danger: statutory language (and supportive documentation such as the Congressional record), expert opinion, judgments of the general public, and judgments of policy makers.[56]

The core phrase of the legal definition of an endangered species, i.e., "in danger of extinction," offers virtually no guidance as to what constitutes unacceptable

53. "Danger," as in being "in danger of extinction," which represents the first words in the ESA's definition of endangered species (16 U.S.C.A § 1532(6)).

54. OSHA Lead Exposure Regulation, 29 C.F.R. § 1910.1025(c)(1).

55. Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed. Reg. 74434, 74479-81 (Dec. 30, 2021) (to be codified at 40 C.F.R. pts. 86, 600).

56. *See* Paul R. Hunter & Lorna Fewtrell, *Acceptable Risk*, *in* WATER QUALITY: GUIDELINES, STANDARDS AND HEALTH 207, 208 (Lorna Fewtrell & Jamie Bartram eds., 2001); John A. Vucetich & Michael Paul Nelson, *Acceptable Risk of Extinction in the Context of Endangered Species Policy*, *in* PHILOSOPHY AND PUBLIC POLICY 81, 91 (Andrew I Cohen ed., 2018).

risk.[57] And it would be remarkable to conclude that Congress offered so little guidance about what counts as unacceptable risk or loss. Rather, Congress almost certainly offered substantive guidance with the phrase, "throughout all or a significant portion of its range."[58]

With that last sentence—and the scientific understanding that range loss is intimately and causally linked to the loss of ecological value and is a key mechanism by which extinction risk grows—one should realize that the SPR phrase is not some subordinate, supporting principle by which to understand the legal definition of an endangered species. Rather, for a broad class of species, SPR is central to answering the question, "what is an endangered species?"

D. JUDGMENTS ABOUT ACCEPTABLE LOSS AND SOCIOLOGICAL KNOWLEDGE

The judgment that is required of the Service and featured in the previous section is fundamentally normative and values-based. Yet, the ESA requires that "the secretary shall make determinations [about listing] solely on the basis of the best scientific ... data available ..." This seeming contradiction is readily resolved by distinguishing (i) determinations for listing any particular species from (ii) the standard by which a determination is based. Best available science constrains *determinations* of whether a particular species fits the standard, but the *standard* itself is an inescapably normative judgment.

Furthermore, this normative judgment is constrained by the ESA's explicit purpose, which is supported by documentation of Congress's intent, and further clarified by best-available ecological science (section II). Despite these constraints, a significant normative judgment still remains—i.e., a value judgment that has not been determined by the ESA, Congressional intent, or the best available science. Making that judgment is the responsibility of the Service.

On what grounds could the Service make such a value judgment? That judgment should perhaps be substantively informed by an understanding of the values of the people for whom the law is intended to serve—if such information exists. Fortunately, such information does exist. We present that information, then make the argument that such information ought to inform the Service's judgment.

Two of the authors of this Article led a team of researchers in administering a survey to a representative sample of 909 American residents.[59] Survey participants

57. *See* ERIC T. FREYFOGLE & DALE D. GOBLE, WILDLIFE LAW: A PRIMER 241 (2d ed. 2009) (discussing ambiguities in the ESA's guidance).

58. In section V.A of this Article, we highlighted the court's criticism of the FWS's use of the 3Rs. This criticism is reinforced by the ideas here in section V.C. Specifically: While the 3Rs are useful for explicating the underlying mechanisms of extinction risk, the FWS's use of the 3Rs provides no guidance as to what counts as unacceptably low levels of resiliency, redundancy, or representation. In other words, the Service's final policy almost certainly takes Congress's guidance about unacceptable risk and replaces it with a description of the processes that underlie the extinction process.

59. The results of this survey are part of the peer-reviewed literature. Tom Offer-Westort et al., *What is an Endangered Species?: Judgments about Acceptable Risk*, 15 ENV'T RSCH. LETTER 1, 014010 (2020).

were asked to provide their judgments about what would count as an acceptable loss of geographic range for a species. Specifically, survey participants were presented with these statements:

> The geographic areas where a species lives is called their 'range.' Most mammal species have been driven to extinction from half or more of their historic range because of human activities.

And:

> Extinction is a process that involves regional extinction at various places throughout a species' historic range. The geographic areas where a species lives is called their 'range.' Most mammal species have been driven to extinction from half or more of their historic range because of human activities.

Then, participants were asked these two questions[60]:

> What percentage of historic habitat loss would be acceptable?

And:

> How much [what percentage] of a species' historic range should be lost before federal law steps in to protect a species?

Responses to these survey items indicate that the majority of adult Americans thought that acceptable losses should be less than 30% of a species' historic range (Figure 4).

Participants were also asked to indicate their political orientation on a 7-point scale from "very liberal" to "very conservative." Importantly, responses to the survey items were not associated with political orientation. That is, there was no tendency for conservatives to be more accepting of loss than liberals.

The survey also included a set of questions assessing a person's overall knowledge of the environment. Participants demonstrating less knowledge about the environment tended to be more accepting of loss than those with more knowledge; however, the difference between the most and least knowledgeable in judgment about acceptable loss was about 10% (from a mean of about 25% to a mean of about 15%).

Judgments about acceptable loss are a synthesis of facts and values. Judgments from a representative sample of Americans could, in principle, be impaired by most Americans' lacking expertise pertaining to species endangerment. Being expertly informed about a species' biological conservation may alter one's judgment about what constitutes acceptable loss.

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60. Considering responses to two similarly worded survey items, as done here, increases the ability to meaningfully discern participants' responses to the underlying idea common to both survey items, as opposed to potentially less meaningful responses to idiosyncrasies in the wording of either survey item.

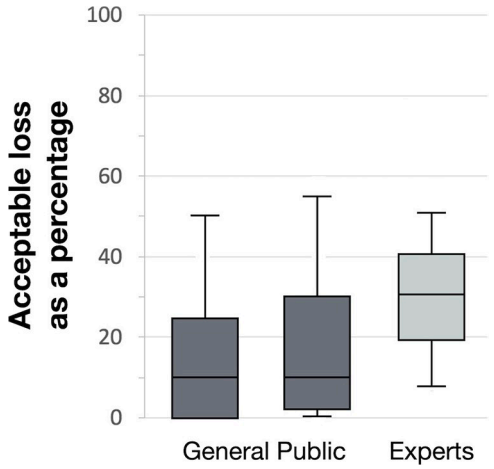

Figure 4. Judgments by the general public and experts on what constitutes an acceptable loss of geographic range. Boxes represent the 25th and 75th percentiles, horizontal lines within each box represent the median, and the whiskers represent the 10th and 90th percentiles. The left column refers to the question, "*What percentage of historic habitat loss would be acceptable*?" The middle column refers to the question, "*How much [what percentage] of a species' historic range should be lost before federal law steps in to protect a species*?" See main text for other details.

This possibility is accounted for with another recent scientific finding. In particular, a representative sample of 459 conservation scholars were presented with this statement and question[61]:

> In the past two centuries, the median terrestrial vertebrate species is thought to have lost approximately 60% of its historic range. Taking account of human needs, what would be an acceptable loss of historic range for most species (0 = no range loss & complete restoration; 60 = current median loss; 100 = complete extirpation).

The distribution of expert responses to this item is given in the right-most column of the figure above. While experts' judgments tend to be accepting of larger losses, the distributions of responses are importantly overlapping. Three-quarters of the experts surveyed indicated that acceptable loss is 40% or less of a species geographic range (Figure 4).

