BEFORE THE UNITED STATES DEPARTMENT OF INTERIOR, THE UNITED STATES DEPARTMENT OF COMMERCE, THE UNITED STATES FISH AND WILDLIFE SERVICE, AND THE NATIONAL MARINE FISHERIES SERVICE

PETITION OF PACIFIC LEGAL FOUNDATION, *ET AL.*, FOR RULE-MAKING UNDER THE ADMINISTRATIVE PROCEDURE ACT

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INTRODUCTION

Pursuant to the Administrative Procedure Act,[1] Pacific Legal Foundation, the Coalition of Labor, Agriculture, and Business of Santa Barbara County, Property Owners Association of Riverside County, California Cattlemen's Association, California Wool Growers Association, and the Center for Environmental Science, Accuracy, and Reliability hereby petition the Secretaries of Interior and Commerce, and their delegates the United States Fish and Wildlife Service and National Marine Fisheries Service, to initiate rule-making to define the terms "species" and "subspecies" as used in the Endangered Species Act.[2]

Rule-making is urgently needed to clarify a critical aspect of decision-making under the Act. A population, even if faced with looming extinction, is ineligible for protection under the Act unless it can be classified as a listable entity, *i.e.*, a species, subspecies, or distinct population segment of a species.[3] The Act, however, defines none of these terms; it simply declares that "species" *includes* any "subspecies" of fish,

[1] 5 U.S.C. § 553(e).

[2] 16 U.S.C. §§ 1531-1544.

[3] *See id.* §§ 1533(a)(1), 1532(16); Oliver Frey, Note, *When Science and the Statute Don't Provide an Answer: Hybrid Species and the ESA*, 26 DUKE ENVTL. L. & POL'Y F. 181, 183 (2015).

wildlife, or plant, and any "distinct population segment" of a vertebrate species.[4] Over twenty years ago, the Services promulgated a policy defining "distinct population segment,"[5] yet neither agency has ever defined, through regulation or otherwise, the meaning of "species" or "subspecies." Instead, the Services have operated under a longstanding regulation that directs them to consult with their own experts and the outside scientific community when making taxonomic decisions.[6] But that instruction is unhelpful, because there is no universally accepted definition among taxonomists for either species or subspecies.[7] Not surprisingly, the absence of definition has caused considerable controversy[8] as well as inconsistent decision-making.[9]

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[4] *See* 16 U.S.C. § 1532(16). *See also* Anna L. George & Richard L. Mayden, *Species Concepts and the Endangered Species Act: How a Valid Biological Definition of Species Enhances the Legal Protection of Biodiversity*, 45 NAT. RESOURCES J. 369, 374 (2005) (observing that the Act's "definition" for species "does not define a species at all" but "merely provides for protection of groups below the species level").

[5] 61 Fed. Reg. 4722 (Feb. 7, 1996).

[6] 50 C.F.R. § 424.11(a).

[7] George & Mayden, *supra* note 4, at 375 ("[T]here is no single accepted method for recognizing species."); Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1100-01 (1997) ("Although many biologists use the word subspecies, it carries no similar, generally recognized biological meaning."). Exacerbating the regulation's inadequacy is "the decline of taxonomy as a discipline in major universities." Kevin Winker, *Subspecies Represent Geographically Partitioned Variation, a Gold Mine of Evolutionary Biology, and a Challenge for Conservation*, 67 THE AUK 6, 10 (2010).

[8] *E.g.*, Holly Doremus, *The Endangered Species Act: Static Law Meets Dynamic World*, 32 WASH. U. J.L. & POL'Y 175, 188 (2010) ("Fights about ESA protection resting on taxonomy are frequent.").

[9] *Id*. at 192 ("I detailed the Services' incoherent approach to the ESA taxonomy problem thirteen years ago. Not much has changed since then.") (footnote omitted); Rob Roy Ramey II, *On The Origin of*

The Endangered Species Act's deficient administration substantially worsens its already controversial reputation.[10] Without clarifying rule-making, the public understandably will continue to believe that the Services' taxonomy decision-making is a function of politics or other non-scientific concerns.[11] The regulated community in particular will reasonably fear that the agencies' taxonomy judgments are really just a "numbers game." That is, a single species is split into multiple species or subspecies, and because each resulting taxonomic unit will have fewer numbers and smaller ranges, each will be at greater risk of extinction and therefore more likely to be listed.[12]

This petition asks for an end to the arbitrariness through the setting of clear, scientifically defensible and politically sensible

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Specious Species, *in* INSTITUTIONS AND INCENTIVES IN REGULATORY SCIENCE 77, 90 (Jason Scott Johnston ed., 2012) ("[T]he need for explicit criteria is obvious.").

[10] *See, e.g.*, Holly Doremus, *Adapting to Climate Change with Law that Bends without Breaking*, 2 SAN DIEGO J. CLIMATE & ENERGY L. 45, 56 (2010) (noting the "ferocity and persistence of controversy over [the Act's] implementation"); Zygmunt J.B. Plater, *Endangered Species Act Lessons Over 30 Years, and the Legacy of the Snail Darter, a Small Fish in a Pork Barrel*, 34 ENVTL. L. 289, 292 (2004) ("The [Act] quickly became intensely and excruciatingly political, a pitched battleground for some of the most aggressive forces in modern politics.").