With respect to the aforementioned findings, we make one narrow claim: After taking account of constraints imposed by the ESA, Congressional intent, and best-available ecological science, the Service should make a value judgment about what counts as acceptable loss for a species, substantively informed by

61. This survey result was first reported in John A. Vucetich et al., *How Scholars Prioritize the Competing Values of Conservation and Sustainability*, 257 BIOLOGICAL CONSERV. 109126 (2021).

scientifically derived information about the values of constituents and experts as they pertain to the judgment.

This claim does not preclude other legitimate considerations from informing the Service's judgment.[62] Additionally, we are unable to envision an argument that would conclude that the knowledge of the values of constituents and experts is irrelevant. In no way does such consideration reduce the creation of policy to mere scientific polling, because the policy is already greatly constrained by other powerful influences and further mediated by however the Service decides to take account of the scientific information about values.

E. THE MEANING OF "RANGE"

Understanding the phrase SPR requires understanding not only the meaning of "significant" but also that of "range." Since publication of the Solicitor's Memorandum (2007), the Service has expressed its belief that "range" (as the word appears in the ESA's definition of endangered species) is best equated with "current range." Courts have affirmed, though not required, the Service to interpret the term as such.[63] This affirmation is troubling because there is considerable reason to think that "range" instead means "historic range" (as detailed in Appendix A).

Concerns about "range" are, however, moot as they pertain to the interpretation of SPR proposed here. In particular, we show in Appendix B that the proposed policy (presented in section VI.B.) is not affected by whether one interprets range as being current or historic. But the proposed policy is considerably easier to comprehend if explained while equating range with historic range. Therefore, for the purpose of initially presenting the proposed policy, we equate "range" in the ESA's definition of endangered species with "historic range."

F. THE SEVEN FORMS OF RARITY

We now turn attention away from interpretation of statutory language to highlight an essential feature of "rarity," the formal concept developed through extensive, long-standing conservation scholarship and introduced in Section II. The motivation for returning to rarity is that any robust interpretation of SPR must handle the hundreds of varied circumstances that surround endangered species cases—from wolves to ghost orchids. The details of rarity provide the framework for an SPR policy capable of handling the diversity of circumstance present among endangered species.

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62. We do not have any additional legitimate considerations of a particular nature in mind. Whether such a consideration exists would require an explanation, as opposed to being adequately supported by presumption or assertion.

63. Humane Soc'y of the U.S. v. Zinke, 865 F.3d 585, 603 (D.C. Cir. 2017); Ctr. for Biological Diversity v. Zinke, 900 F.3d 1053, 1054 (9th Cir. 2018).

Rarity is a relative concept, in the sense that a species is rare (or not) in relation to its prior condition or in relationship to other species. For this reason, not every species that exhibits some form of rarity would necessarily qualify as threatened or endangered. However, the reverse is true: Every endangered species is (or soon will be[64]) characterized by one and only one of seven forms of rarity. That is the valuable result: Of the thousands of instances of endangerment, each is well-characterized by one of only seven forms of rarity. Those seven forms of rarity are presented in Figure 1.

VI. A New, Robust Interpretation

We begin this section by summarizing the essential properties that a robust interpretation of SPR must have. These properties directly arise from the preceding analysis. Next, we propose a robust interpretation that adheres to these properties. Afterward, we explain how the policy is related to another element of the ESA, i.e., threat assessments. We conclude this Section by indicating how this proposed interpretation is (i) specific enough to guide decisions away from being arbitrary and capricious, and (ii) flexible enough to account for the wide range of circumstances that surround endangered species.

A. essential properties of an SPR policy

The preceding analyses indicate that a robust interpretation for the legal definition of an endangered species, given the meanings of "range" and "significance," must have the following properties:

- SPR cannot be surplusage.
- SPR should account for the percentage of lost range, *per se*, in addition to other ways that some particular portion of range might be considered significant.
- Interpreting the ESA's definition of "endangered species" must serve the ESA's purpose. The purpose of the ESA, in the parlance of current science, is to lessen the biodiversity crisis and restore the values of endangered species that have been lost to the extinction process—which for terrestrial vertebrate species is more often than not associated with contraction of a species' range.
- Interpreting the ESA's definition of "endangered species" must pass normative judgment about what counts as unacceptable risk and associated loss (of species' value)—unacceptable to the point of deserving corrective action. That judgment should be informed by the best-available science.[65]

64. Ecologists' understanding of endangerment would also include the notion that some species are at risk of extinction because their population growth rate is negative. Such species may not be rare at the moment but soon will be.

65. This includes both ecological science (Section II of this Article) and social science (such as Figure 4; *see also* Sections VII.C and D).

- Interpreting the ESA's definition of "endangered species" must be appropriately flexible to accommodate the varied circumstances that surround any species. We will see momentarily that this flexibility is provided in part through the taxonomy of rarity.
- Interpreting the ESA's definition of "endangered species" must be appropriately specific to favor consistent and (legally) defensible application.

B. THE PROPOSED POLICY

One policy which satisfies the aforementioned properties is: A species will generally be considered endangered if its current range is reduced by X% or more of the species' historic range. These are species for which enough loss has occurred to merit the corrective actions afforded by the ESA. Except, for some species it may be necessary to adopt a threshold for acceptable loss that is less than X%. These cases include:

- Species whose historic range is small enough that small reductions in occupied range would lead to a danger of global extinction. When handling such a case, the Service should propose a lower threshold of acceptable loss for that species and defend that view with the best available science.
- Species that have lost little of their current range but have become too rare as a result of lost habitat throughout their historic range or have become too rare because their range-wide density has been reduced to the point of being too rare.

In extreme cases, X would be zero. Such a case would represent a species "at risk of extinction throughout all of its range."

There is ample evidence in this Article (e.g., Figure 4) to develop a robust determination for the value that should replace "X" in this preceding policy recommendation.

There may be cases leading the Service to additionally conclude that some particular portion of range is significant, due to, for example, its contribution to overall viability. In such cases, the Service would explain how and why that portion is significant. Conserving these significant portions of range is independent of the requirement to conserve a specific percentage of historic range.

While this expression of the proposed policy assumes that "range" in the ESA's definition of an endangered species equates to "historic range," the policy is functionally identical if one assumes that "range" equates to "current range." (Appendix A for details).

C. threat assessments

The Service might respond to the proposed policy by indicating that it accounts for lost historic range (and the possible need to restore lost range) when conducting its analysis of threats as required by the ESA[66], which states:

> The Secretary shall . . . determine whether any species is an endangered species or a threatened species *because* [emphasis added] of any of the following factors:
>
> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
>
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
>
> (C) disease or predation;
>
> (D) the inadequacy of existing regulatory mechanisms; or
>
> (E) other natural or manmade factors affecting its continued existence.[67]

The consideration of historic range is clearly important in fulfilling the ESA's requirement for determining which threats caused a species to become endangered. For emphasis, the word "because" in the above cited text indicates that this portion of § 1533 in the ESA is focused on assessing the causes of endangerment (i.e., why a species is endangered). Understanding why a species is endangered is important, in part because it leads to an understanding of how the species may be recovered. But understanding *why* a species is endangered is different from understanding *whether* a species is endangered. Nothing in § 1533 of the ESA provides any sense or guidance as to Congress's thinking about how one determines *whether* a species is endangered (i.e., a standard for drawing the line between endangered and not endangered). That guidance is provided in § 1532 of the ESA, where Congress defines an endangered species and thereby provides its guidance for developing an objectively measurable standard to judge *whether* a species is endangered. The courts have indicated that the Service needs to develop such a standard, and the guidance for that standard rests with the SPR phrase.[68]

One might object to the analysis of the preceding paragraph on grounds that *whether* and *why* are so tightly linked as to be inseparable. Yet they are separable, as illustrated by this pair of analogous questions: Is this person dying? If the answer is yes, then why are they dying? The questions and possible answers are distinct. The answer to the first question indicates *whether* corrective action is

66. The Service seems to make this argument in USFWS (2014), *supra* note 39 at 37,583, 37,584.
67. 16 U.S.C. § 1533.
68. USFWS (2020), *supra* note 42 at 69,854, 69,880.

required. The answer to the second question indicates *what* corrective action to take.