[11] *See* Doremus, *Listing Decisions*, *supra* note 7, at 1105 (noting that the Services' unexplained inconsistency in employing taxonomic standards "invites the charge that caprice or political pressure, rather than objective, value-neutral standards, drive their decisions").

[12] Thomas Wheeler, *The Concept of Species With Constant Reference to Killer Whales*, 4 WASH. J. ENVTL. L. & POL'Y 250, 279 (2014). *See* Doremus, *Listing Decisions*, *supra* note 7, at 1088 ("The science of taxonomy, as we have learned too late, offers opponents of Federal public works projects a virtually limitless arsenal of weapons with which to do battle.") (quoting S. REP. NO. 96-151, at 14 (1979) (additional views of Sen. Baker)); Doremus, *Static Law*, *supra* note 8, at 188 ("The more narrowly a 'species,' within the meaning of the statute, is defined, the more likely it is to qualify for listing.").

definitions for the statutory terms "species" and "subspecies." The petition recommends that, for the former, the longstanding and well-regarded biological species concept be adopted.[13] For the latter, the petition asks for the adoption of a variant of the equally longstanding "75% rule."[14] These definitions will ensure that only those populations that are on a distinct evolutionary path will be designated as species and subspecies.

Although not universally accepted in the scientific community, the proposed definitions are scientifically defensible. And irrespective of the content of the academic debate, *no* single definition of either term will receive unanimous support from the scientific community, in part because neither term is a pure function of science. Rather, "species" and especially "subspecies" are terms of convenience, deriving their value from larger conservation policy.[15]

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[13] *See infra* at pp. 15-21.

[14] *See infra* at pp. 21-28.

[15] *See* Doremus, *Listing Decisions*, *supra* note 7, at 1098 ("Although grounded in the natural world, the species concept is a tool rather than a natural phenomenon."); Doremus, *Static Law*, *supra* note 8, at 186-87 ("Subspecies do not have the fundamental biological significance of species; they are not the units of evolution.").

Informing that larger policy is the fact that the protection of all populations is economically and socially infeasible[16]; sound conservation therefore demands prioritization.[17] Many scientists believe that the priority of conservation should be the preservation of evolutionary potential—*i.e.*, biodiversity.[18] If that is correct, then being choosy about which populations can be eligible for protection makes sense as a matter of science.[19] But it also makes for good social policy. Moderating the Act's economic impact through fewer listings—a likely consequence of adopting rigorous taxonomic standards that will eliminate outmoded

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[16] *See* John Copeland Nagle, *Playing Noah*, 82 MINN. L. REV. 1171, 1192 (1998) ("[W]e can probably save any species, but we cannot save every species.").

[17] Attempting to conserve every species on an equal basis is not only impossible, it is inconsistent with the larger conservation policy of maximizing the benefits of evolution. *See* John Charles Kunich, *The Fallacy of Deathbed Conservation Under the Endangered Species Act*, 24 ENVTL. L. 501, 560 (1994) (arguing that extinction is ecologically helpful because it "clears limited habitat and resources for use by the species that are best adapted for current conditions," and that it is a "natural method of weeding the garden, of filtering out the weaker, or inflexible, or anachronistic species so as to maximize the evolutionary fitness of the gene pool at any point in time").

[18] Doremus, *Static Law*, *supra* note 8, at 215 ("[M]odern taxonomy focuses on evolution; it aims to recognize groups that are on evolutionarily separate paths."); *id*. at 216 (ensuring "the current and future functioning of evolutionary processes" is "what many scientists believe should be the primary goal of conservation efforts"); RICHARD FRANKHAM, ET AL., INTRODUCTION TO CONSERVATION GENETICS 2 (2002) ("[W]e have a stake in conserving biodiversity for the resources we use, for the ecosystem services it provides us, for the pleasure we derive from living organisms and for ethical reasons."). *See* ERNST MAYR, ANIMAL SPECIES AND EVOLUTION 11 (1963) ("The origin of new species, signifying the origin of essentially irreversible discontinuities with entirely new potentialities, is the most important single event in evolution."). *Cf.* Nagle, *supra* note 16, at 1215 ("[B]iodiversity as a whole has overwhelming utilitarian value . . . .") (quoting CHARLES C. MANN & MARK L. PLUMMER, NOAH'S CHOICE: THE FUTURE OF ENDANGERED SPECIES 133 (1995)).

[19] *See* J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 HOUS. L. REV. 933, 972 n.150 (1997) ("[M]ost species individually are not critically important to the continuing diversity of biological evolution.") (citing Sean Nee & Robert M. May, *Extinction and the Loss of Evolutionary History*, 278 SCI. 692, 692-94 (1997)).

classifications[20]—lessens the chance of a "public backlash that may eventually lead to a substantial weakening of the [Act]."[21] Additionally, time and money that might have been spent on protecting insignificant populations instead can be directed toward those populations the preservation of which best serves biodiversity.[22]

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A set of definitions that prioritizes the protection of those populations that currently, or likely will, function as units in evolutionary development makes good legal and conservation sense. The definitions proposed herein serve these goals. Petitioners urge their adoption.

BACKGROUND ON PETITIONERS

Pacific Legal Foundation is the nation's leading public interest organization advocating, in courts throughout the country, for a balanced

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[20] *See, e.g.*, ROBERT M. ZINK, THE THREE-MINUTE OUTDOORSMAN 53 (2014) ("[M]ost subspecies do not match even this goal [of 75% distinctiveness]".); J.V. Remsen, Jr., *Subspecies as a meaningful taxonomic rank in avian classification*, 67 ORNITHOLOGICAL MONOGRAPHS 62, 64-65 (2010) (predicting that "more than 75% of North American subspecies" delimited according to scientifically outmoded methods "would not survive application of the 75% rule").

[21] Kevin W. Grierson, Note, *The Concept of Species and the Endangered Species Act*, 11 VA. ENVTL. L.J. 463, 484 (1992).

[22] *Id*. at 487. *See* Kevin D. Hill, *The Endangered Species Act: What Do We Mean By Species?*, 20 B.C. ENVTL. AFF. L. Rev. 239, 239 (1993) ("[P]oor taxonomic decisions inappropriately listing a species can result in misallocation of limited resources."); Remsen, *supra* note 20, at 75 ("A benefit of the biological species concept to conservation is that it provides a degree of triage in terms of prioritizing resources at the global level.").

interpretation of environmental law. Protecting the natural environment is a critical task, but no governmental effort, no matter how important to the common good, can override citizens' fundamental liberties. In the Foundation's view, foremost among those is the right to reasonable use and enjoyment of private property. Too often, environmental laws generally—and the Endangered Species Act in particular—have been twisted by misguided environmental groups and compliant bureaucrats to preclude such use and enjoyment.[23] This injustice has been effected in part by the inconsistent, and frequently vague and capricious, taxonomic standards employed in Endangered Species Act decision-making. Some of this harm can be avoided through adoption of the definitions that the Foundation and its co-petitioners propose.

The Coalition of Labor, Agriculture, and Business of Santa Barbara County (COLAB) is a non-profit organization comprised of 1,000 members including all the leading farming and ranching families in the central coast region of California. Founded in 1991, COLAB seeks to preserve Santa Barbara County's heritage and economy, which are

[23] *See* Damien M. Schiff, *The Endangered Species Act at 40: A Tale of Radicalization, Politicization, Bureaucratization, and Senescence*, 37 ENVIRONS ENVTL. L. & POL'Y J. 105, 113-20 (2014).

primarily dependent on family-owned businesses with a heavy emphasis on farming and ranching operations. COLAB cares about the Endangered Species Act's frequent maladministration, including the failure to define and consistently apply definitions for "species" and "subspecies," because Santa Barbara County has more listed species than any other county in the continental United States.

The California Cattlemen's Association (CCA) is a non-profit trade organization representing California's ranchers and beef producers in legislative, regulatory, and judicial matters. CCA has 34 county affiliates and approximately 2,400 members, including more than 1,700 cattle producers. CCA's mission is to support and protect ranching throughout the state from a variety of threats, including overreaching environmental regulation. Many of CCA's members have been and continue to be burdened by such onerous regulation, including that emanating from the Endangered Species Act. Bringing more consistency and transparency to taxonomic decision-making under the Act may help to begin to ease some of that burden.

The Property Owners Association of Riverside County (POARC) is a non-profit research, educational, and advocacy organization. Founded

in 1983, POARC seeks to promote free enterprise and economic growth, as well as to serve as an advocate for property owners to ensure that the interests and private property rights of landowners are protected in the formation and implementation of public policies. POARC represents a membership consisting of property owners, farmers, ranchers, developers, homebuilders, architects, engineers, contractors, attorneys, brokers, real estate agents, property managers, businesses, and others whose interests are affected by land-use regulation. POARC's membership includes landowners in Riverside County whose properties are subject to the regulatory restrictions of the Endangered Species Act, triggered in part by controversial taxonomic decision-making. Thus, POARC has a keen interest in the adoption of clear, consistent, and scientific taxonomic definitions.

California Wool Growers Association (CWGA) is a non-profit organization that represents more than 500 sheep producers including farm-flock, large commercial operations, lamb feeders, seedstock producers, wool producers, and industry stakeholders. Since 1860, CWGA has been the voice of the California sheep industry, delivering lasting value to support and grow all segments of the California sheep

industry. Endangered species regulation frequently imposes a significant burden on members' businesses.

The Center for Environmental Science, Accuracy, and Reliability (CESAR) is a California non-profit corporation the primary purpose of which is to bring scientific rigor to regulatory decisions undertaken pursuant to environmental statutes, and to ensure consistent application of these statutes throughout all industries and sectors. CESAR believes that these activities will generate additional support for environmental statutes, because the results of and bases for regulatory actions will be transparent and supported by good science. CESAR believes that these goals will be furthered by the adopting of the proposed species and subspecies definitions, which will help to reduce the arbitrariness and politicization of much Endangered Species Act decision-making.