One might also object to the preceding analysis on grounds that § 1533(a)(1) requires attending both *whether* and *why* because that passage of the ESA includes the words "whether" and "because." We would concede this point if the ESA did not include a legal definition for endangered species; but, it does.[69] And, that definition clearly answers the question, "by what standard does one determine *whether* a species is endangered?" While the process of assessing threats (as required by § 1533(a)(1) of the ESA) might, in some cases, incidentally offer auxiliary insight as to whether a species is endangered, its primary purpose is to guide the Service in its assessment of *why* a species is endangered. Furthermore, attending historic range in threat assessment does not grant *carte blanche* to ignore the relevance of historic range in the legal definition of the ESA, which is clearly guidance for determining the standard for *whether* a species is endangered.

D. SPECIFICITY

The development of any policy pertaining to acceptable risk, loss, or harm requires the policymaker to make a judgment that is both normative and specific. This judgment is constrained by statutory language and further specifications should be informed by a scientifically derived understanding of views held by experts and the general public.[70] These normative judgments need enough specificity for consistent and objective application to individual cases. These features are commonplace in federal policies involving acceptable risk, loss, or harm (see Section V.C for examples). There is no robust reason for policy pertaining to acceptable risk, loss, or harm in biological species to differ in these regards.

Section VII.B provides the structure for a policy representing an appropriately specific, measurable standard for determining whether a species fits the legal definition of an endangered species. The next (and more-or-less final) step in developing this policy is for policymakers to select a value for X, *i.e.*, the portion of lost range that is unacceptable and beyond which corrective actions of the ESA are warranted. This value should be selected in a manner that comports with the statutory meaning of "significant" (Sections V.A and V.B) and is appropriately informed by relevant sociological information (Section V.D).

For example, if the Service wanted to align X with the typical conservation expert, it would select a value of 30%. If the Service instead wanted to align X with no more loss than what most American residents would accept, then the Service would (coincidentally) also select a value of 30%. These are two examples for how policymakers can use Figure 4 to select an appropriate value for X.

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69. 16 U.S.C. § 1532(6).

70. See Section IV.C for an explanation. The most salient of these views are represented in Section IV.D, especially Figure 4.

Any approach that does not focus on the selection of a consistently applied value for X will fail for some combination of the following reasons: Being arbitrary and capricious, failing to identify a standard with sufficient measurable specificity, or being applied inconsistently and subjectively across cases.

E. flexibility

The proposed SPR policy is not only specific but also flexible. It is flexible enough to account for every kind of endangered species. The proposed policy's flexibility arises from its use of an all-encompassing taxonomy of rarity widely used by conservation biologists (Section V.F.). This flexibility is manifest in the proposed policy by its acknowledgment that some cases will require smaller values of X. The cases requiring smaller values of X are specified in the proposed policy and involve species at risk of extinction throughout the entirety of their range. Many of these cases will involve species with small historic ranges. In those cases, the Service would have an obligation to select a smaller value of X (perhaps zero) and explain why that smaller value is appropriate. The explanation would require a normative judgment about what counts as being "at risk of extinction" and a scientific explanation for how extinction risk is influenced by X and other factors, such as total abundance and the population's per capita growth rate.

VII. Additional Considerations

A robust interpretation of SPR must also be understood in the context of other facets of the ESA, its attending policies, and other contextualizing considerations. In this section, we address the most important of these elements.

A. relationship to distinct population segment policy

For an interpretation of SPR to be robust, it must also interact appropriately with other policies pertaining to the ESA. Of particular importance is policy pertaining to distinct population segments (herein referred to as "DPS"), which elaborates on what can qualify as a listable entity under the ESA. What counts as a listable entity requires legal specificity in part because biological definitions of a species are indefinite. Here we explain how the proposed SPR does indeed comport with DPS policy.

The proposed SPR policy would apply to any listable entity, including a DPS. In other words, after identifying a listable entity (of any kind, species, subspecies, DPS, etc.), then one would apply the SPR policy. No less important, the ESA does not permit an SPR—*in and of itself*—to be a listable entity.

There is value in inspecting more closely how SPR and DPS policies relate to one another for a particular kind of case, i.e., taxa that are habitat generalists with large historic ranges (such as gray wolves and grizzly bears). To understand such cases, recall that longstanding policy allows for recognizing a DPS only on the

basis of its "significance" and "discreteness," and recall that discreteness involves two criteria.[71]

Consider the first criterion for discreteness, which requires a DPS to be "markedly separated from other populations as a consequence of physical, physiological, ecological, or behavioral factors."[72] A useful basis for judging this kind of separateness are Level I and Level II ecoregions—a schema widely recognized by ecologists, including those working at federal agencies, such as the EPA. As a consequence of ecological factors, Level I and Level II ecoregions are markedly separate, as indicated by the boundaries of the map in Figure 5. The marked, ecological separateness of ecoregions will *in some cases* result in taxa whose historic ranges spanned two or more ecoregions, comprised of two or more DPSs characterized by marked, ecological separateness. There is no requirement that a DPS align precisely with the boundaries of an ecoregion. Rather, we use ecoregions to illustrate a broader point: Habitat generalists with large historic ranges are likely to exhibit marked, ecological separateness across their historic range due to marked differences in habitat. Such taxa are likely composed of two or more DPSs.[73]

To further illustrate the first criterion for discreteness (i.e., being "markedly separated") in relation to the proposed SPR policy, consider the gray wolf of the coterminous United States. Across the historic range of this gray wolf, the composition of their diet varied markedly. Gray wolf diet consisted largely of white-tailed deer in some regions, a mixture of deer and moose in other regions, elk in other regions, and more.[74] Those differences are concomitant with, for example, marked differences in predation behavior[75] and ecosystem function. Differences in ecosystem function arise from wolves' impact on prey populations and the differing impact of these prey populations on the ecosystems they inhabit.[76] These are only examples of regional differences in the ecology, behavior, and phenotype of gray wolves—differences which serve as the basis for acknowledging that the gray wolf species is composed of several DPSs.

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71. Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act. 61 FR 4722, 4725 (Feb. 7, 1996). [hereinafter USFWS (1996).]

72. *Id.*

73. Some habitat *specialists* had large historic ranges. Some of those taxa may also have exhibited spatial variation in genetics that leads to acknowledging that such taxa are composed of two or more DPSs. The salient point being that the proposed SPR policy does not interfere with DPS policy.

74. WOLVES: BEHAVIOR, ECOLOGY AND CONSERVATION 106–07 (L. David Mech & Luigi Boitani, eds., 2003).

75. Camilla Wikenros et al., *Wolf Predation on Moose and Roe Deer: Chase Distances and Outcome of Encounters*, 54 ACTA THERIOLOGICA 207 (2009).

76. John A. Vucetich et al., *Predicting Prey Population Dynamics from Kill Rate, Predation Rate and Predator–Prey Ratios in Three Wolf-Ungulate Systems*, 80 J. ANIMAL ECOLOGY 1236, 1243 (2011).

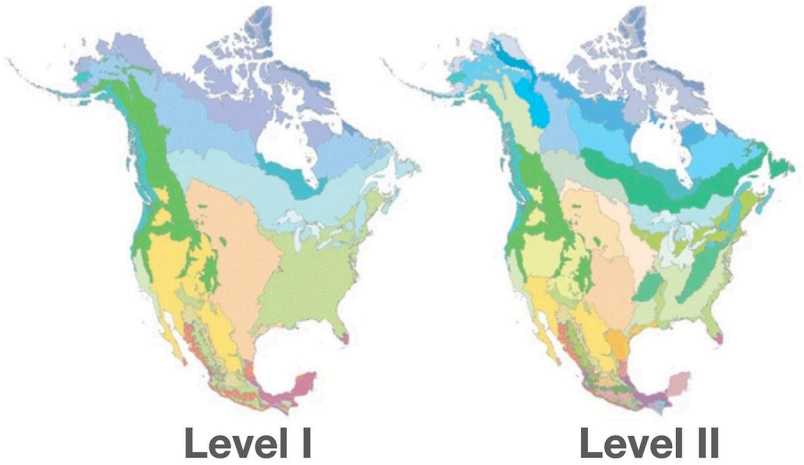

Figure 5. Level I and II Ecoregions of North America. Source: www.epa.gov/eco-research/ecoregions-north-america

To further see how the proposed SPR policy comports with existing DPS policy, consider the DPS policy's requirement for "significance," which refers to the DPS's "importance to the taxon." The policy lists several examples of such importance, including "evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon."[77] That wolves no longer securely inhabit, for example, ecoregions 8.1 and 5.3, or ecoregions 9.2, 9.3, and 9.4, or ecoregion 10.1 certainly qualifies as a significant gap in the range of that taxon.[78] The DPS policy's account of "significance" concludes, "Because precise circumstances are likely to vary considerably from case to case, it is not possible to describe prospectively all the classes of information that might bear on the biological and ecological importance of a discrete population segment."[79] The salient consequence of that stipulation is that the significance of a DPS must be argued. The SPR policy proposed here does not interfere with that or any other element of DPS policy.

Finally, consider the DPS policy's second criterion for "discreteness," which states that "discreteness" can be manifested as being "delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms." [80]

77. USFWS (1996), *supra* note 71 at 4725.

78. The listed ecoregions align approximately with the great basin, the northeast, and the central plains, respectively. Precise locations of these regions may be found at: https://perma.cc/54TJ-SDCB.

Note, researchers sometimes aggregate ecoregions to better suit the particular application. *See, e.g.*, James A. Falcone et al., *GAGES: A Stream Gage Database for Evaluating Natural and Altered Flow Conditions in the Conterminous United States: Ecological Archives* E091-045, 91 ECOLOGY 621 (2010).

79. USFWS (1996), *supra* note 71 at 4725.

80. *Id.*

Ecological science recognizes this second criterion as often being an importantly specific instance of the first criterion for discreteness. The principle that makes criterion two a specific instance of criterion one is that humans are often an important part of a species' ecology. More specifically, the second criterion refers to discreteness in terms of mortality and habitat that are a consequence of anthropogenic ecological factors, i.e., regulatory mechanisms (or a lack thereof). To consider that a regulatory mechanism can be, or can directly lead to, an anthropogenic ecological factor is very much aligned with (i) principles of the Anthropocene and (ii) conceptual limitations of demarking "natural" and "unnatural" processes on the basis of human influence. Ideas (i) and (ii) are increasingly taken into account during the administration of federal environmental policy.[81]

Insomuch as the second criterion for "discreteness" is a special case of the first criterion—on grounds that humans are routinely part of a species' ecology—then it is appropriate to acknowledge that other political boundaries can, in principle, give rise to the discreteness that defines a DPS. An example would be states where regulatory mechanisms allow for or encourage unduly high rates of exploitation of a particular taxon. In summary, state governmental boundaries must also be considered as potential boundaries for DPSs.

DPS policy emphasizes that DPS classifications are to be used "sparingly." As such, DPS policy should only be applied to species with large historic ranges only when necessary, as opposed to more frequently. Nothing about the proposed SPR policy interferes with the requirement for sparing use.

The Service does, however, express a belief in the DPS policy that almost certainly requires revision or rejection, given the scholarship presented here, where it states:[82]

> Despite its orientation toward conservation of ecosystems, the Services do not believe the Act provides authority to recognize a potential DPS as significant on the basis of the importance of its role in the ecosystem in which it occurs. In addition, it may be assumed that most, if not all, populations play roles of some significance in the environments to which they are native, so that this importance might not afford a meaningful way to differentiate among populations.[83]

Contrary to that belief, the best-available ecological science almost certainly indicates that the role of a species in an ecosystem is an important basis for distinctness. This belief also contradicts a central feature of the DPS policy explaining "significance," which includes reference to the "ecological importance" of a DPS.[84]

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81. *See e.g.*, BEYOND NATURALNESS: RETHINKING PARK AND WILDERNESS STEWARDSHIP IN AN ERA OF RAPID CHANGE 64 (David N. Cole & Laurie Yung, eds., 2010); Michael T. Rains, *A Forest Service Vision During the Anthropocene*, 8 FORESTS 94 (2017).

82. USFWS (1996), *supra* note 71 at 4723.

83. See also Section II of this Article.

84. See quote from USFWS (1996) associated with note 79.

This assessment of DPS does not imply any need for the Service to revisit their DPS policy, except to: (i) abandon the belief expressed just above; and (ii) strike the word "international" from the list of criteria that can result in recognizing a DPS so that the operative phrase is "delimited by governmental boundaries."[85] These revisions are not needed to justify or allow for the proposed SPR policy. Rather, the analysis presented here, while motivated by concerns over SPR, reveals clear and significant shortcomings —quite aside from whether the proposed SPR policy is adopted.

Finally, a purpose of DPS policy is to afford ESA protections to DPSs that need such protection, but not to DPSs that do not need ESA protection.[86] Nothing about the proposed SPR policy interferes with that purpose.

B. CRITICAL HABITAT

The SPR policy proposed in Section VI.B also comports well with the notion of "critical habitat" as that idea is defined in the ESA[87] and administered by the Service.[88] The essential distinction between SPR and critical habitat is their purposes and explicit contexts. The purpose of SPR is to convey the standard by which a species is to be judged endangered. The purpose of critical habitat is to provide a means of conservation,[89] so that a species' condition can improve to the point of no longer fitting the definition of an endangered species.

This distinction is highlighted, for example, by observing, that, "the only effect of designating an area as critical habitat is to trigger the ESA requirement that actions authorized, funded, or carried out by federal agencies must not destroy or adversely modify designated critical habitat." By contrast the effect of observing that a species is in danger of extinction throughout a significant portion of its range is to afford all of the protections of the ESA until the species no longer fits the ESA's definition of endangered.

In other words, the purpose of SPR is to determine whether a species is endangered and therefore in need of all the protections afforded by the ESA. By

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85. See quote from USFWS (1996) associated with note 80.