BACKGROUND ON TAXONOMY

The science of taxonomy—or systematics, as it is more commonly known today—is biology's oldest branch.[24] It aims to classify in an orderly fashion all living things.[25] The first people to attempt such a

[24] ERNST MAYR, THE GROWTH OF BIOLOGICAL THOUGHT: DIVERSITY, EVOLUTION, AND INHERITANCE 243 (1982), *cited in* Doremus, *Static Law*, *supra* note 8, at 183 n.40.

[25] *See* ERNST MAYR, PRINCIPLES OF SYSTEMATIC ZOOLOGY 2 (1969).

comprehensive classification were the Greeks,[26] the efforts of Aristotle the most prominent.[27] Today, the best-known exponent of the pre-modern approach to taxonomy is Carolus Linnaeus, the eighteenth-century Swedish scholar who devised a system of classification the basic form of which is still in use. In Linnaeus' view, "both species and genera [are] fixed, real, and known by definitions."[28] Thus, "individual members of a species come and go in terms of existence, [but] the species itself remains the same, . . . unchanged since the beginning of creation."[29]

Charles Darwin challenged the Linnaean view in his famous treatise, *On the Origin of Species*. In that work, Darwin argued that, through natural selection, species can evolve into new forms. But Darwin did not provide a standard for differentiating among species—his purpose was merely to unseat the view that a "species," however defined, was entirely (or at least largely) fixed.[30] Thus, for Darwin the term "species"

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[26] JOHN S. WILKINS, SPECIES: A HISTORY OF THE IDEA 12-13 (2009).

[27] *See id*. at 15 ("If, as Whitehead said, Western thought is a series of footnotes to Plato, then biological thought is a series of footnotes to Plato's onetime pupil Aristotle . . . ."). Aristotle's most prominent taxonomic works are *On the Parts of Animals*, *The History of Animals*, and *On the Generation of Animals*. *See id*. at 16.

[28] *Id*. at 70.

[29] DAVID N. STAMOS, THE SPECIES PROBLEM 112 (2003).

[30] Hence, "Darwin should be seen today as a sort of *liberation biologist*," in the sense of freeing terms from unhelpful meanings while allowing other persons to fill in the vacancies. *Id*. at 58.

was simply "a way of marking the variety that is subjected to selection or has been so subjected and gone to fixation."[31] Although Darwin's work on natural selection ultimately led to the solving of the species "question" (how do species arise?), it did not resolve the species "problem," *i.e.*, at what point are the effects of natural selection (and other factors) significant enough that a population becomes a separate species?[32]

Resolution of the species problem was left to Darwin's intellectual descendants, among them the German-born ornithologist Ernst Mayr, a prominent exponent of the Modern Synthesis of genetics and evolution.[33] Beginning with a 1940 paper[34] and continuing through many books and articles over the remainder of the twentieth century, Mayr vigorously advocated for what he called the "biological species concept" as the best solution to the species problem.[35] Its key criterion is reproductive

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[31] WILKINS, *supra* note 26, at 149. In other words, speciation "is a side effect of selection for varieties." *Id*. at 159.

[32] *See id*. at 173-74.

[33] From Julian Huxley's eponymous 1942 book, the Modern Synthesis denotes the melding of Mendelian genetics and Darwinian natural selection. *See* WILKINS, *supra* note 26, at 181.

[34] Ernst Mayr, *Speciation Phenomena in Birds*, 74 AMERICAN NATURALIST 249 (1940).

[35] Although Mayr is most often associated with the rule that species are defined by reproductive isolation, Ukrainian-American evolutionary geneticist Theodosius Dobzhansky is typically considered the first to have advocated for the rule. Stewart H. Berlocher, *Origins: A Brief History of Research on Speciation*, *in* ENDLESS FORMS: SPECIES AND SPECIATION 3, 4 (Daniel J. Howard & Stewart H. Berlocher eds., 1998).

isolation: a species comprises "[g]roups of actually (or potentially) interbreeding natural populations which are reproductively isolated from other such groups."[36] Over the last several decades, many competing species concepts have emerged,[37] but the biological species concept remains the most widely accepted.[38]

In contrast to "species," the term "subspecies" is of much more recent vintage. It emerged during the nineteenth century to mean "geographic race" or "variety," *i.e.*, a population not sufficiently different from other, closely related populations to merit a separate species designation.[39] As noted in the introduction, the term has no commonly accepted meaning in the scientific community.[40]

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[36] MAYR, PRINCIPLES, *supra* note 25, at 412. Mayr tinkered with his definition over his half-century-plus career, but the requirement of substantial reproductive isolation (allowing for some "leakage of genes") remained constant. *See* WILKINS, *supra* note 26, at 192. That being said, reproductive isolation always has been considered a relevant factor in taxonomy. *Id*. at 195, 198. Mayr made it paramount.