86. In particular, a purpose of the DPS policy is: "Listing, delisting, or reclassifying distinct vertebrate population segments may allow the Services to protect and conserve species and the ecosystems upon which they depend before large-scale decline occurs that would necessitate listing a species or subspecies throughout its entire range. This may allow protection and recovery of declining organisms in a more timely and less costly manner, and on a smaller scale than the more costly and extensive efforts that might be needed to recover an entire species or subspecies. The Services' ability to address local issues (without the need to list, recover, and consult rangewide) will result in a more effective program." (USFWS 1996, *supra* note 71 at 4722).

87. 16 U.S.C. § 1532(5)(A).

88. Before the U.S. House of Representatives, Committee on Natural Resources, regarding implementation of the critical habitat requirements of the Endangered Species Act of 1973 (April 19, 2016) (Testimony of Dan Ashe, Director, U.S. Fish and Wildlife Service, Department of the Interior), https://perma.cc/YJ7Y-42VR.

89. "Conservation" is defined in 16 U.S.C. § 1532(3) and we use that term in this sense throughout Appendix C.

contrast the purpose of critical habitat is to provide one of many possible means for conservation. Most succinctly, SPR speaks to *whether* a species in endangered; critical habitat speaks to *how* one might go about conserving an endangered species.

Given those distinct purposes, the ESA's defining critical habitat as being "essential for the conservation of the species"[90] does not represent misalignment, confusion, or cross-purpose with the notion that some portion of range might be "significant."[91]

C. CLIMATE CHANGE

The purpose of the ESA is to mitigate anthropogenic threats, and climate change is an anthropogenic threat. At the same time, it may not be possible to mitigate some threats associated with climate change. Taxa that qualify as endangered species due to such threats may be "conservation-reliant" and may warrant ESA protections for the foreseeable future.[92] As such, the proposed SPR policy is not unworkable due to climate change. While concerns about the ESA and climate change are extremely important and merit more attention, they transcend concerns pertaining to SPR. Otherwise and in the meantime, experimental populations[93] may be the most useful mechanism within the ESA for mitigating cases where climate change has irreversibly rendered some portion of a species' range unsuitable.

D. CONSERVATION-RELIANT SPECIES AND CONSERVATION TRIAGE

The interpretation of SPR proposed here would likely reveal that many endangered species will require indefinite protection under the ESA. One concern with such a circumstance is that Congress is unlikely to allocate sufficient funds to the Service, precluding the Service from fully pursuing the recovery of all species at any one point in time. Important insight about how to handle this circumstance is found in scientific findings about Americans' attitudes about these circumstances.[94] In particular, a large majority of Americans:

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90. 16 U.S.C. § 1532(5)(A).

91. For readers less familiar with ecology, "range" and "habitat" are basic terms in ecology and both words refer to where a species lives. A species' "range" and "habitat" can typically be shown on a map. But there is a strong tendency for ecologists to use "range" to describe where species lives on small-scale maps (e.g., Grizzly bears' range includes western Montana) and to depict "habitat" to be depicted on larger-scale maps (that could, for example, show that Grizzly bears do not live in downtown Missoula, even though they live in western Montana). A species' "range" and "habitat" are both dependent on the "physical [and] biological features" of an area. Ecologists have not tended to use the term "critical habitat" except when motivated by discourse related to the ESA. The ESA does not define the words "range" or "habitat" (apart from "critical habitat"). But there is no usage of "range" or "habitat" (as distinct from "critical habitat") that is inconsistent with ecologists' use of those terms.

92. *E.g.*, polar bears.

93. 16 U.S.C. § 1539(j) (allowing for the introduction of listed species to suitable habitats outside of their historical ranges).

94. Offer-Westort et al., *supra* note 59.

- Agree with the statement, "It will be impossible to fully recover some endangered species. Nevertheless, some of these species benefit importantly from federal protection. We should protect this kind of species," (Figure 6) and,
- Disagree with the statement: "If a species cannot be fully recovered, they should not be protected even if the species would benefit from such protection." (Figure 7).

The interpretation of SPR proposed here would likely exacerbate the challenge of deciding how to allocate insufficient funds among endangered species. Again, important insight about how to handle this circumstance is found in scientific findings about Americans' attitudes about these circumstances.[95] In particular, most Americans think that, when it is not possible to fully protect all species, it is best to provide minimal protection to all endangered species by making it illegal to kill or harm them and providing additional protections when possible (Figure 8). Further, most Americans think it is not right—under that circumstance—to fully protect some species and provide no protection for others. In conclusion, these sociological findings are relevant for allaying concerns that about interpreting the ESA in ways that would result in strong public opposition. We further consider this concern in the next section.

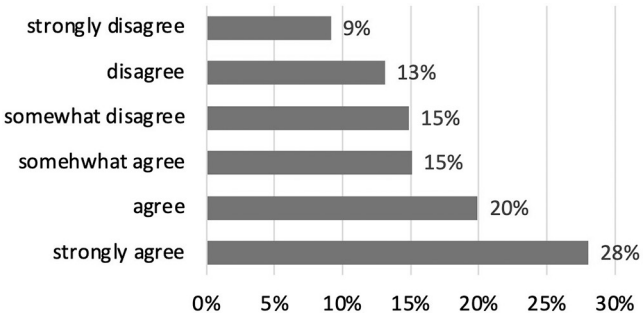

Figure 6. Responses from a representative sample of 909 adult U.S. residents to the statement, "*It will be impossible to fully recover some endangered species. Nevertheless, some of these species benefit importantly from federal protection. We should protect this kind of species*."

95. *Id.*

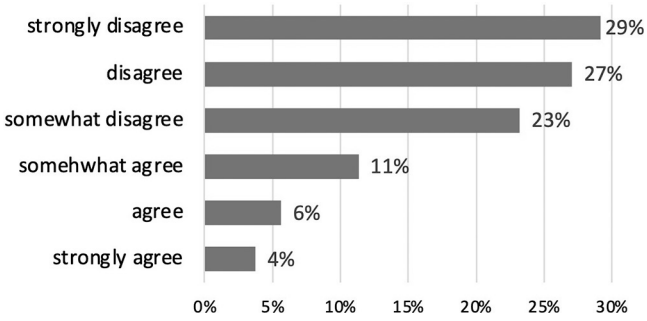

Figure 7. Responses from a representative sample of 909 adult U.S. residents to the statement, "*If a species cannot be fully recovered, they should not be protected even if the species would benefit from such protection.*"

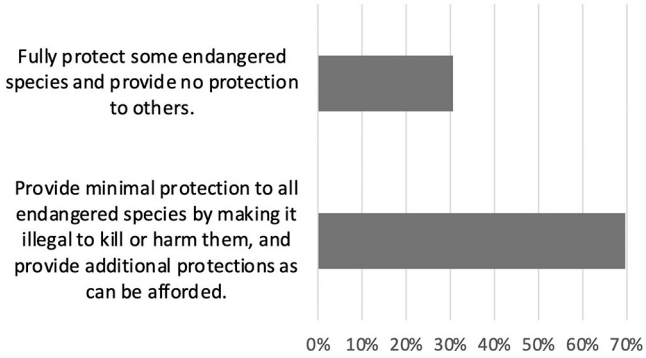

Figure 8. Distribution of responses from a representative sample of 909 American residents to the question, "*How should the effort to protect endangered species be allocated when there is not enough funding to protect all endangered species?*"

E. PUBLIC SUPPORT AND FEAR OF BACKLASH AGAINST THE ESA

Some may be concerned that full implementation of the ESA—by, for example, establishing and implementing an adequate SPR policy—would trigger "backlash" by the public, leading to loss of support for the ESA. This concern is consistent with, for example, Service leadership referring to the ESA as a "glass hammer" and fear of "over-exercising" the ESA.[96] Scientific knowledge indicates that backlash by any significant segment of our citizenry is unfounded. We summarize this knowledge here.

96. These are phrases that we, the authors, recall hearing from leaders of the FWS in public addresses and private conversations.

First, support for the ESA is strong, broad, and enduring.[97] In particular, the ESA is overwhelmingly supported by both liberals and conservatives (Figure 9). The ESA is also overwhelmingly supported by those who identify with a broad range of special interests (Figure 10). The ESA is also overwhelmingly supported in regions of the U.S. where the ESA has been used to protect a controversial species, i.e., the gray wolf (Figure 11). The ESA's overwhelming support has consistently endured over time (Figure 12).

Survey research also indicate that the general public calls for strengthening the ESA and increasing its funding.[98] Specifically, survey participants from a representative sample of 909 adult U.S. residents were asked to finish this statement, "I think the ESA should be . . ." with one of six phrases ranging from "far more protective" to "far less protective." The distribution of responses indicates that most Americans think the ESA should be more protective of biodiversity (Figure 13).

The result depicted in Figure 13 reinforces earlier peer-reviewed science. In particular, Czech & Krausman's (1997)[99] report on a sample of 644 members of the general public, who were asked to finish this statement: "In the best interests of the nation, the Endangered Species Act should be. . ." with one of these four responses: "revoked," "weakened to provide less protection to species," "remain unchanged," and "strengthened to provide more protection to species." Forty-nine percent of the sample indicated that the ESA should be strengthened. Only 16% thought the ESA should be weakened or revoked.

Consistent with calling for a more protective ESA, most members of the public believe that the federal government allocates too little to the protection of endangered species (Figure 14) and that more federal funding should be allocated to the protection of endangered species (Figure 15). While these results indicate strong support for the ESA by the general public, we do acknowledge the concern that politically powerful special interests, which do not represent any significant segment of citizens, may work increasingly against the ESA if the Service were to implement the ESA as Congress intended. If that concern is genuine and a reason to oppose the proposed SPR policy, it should be publicly identified as such by the Service in order to confront it. Failure to do so contributes to the erosion of representative democracy. If this concern is not genuine, then fear of backlash should not be an obstacle for the proposed SPR policy.

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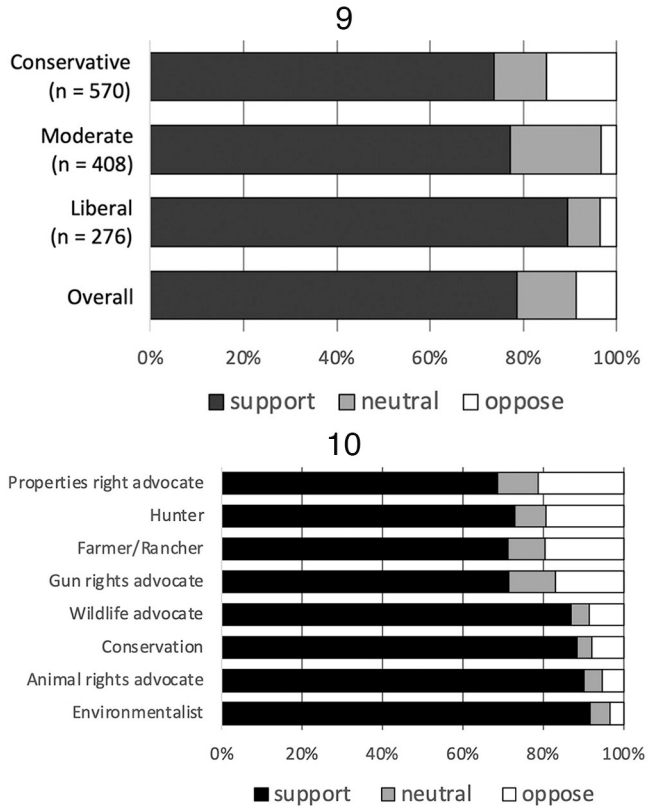
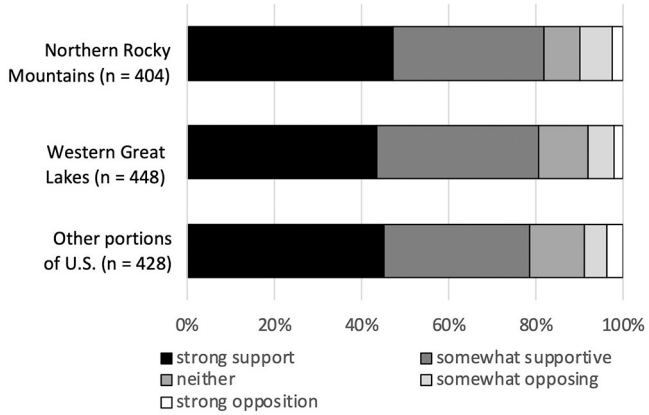
97. Jeremy T. Bruskotter et al., *Support for the U.S. Endangered Species Act Over Time and Space*, Conservation Letters, Nov.–Dec. 2018, at e12595 (first reporting the results presented in this section).

98. Results presented here are previously unreported portions of the survey described in Offer-Westort et al. (2020), *supra* note 59.

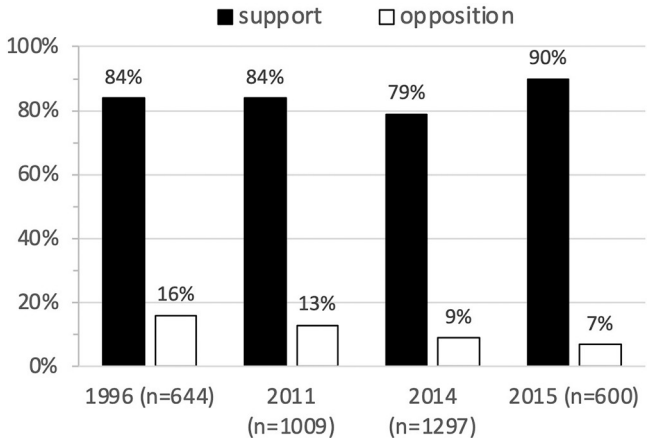
99. Brian Czech & Paul R. Krausman, *Public Opinion on Species and Endangered Species Conservation*, Endangered Species Update, May–June 1997, at 7, 9; *see also* Jeremy T. Bruskotter et al., *Support for the ESA Remains High as Trump Admin and Congress Try to Gut It*, The Conversation (July 20, 2018), https://perma.cc/YB9P-62KM.



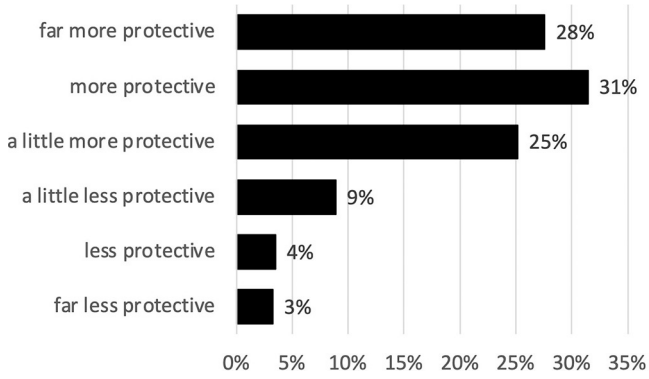
Figures 9 and 10. Distribution of responses from a representative sample of adult U.S. residents to the survey item, "As you may know, the Endangered Species Act is an environmental law established to protect all wildlife, plants, and fish that are in danger of extinction. Based on what you know, would you say that you strongly support, somewhat support, somewhat oppose, or strongly oppose the Endangered Species Act?" Each horizonal bar of Figure 10 (bottom) represents survey participants that self-identified with each of the listed special interests.