[37] WILKINS, *supra* note 26, at 197-221,

[38] *See* Ernst Mayr, *The Biological Species Concept*, *in* SPECIES CONCEPTS AND PHYLOGENETIC THEORY: A DEBATE 17, 17 (Quentin D. Wheeler & Rudolf Meier eds., 2000) (noting the "increasingly wide adoption" of the concept). The biological species concept is not commonly employed by those specialists dealing with organisms that typically lack strict reproductive isolation, *e.g.*, botanists or entomologists.

[39] MAYR, PRINCIPLES, *supra* note 25, at 41. *See* Ramey, *supra* note 9, at 79 ("[T]he category of 'subspecies' was introduced as a way to describe geographic variation often found within species . . . ."). *See also* Winker, *supra* note 7, at 7.

[40] Doremus, *Listing Decisions*, *supra* note 7, at 1100-01.

THE ENDANGERED SPECIES ACT'S APPROACH TO TAXONOMY

The first federal endangered wildlife law,[41] the Endangered Species Act of 1966,[42] used the term "species"[43] but did not define it.[44] Its successor, the Endangered Species Act of 1969,[45] protected "subspecies" as well as "species,"[46] but defined neither.[47] Today's Endangered Species Act does not define "species"; instead, it merely denotes that the term includes some "subspecies" as well as "distinct population segment[s]."[48] Nevertheless, the legislative history of the 1979 Amendments to the Act—which added the "distinct population segment" language—reveals a Congressional concern that taxonomic decision-making not result in a proliferation of listings.[49]

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[41] The Lacey Act of 1900, ch. 553, 31 Stat. 187 (May 25, 1900), *codified as amended at* 16 U.S.C. §§ 3371-3378, prohibited the unpermitted importation of "any foreign animal or bird," as well as the trade in "wild animals or birds" taken illegally under state law, *see* §§ 2, 3, 31 Stat. at 188, without using taxonomic nomenclature.

[42] Pub. L. No. 89-669, 80 Stat. 926 (Oct. 15, 1966).

[43] *Id*. § 1, 80 Stat. at 926.

[44] *See id*. § 5, 80 Stat. at 929.

[45] Pub. L. No. 91-135, 83 Stat. 275 (Dec. 5, 1969).

[46] *E.g.*, *id*. § 2, 83 Stat. at 275.

[47] *See id*. § 1, 83 Stat. at 275.

[48] *See* 16 U.S.C. § 1532(16). The origin of "distinct population segment" is likely the Marine Mammal Protection Act's "population stocks." Doremus, *Listing Decisions*, *supra* note 7, at 1093.

[49] S. REP. NO. 96-151, at 1397 (1979) (noting that the listing of distinct population segments could provide a "great potential for abuse," and urging the Services to "list populations sparingly").

Also in 1979, the Services proposed regulations to, among other things, govern the taxonomy analysis for populations proposed for listing.[50] Rather than define any of the Act's taxonomic terms, the proposal merely directed the Services to rely on "standard" distinctions and the agencies' own expertise. In response to the proposal, several commenters requested that the Services set forth the rules by which such "standard" distinctions would be made.[51] The Services declined, stating without explanation in the final rule's preamble that, other than reliance on internal expertise and that of the scientific community, "no criteria . . . can be established for acceptance of taxonomic treatments."[52] Since then, neither the Secretaries nor the Services have promulgated definitions for "species" and "subspecies."

[50] *See* 44 Fed. Reg. 47,862, 47,863 (Aug. 15, 1979).

[51] 45 Fed. Reg. 13,010, 13,012 (Feb. 27, 1980).

[52] *Id*. at 13,013.

PROPOSED DEFINITION FOR "SPECIES"

Petitioners propose the adoption of the following definition for "species":

A species is a group of actually or potentially interbreeding populations that are reproductively isolated from other such groups to the extent that the rate of fertile hybridization is less than 1% per generation.

This definition follows closely upon the biological species concept as formulated by Mayr.[53] That concept is widely recognized as the leading definition for species used by practicing taxonomists.[54] The definition differs slightly from Mayr's original version in allowing for the fact that "complete reproductive isolation fail[s] to evolve suddenly at speciation, [and] compatibility often lingers on for many millions of years after

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[53] *See* Stephen J. O'Brien & Ernst Mayr, *Bureaucratic Mischief: Endangered Species and Subspecies*, 251 SCI. 1187, 1187 (1991).

[54] *See* Doremus, *Static Law*, *supra* note 8, at 184 ("Mayr's biological species concept . . . remains the best-known and probably the most widely used species definition."); Kevin de Queiroz, *Ernst Mayr and the modern concept of species*, 102 PROC. NAT'L ACAD. SCI. 6600, 6600 (2005) (noting "the wide acceptance of Mayr's proposed species definition"); Rainer Froese, *The good, the bad, and the ugly: A critical look at species and their institutions from a user's perspective*, 9 REV. FISH BIOLOGY & FISHERIES 375, 375 (1999) ("Of the various species concepts that are in use today, . . . most users . . . favour[] the biological species concept of Mayr . . . .").

speciation."[55] Thus, the proposed species definition recognizes that reproductive isolation need not be absolute.[56]

The proposed definition is legally defensible. At the time of the Endangered Species Act's passage, the only scientifically based species concept used by taxonomists was the biological species concept.[57] Statutory text, when not specifically defined, should be interpreted according to its ordinary, public meaning at the time of enactment.[58] Hence, interpreting "species" consistent with the biological species concept would comport with this basic principle of construction.

Such an interpretation also would comport with the equally basic interpretive principle that redundancy should be avoided.[59] Alternative species concepts that require something less than reproductive isolation

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[55] James Mallet, *Hybridization, ecological races and the nature of species: Empirical evidence for the ease of speciation*, 363 PHIL. TRANS. R. SOC'Y B. 2971, 2975 (2008). *See* JERRY A. COYNE & H. ALLEN ORR, SPECIATION 34 (2004) ("Adopting a species concept that allows some introgression does not trouble us [as adherents of the biological species concept].").

[56] *See* Mallet, *supra* note 55, at 2979 ("[A] reasonable definition of species is that they should represented differentiated clusters of genotypes between which hybridization is very rare, say less than approximately 1% per generation.").

[57] De Queiroz, *supra* note 54, at 6601 ("[A]lternative species concepts did not really begin to proliferate until the 1970s . . . ."). *See* Doremus, *Static Law*, *supra* note 8, at 200 (observing that, at the time of the Act's passage, the only species concepts in vogue were the biological species concept and "essentialism," tied to biblical fundamentalism).

[58] Baker Botts LLP v. ASARCO LLC, 135 S. Ct. 2158, 2165 n.2 (2015).

[59] Bank of Am. Nat'l Trust & Sav. Ass'n v. 203 N. LaSalle St. P'ship, 526 U.S. 434, 452 (1999) (noting "the interpretive obligation to try to give meaning to all the statutory language").

typically end up duplicating subspecies concepts.[60] For example, the phylogenetic species concept is perhaps the most prominent competitor with the biological species concept.[61] Under the former, a population need differ only by one character from another population to be considered a distinct species.[62] Such a standard necessarily admits of no subspecies.[63] Therefore, to adopt such a standard for "species" would impermissibly render the Act's separate allowance for the listing of subspecies (and, *a fortiori*, distinct population segments) redundant. The biological species concept presents no such legal defect.[64]

In addition to being legally justified, the proposed definition of "species" is scientifically defensible. As noted above, many conservation

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[60] *See* Remsen, *supra* note 20, at 78 (observing that what an adherent of the biological species concept would call a subspecies, a follower of the phylogenetic species concept would label a species).

[61] Doremus, *Static Law*, *supra* note 8, at 186.

[62] *Id.*

[63] *Id.* at 187 n.58. Even the smallest populations could merit separate classification. *See* Brent D. Mishler & Edward C. Theriot, *The Phylogenetic Species Concept (*sensu *Mishler and Theriot): Monophyly, Apomorphy, and Phylogenetic Species Concepts*, *in* SPECIES CONCEPTS, *supra* note 38, at 44, 46, 51 ("[T]here may be no smallest irreducible cladistic unit within which no further diverging phylogenetic patterns occur . . . ."). *Cf.* Remsen, *supra* note 20, at 75 ("[I]t is no surprise that among the most vocal advocates for the phylogenetic species concept are those devoted to the conservation of small areas or islands . . . .").

[64] *See* Doremus, *Static Law*, *supra* note 8, at 187 n.58. *See also* O'Brien & Mayr, *supra* note 53, at 1188. *Cf.* Alan R. Templeton, *Species and Speciation: Geography, Population Structure, Ecology, and Gene Trees*, *in* ENDLESS FORMS, *supra* note 35, at 32, 33 ("[O]ne of the great strengths of the [biological species concept] is that by defining species in terms of isolating mechanisms, it provides solid guidance to experimental, observational, and theoretical studies of the speciation process.").

scientists recognize that the "species is the principal unit of evolution."[65] Thus, it makes sense when attempting to conserve "species," as the Endangered Species Act endeavors,[66] to do so by preserving evolutionary potential, *i.e.*, the ability for this biodiversity to persist and adapt to changing environmental conditions.[67] Requiring reproductive isolation serves this evolutionary end by directing conservation efforts at those populations that have formed unique branches on the tree of life.[68]

To be sure, evolution starts to happen before reproductive isolation develops.[69] But the Act's structure makes clear that the mode for protecting the evolutionary value residing in inchoate speciation is *not* through the listing of species but rather subspecies and distinct

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[65] Ernst Mayr, *A Critique from the Biological Species Concept Perspective: What Is a Species, and What Is Not?*, *in* SPECIES CONCEPTS, *supra* note 38, at 93, 93. *See* George & Mayden, *supra* note 4, at 371 ("[S]pecies are the quintessential building blocks of natural history and the fundamental measurable unit of biodiversity . . . ."). *See also* MAYR, PRINCIPLES, *supra* note 25, at 61 ("[T]he taxonomist [does not] have to 'make' taxa, evolution ha[s] done this for him."); Richard G. Harrison, *Linking Evolutionary Pattern and Process: The Relevance of Species Concepts for the Study of Speciation*, *in* ENDLESS FORMS, *supra* note 35, at 19, 19 ("Species are fundamental units of natural diversity . . . .").