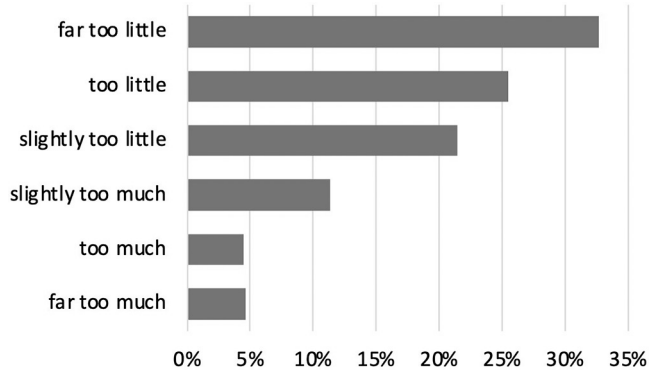
Figures 11. Distribution of responses to the same survey question described in Figure 9 about support for the ESA. Each horizontal bar represents a different region of the U.S. The region labelled "other portions of the U.S. exclude (i) Alaska, (ii) Arizona, New Mexico, and (iii) North Carolina, which correspond to areas inhabited by gray wolves, Mexican wolves or red wolves, respectively.



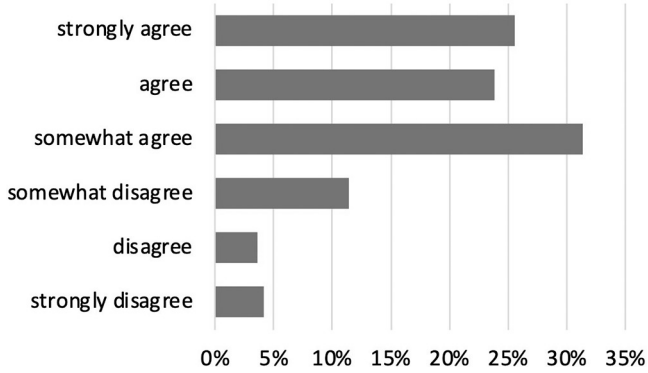
Figures 12. Support for and opposition to the ESA as inferred from four surveys conducted over a 20-year period. See footnote 97 for details.



Figures 13. Distribution of responses from a representative sample of 909 American resident to the statement, "*I think the Endangered Species act should be*. . .".



Figures 14. Distribution of responses from a representative sample of 909 adult U.S. residents to the statement, "*Less than a one-tenth of a percentage (0.1%) of the federal budget is spent in the ESA*. This amount is. . .".



Figures 15. Distribution of responses from a representative sample of 909 adult U.S. residents to the statement, "*The ESA is not sufficiently funded by Congress to protect all species. Without necessarily increasing taxes or the federal budget, we should allocate more funding to the ESA*."

VIII. SUMMARY

This proposed interpretation of the SPR is more protective of endangered species compared to policy that has been in place since 2001 and emerges from a synthesis of ecological science, the ESA's statutory purpose, court opinions, and scientifically documented views of conservation experts and attitudes of the general public.

A. THE ECOLOGICAL SCIENCE

Global extinction is the final state of an unconserved species, but the primary manifestation of the biodiversity crisis is the loss of species' geographic range.[100] Extinction is the dramatic tip of an iceberg whose far more insidious and massive body is the loss of species' range.

The biodiversity crisis is not only dire but also worsening. This statement is not rhetorical. The best-available science indicates that the worldwide conservation status of species has been worsening for several decades across major groups of taxa, including birds, mammals and amphibians.[101]

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100. Loss of geographic range is also a primary mechanism by which extinction risk increases. See Section II for details.

101. Especially concerning are trends in the Red List Index (RLI), for which 0 equates to all species having gone extinct and 1.0 equates to all species qualifying as Least Concern. ("Least Concern" refers to species that are not expected to become extinct in the near future according to criteria established by the IUCN.) A declining RDI indicates that the biodiversity crisis is worsening. Among vertebrate taxa for which the RLI can be usefully assessed (birds, mammals, and amphibians), the RLI—when aggregated across species and geographic regions—has been declining for at least the past three decades. *Red List Index*, IUCN, https://perma.cc/3ZLG-HQMB (last visited Sept. 2, 2022). Trends in the RLI are also important because realizing a positive trend has been adopted as an explicit goal for the

More than half of this worsening is concentrated among just eight nations, including the United States.[102] The U.S.'s poor performance in stemming the biodiversity crisis is especially troubling for two reasons. First, a large portion of the U.S.'s land base is designated as public lands intended to serve the most important public interests. Second, the U.S. has high per capita wealth as compared to the other eight nations contributing most to the biodiversity crisis.[103] If any country can readily afford to do better, it is the United States.

B. STATUTORY PURPOSE & COURT OPINION

Congressional records are clear that the ESA is intended to do more than merely prevent global extinction. Rather, the ESA's unambiguous purposes—according to those same records and the ESA[104]—include stemming the biodiversity crisis and protecting the ecological value of species. Both purposes require limiting the loss of species' geographic range. The severity and worsening of the biodiversity crisis indicate that the ESA has been inadequately applied to meet its purpose. An important element of this inadequacy has been an SPR policy that does not explicitly account for the importance of limiting losses to species' geographic ranges.

The legal definition of an endangered species provides substantive guidance for what counts as levels of unacceptable loss, unacceptable risk, and unacceptable danger. The courts have indicated the need for the Service to provide a clear, objective, measurable standard by which to apply Congress's guidance.[105]

C. PUBLIC ATTITUDES

Any policy about (un)acceptable harm, loss, or danger requires making a normative judgment about what counts as (un)acceptable. This requirement undoubtedly applies to the interpretation of endangered species, especially as it concerns SPR. The Service may be aided in making such a judgment by understanding the attitudes of the public and conservation experts as they pertain to SPR. As such, it is important to understand the best available science pertaining to understanding the values of Americans as they relate to the ESA, acceptable loss of range, and the biodiversity crisis. These values are summarized, thusly:

Convention on Biological Diversity's 2010 target, Aichi Biodiversity Targets, the UN Sustainable Development Goals (Goal 15), and the Convention on Migratory Species (and several of its daughter agreements). *Id*. The United States supports each of these international agreements, and the ESA is the primary legal instrument for realizing that goal. But the ESA can serve that goal only if interpreted adequately.

102. Ana S. L. Rodrigues et al., *Spatially Explicit Trends in the Global Conservation Status of Vertebrates*, 9 PLOS ONE 11, e113934 (2014).

103. *Id*.

104. 16 U.S.C. § 1531(b).

105. See Section V.A of this Article.

An overwhelming majority of Americans are supportive of the ESA, and most think it should be better funded and more protective of species. An overwhelming majority of Americans also think that federal protections are warranted for species that have lost more than 30% of their geographic range. Expert opinion is similar. Those scientifically derived views are also well-aligned with the urgent need to stem what is a catastrophically severe biodiversity crisis, as described in section II.

Most people think it is appropriate to protect a species even if it cannot be fully recovered. Most people also think that all species qualifying as endangered should receive the minimal protection that is afforded by making it illegal to kill or harm the species and subsequently providing more protection and recovery effort as resources allow. Much of the information described here was first made available only within the past few years.