[66] *See* 16 U.S.C. § 1531(b).

[67] *See* Susan M. Haig, *et al.*, *Taxonomic Considerations in Listing Subspecies Under the U.S. Endangered Species Act*, 20 CONSERVATION BIOLOGY 1584, 1590 (2006) ("The ESA provides for protection of groups or populations to allow for the conservation of evolutionary potential within a species.").

[68] *See* Hill, *supra* note 22, at 263 (observing that "the definition of species must reflect the need to protect biodiversity" and arguing for the adoption of the biological species concept). *Cf.* MAYR, PRINCIPLES, *supra* note 25, at 38 ("Awarding species rank to every local population, no matter how slight its difference, completely destroy[s] the biological significance of the species category.").

[69] *See* Doremus, *Static Law*, *supra* note 8, at 217-28.

population segments.[70] To use the species category for the former end would, as noted above, improperly render part of the Act's structure superfluous.[71]

It is also true that the biological species concept does not work with organisms that do not reproduce sexually. But such organisms tend to be of little significance from an evolutionary perspective,[72] and thus of minor consequence to the Act's conservation goals.[73] Indeed, a large majority of the populations currently protected under the Act are wildlife,[74] which typically reproduce sexually. Moreover, given the Act's focus on populations (*e.g.*, the recognition of distinct *population* segments of species), it would be otiose to accommodate asexual organisms in a definition of "species" because the former do not produce populations.[75]

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[70] *See* 16 U.S.C. § 1532(16).

[71] Such a reading would render Congress' allowance for the listing of "subspecies" as well as "species" idle—why specify such a power if the criteria for distinguishing the subspecies taxon are the same as those for diagnosing species? *Cf. Gustafson v. Alloyd Co., Inc.*, 513 U.S. 561, 574 (1995) ("[T]he Court will avoid a reading which renders some words altogether redundant.").

[72] *See* MAYR, ANIMAL SPECIES, *supra* note 18, at 27.

[73] Although many plant species, for example, can reproduce asexually, very few do so exclusively. *See* Jonathan Silvertown, *The Evolutionary Maintenance of Sexual Reproduction: Evidence from the Ecological Distribution of Asexual Reproduction in Clonal Plants*, 169 INT'L J. PLANT SCI. 157, 157 (2008) (observing that "only very rarely do clonal plants become entirely asexual").

[74] *Compare* 50 C.F.R. § 17.11(h) *with id.* § 17.12(h).

[75] *See* Mayr, *The Biological Species Concept*, *supra* note 38, at 25 ("[A]sexual organisms . . . form clones, not populations.").

In any event, *every* plausible species definition will present a theoretical or operational challenge,[76] and so the existence of such a challenge is no reason to reject a proposed definition.[77]

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The biological species concept is widely accepted in the scientific community, can be applied fairly while preventing taxonomic decision-making from devolving into "advocacy science,"[78] and can provide critically needed guidance for the agencies and regulated public alike. It should be adopted.

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[76] *See* George & Mayden, *supra* note 4, at 391-95,

[77] *See* MAYR, ANIMAL SPECIES, *supra* note 18, at 29 ("Almost any concept is occasionally difficult to apply, without thereby being invalidated. The advantages of the biological species are far greater than its shortcomings."); Quentin D. Wheeler & Norman I. Platnick, *The Phylogenetic Species Concept (*sensu *Wheeler and Platnick)*, *in* SPECIES CONCEPTS, *supra* note 38, at 55, 57. *See also* MAYR, PRINCIPLES, *supra* note 25, at 30 ("The concept *tree*, for instance, is not invalidated by the existence of spreading junipers, dwarf willows, giant cacti, and strangler figs."). *Cf.* Remsen, *supra* note 20, at 76 ("De Queiroz and Donoghue (1988:334) concluded that 'no one species concept can meet the needs of all comparative biologists.' I suggest that use of a biological species concept that identifies minimum diagnosable units as subspecies spans more of those needs than is appreciated.").

[78] *See* Jason Scott Johnston, *Introduction*, *in* INSTITUTIONS AND INCENTIVES, *supra* note 9, at 1, 3 ("Advocacy science is the practice of culling a complex body of scientific literature for studies or funding new studies that support the decision to regulate."); Ramey, *supra* note 9, at 83 ("If species concepts and definitions can be selected post hoc to fit any set of observations, then just about any group of organisms could potentially qualify (or not qualify) as a species depending on the investigator's whim or regulatory agency's bias.").

PROPOSED DEFINITION FOR "SUBSPECIES"

Petitioners propose the adoption of the following definition of "subspecies":

A subspecies is a population for which at least 75% of its distribution lies outside the distribution of any other population within the same species, based on two or more independent characters—such as genetics, morphology, or ecological distinctiveness—that reflect authentic evolutionary significance.