D. CONCLUSION

The proposed SPR interpretation *is* a significant departure from previous SPR policy, the need for which is indicated by the ESA's statutory purpose, court opinion, science, and attitudes of conservation experts and the general public.

The biodiversity crisis is like the climate change crisis in that preventing harm is easier than undoing harm. As such, the climate change crisis offers an important lesson for mitigating the biodiversity crisis. Specifically, climate change has been ignored for political expediency to the point where scientific consensus is growing to the realization that it is now impossible to avoid serious harm from climate change. For these reasons there is urgency in accepting the proposed SPR interpretation now, rather than implementing an unduly weak interpretation, only later to find out that it is unsatisfying to the courts and future generations of Americans. Later will be too late.

We anticipate others will develop competing ideas for how to interpret SPR. We hope those policies will be subjected to the same kind of rigorous scrutiny that we have provided for this proposed interpretation. We also anticipate that some will criticize this proposed interpretation. Of those critics, we ask that the criticisms be fully and transparently vetted, including an opportunity for rejoinder.

APPENDIX A. THE INTERPRETATION OF "RANGE" AND ITS IMPACT ON INTERPRETING SPR

We explain in Appendix B why equating "range" with "current range" is inappropriate. However, that equating is allowed (though not required) by the courts.[106] As such, it is important to demonstrate that equating "range" with "current range" does not undermine or alter the proposed policy.

The demonstration begins by acknowledging that current range can exist in either of two states, *occupied range* or *unoccupied range*. By this account, unoccupied (current) range would be defined as *range that would become occupied after mitigating threats and taking actions that result in recolonization or reintroduction*. This definition is almost certainly a less-than-parsimonious use of the English language. However, this less-than-parsimonious language is the sole result of the Service's less-than-parsimonious interpretation of "range" as "current range." Under that poor interpretation, this notion of unoccupied (current) range is *essential* for maintaining consistency with the ESA's essential logic and purpose, which is that anthropogenic threats have resulted in unacceptable harms to many species that require corrective action.

The notion that many species do not occupy all of their current range is also reflected in more natural-sounding interpretation of unoccupied (current) range: A species does not have to be currently distributed or currently inhabit all of its current range because some of its current range may have been rendered unsuitable by threats that the ESA is expected to mitigate.

Nothing about that interpretation of unoccupied (current) range is misaligned, confusing, or at cross-purpose with the ESA's definition of "critical habitat."[107]

Reprinted, just below, is the core portion of the proposed policy presented in Section VI.B. This reprinting features bold-faced and italicized text to highlight substituted phrases ("current range" for "historic range" and "occupied range" for "current range"). These substitutions demonstrate that the policy in VI.B is functionally identical, regardless of whether range is interpreted as "historic range" or "current range."

THE PROPOSED POLICY, REPRISED

A policy that satisfies the aforementioned properties is: A species will generally be considered endangered if its **occupied range** is reduced by X% or more of the species' ***current range***. These are species for which enough loss has occurred to merit the corrective actions afforded by the ESA. Except for some species, it may be necessary to adopt a threshold for acceptable loss that is less than X%. These cases include:

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106. Humane Soc'y of the U.S. v. Zinke, 865 F.3d 585, 603 (D.C. Cir. 2017); Ctr. for Biological Diversity v. Zinke, 900 F.3d 1053, 1054 (9th Cir. 2018).

107. See Section VII.B.

- Species whose ***current range*** is small enough that small reductions in occupied range would lead to an unacceptably high risk of global extinction. When handling such a case, the Service should propose a lower threshold of acceptable loss for that species and defend that view with the best available science.
- Species that have lost little of their **occupied range** but have become too rare as a result of lost habitat throughout their ***current range*** or have become too rare because their range-wide density has been reduced to the point of being too rare.

APPENDIX B. MORE ON THE INTERPRETATION OF RANGE

A constraint on the interpretation of "current range": While the courts allow (but do not require) the Service to interpret "range" as "current range," not any interpretation of "current range" is allowable, because some interpretations would plainly contradict the purpose of the ESA.

For example, suppose that one were to interpret "current range" simply as *places where the species currently exists*. As straightforward and appropriate as that interpretation may seem, it leads directly to undermining the purpose of the ESA. Here is how: the extinction process for most species involves a contraction of current range.[108] Furthermore, by the aforementioned definition "current range," a species always exists on 100% of its current range. As such, a species could lose massive amounts of its (historic) range and securely occupy all of its current range. Such species would not qualify as endangered unless they were simply (and unqualifiedly) "at risk of extinction." This is problematic because a basic purpose of the ESA is to limit range loss.

The case for "historic range": Robust cases for interpreting "range" as "historic range" (that existed prior to anthropogenic threats, such as over exploitation and habitat loss) have been made elsewhere.[109] Those cases are considerably more sensible and more aligned with the ESA's purpose which is to mitigate the adverse impact of anthropogenic threats on a species' range. Here we recap some of the key reasons.

The House Report associated with the ESA's 1978 amendments states that "[t]he term 'range' is used in the general sense and refers to the historical range of the species."[110] Prior delisting decisions have been made in explicit relationship to historic range (e.g., pelicans and gray whales).[111] Furthermore, a report to Congress states:

> In May, 1979, the chief of FWS's listing branch provided . . . draft guidelines and criteria for determining endangered or threatened species, which . . . define significant portion as (1) more than half of a species' range, which may include historical as well as recent and anticipated future losses or (2) losses of habitat totaling less than 50 percent for species of relatively small range, or in other circumstances where the loss may have an inordinately large negative impact on the species' survival.[112]

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108. Section II of this Article.

109. *See, e.g.*,Vucetich et al., *supra* note 2 at 1387; Jeremy T. Bruskotter & Sherry A. Enzler, *Narrowing the Definition of Endangered Species: Implications of the U. S. Government's Interpretation of the Phrase "A Significant Portion Of Its Range" Under the Endangered Species Act of 1973*, 14:2 HUM. DIMENS.WILDL., 73, 73–80 (2009); *see* Greenwald, *supra* note 2, at 1374–77.

110. H.R. Rep. No. 95–1625, at 18 (1978).

111. Removal of the Brown Pelican From the Federal List of Endangered and Threatened Wildlife, 74 Fed. Reg. 59444–72 (Nov. 17, 2009); Remove the eastern north Pacific population of the Gray Whale from the list of endangered wildlife—final rule. 59 FR 31094 (Jun 16, 1994).

112. U.S. Gen. Acc. Off., B-118370, Endangered Species – A Controversial Issue Needing Solution – Report to the Congress, at 59 (Comp. Gen. Jul. 2, 1979), https://perma.cc/WC9D-QLKS.

A sometimes-raised concern with interpreting "range" as "historic range;" is that it raises the (supposedly unanswered) question, *what point in historic time is being referenced?* The question is answered in a manner consistent with the ESA's purpose by letting "range" refer to the historic range that existed prior to anthropogenic threats, such as over exploitation and habitat loss.[113]

113. The centrality of "historic range" as a *fundamental* consideration in listing a species as threatened or endangered is further indicated by the formal list of threatened and endangered species as presented in Remove the Eastern North Pacific Population of the Gray Whale From the List of Endangered Wildlife, 59 Fed. Reg. 31094 (Jun. 16, 1994), which includes a table of all listed species. That table includes a column labeled "historic range" which is described as "the known general distribution of the species or subspecies as reported in the current scientific literature. The present distribution may be greatly reduced from the historic range."