It is generally accepted that subspecies are inchoate species, and therefore that they are on an evolutionary path to becoming species.[79] But there is no consensus as to how far down the evolutionary road a population must be to qualify as a subspecies.[80] In Petitioners' view, the line should be drawn so as to protect potentially significant evolutionary

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[79] Michael A. Patten & Philip Unitt, *Diagnosability Versus Mean Differences of Sage Sparrow Subspecies*, 119 THE AUK 26, 27 (2002) ("[A]ll species must go through a subspecies stage, making the concept one of evolutionary import."); FRANKHAM, *supra* note 18, at 371 ("[Subspecies] may best be considered as populations partway through the evolutionary process of divergence towards full speciation."). *See* Haig, *et al.*, *supra* note 67, at 1585 ("Infraspecific taxa are important in discussions of biodiversity because they represent evolutionary potential within a species."); O'Brien & Mayr, *supra* note 53, at 1188 ("The possibility that a subspecies carries [ecologically relevant] adaptations coupled with the potential to become a unique new species are compelling reasons for affording them protection against extinction.").

[80] *See* M. A. Cronin, *The Preble's meadow jumping mouse: subjective subspecies, advocacy and management*, 10 ANIMAL CONSERVATION 159, 159 (2007) ("It is well established that the subspecies category is subjective.").

lines while not overprotecting by mistaking phenotypic plasticity or non-adaptive divergence for authentic evolutionary development.[81]

This balancing can be achieved through the adoption of a 75% rule for diagnosability.[82] Such a rule would comport with the views of many taxonomists[83] while avoiding the codification of arbitrary taxonomic fashions,[84] an unfortunate effect of the current regulation's direction to

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[81] *See* Doremus, *Listing Decisions*, *supra* note 7, at 1140 (the listing process should "preclude the listing of patently worthless groups, like the squirrels in a city park").

[82] Naturally, the satisfaction of the diagnosability rule must be supported by unbiased and comprehensive sampling—a quality-control limitation that the Endangered Species Act implicitly imposes through its best-available-data standard, 16 U.S.C. § 1533(b)(1)(A). *See Bennett v. Spear*, 520 U.S. 154, 176 (1997) ("The obvious purpose of the requirement that each agency 'use the best scientific and commercial data available' is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise."). Such a qualification is essential to validating the evidentiary support for a subspecies determination. That is so because, regardless of the percentage rule selected (*e.g.*, whether 75% or 95%), a judgment of diagnosability depends upon (i) the sampling scheme for specimen locations and the type of data (genetic or otherwise) selected for analysis, as well as (ii) the probability of correct diagnosis of individuals. With respect to (i), if many individuals are collected from a few, distant locations without sampling from intervening locations, the two distant populations will appear to be more distinct than they really are (*i.e.*, step changes rather than smooth clines). *See, e.g.*, Jason L. Malaney & Joseph A. Cook, *Using biogeographical history to inform conservation: the case of Preble's meadow jumping mouse*, 22 MOLECULAR ECOLOGY 6000, 6008 (2013). With respect to (ii), an analysis that has a low probability of accurately reflecting reality is scientifically and legally suspect, a deficiency that can be avoided by the selection of an appropriate p-value. *See generally* FED. JUDICIAL CTR. & NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 249-58 (3d. ed. 2011). For an example of an appropriate p-value to govern subspecies classifications, see, *e.g.*, John D. Wehausen & Rob Roy Ramey II, *Cranial Morphometric and Evolutionary Relationships in the Northern Range of* Ovis Canadensis, 81 J. MAMMALOGY 145, 147 (2000).

[83] Patten & Unitt, *supra* note 79, at 27 ("The standard level for defining a subspecies is based on the '75% rule.'") (citing D. Amadon, *The seventy-five percent rule for subspecies*, 51 THE CONDOR 250 (1949)); Winker, *supra* note 7, at 19 ("The 75% rule is a widely accepted quantitative definition . . . ."). Patten and Unitt advocate for a 95% rule based on one character. Patten & Unitt, *supra* note 79, at 27-28. Petitioners believe that a 75% rule based on at least two characters is a fair compromise between the demands for objective rigor and the desire to conserve potentially significant evolutionary development.

[84] Nick J.B. Isaac, *et al.*, *Taxonomic inflation: its influence on macroecology and conservation*, 19 TRENDS IN ECOLOGY AND EVOLUTION 464, 466 (2004) (noting that, when "different taxonomic cultures operate regionally or depend on the group studied, conservation priorities might track taxonomic

follow "standard taxonomic distinctions."[85] The 75% rule would allow for the use of a wide variety of data sets—morphological, ecological, and genetic—consistent with the Fish and Wildlife Service's recent practice.[86] And given many scientists' conservation-biased policy preferences,[87] the proposed 75% rule would appropriately deemphasize the role of subjective judgment in delineating populations.[88] In particular, the proposed definition guards against that bias through its two-character minimum,[89] which takes into account "that nearly all species show

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fashion rather than fundamental biological parameters"); Doremus, *Static Law*, *supra* note 8, at 187 ("Those studying different organisms have developed different naming cultures. Birds, for example, tend to be separated into more subspecies than fish, even when the pattern of variation is similar.") (footnote omitted); Haig, *et al.*, *supra* note 67, at 1585 (observing that the debate over subspecies classification "has been exacerbated by careless taxonomy in some cases . . . and over-application of the subspecies concept for species that attract human interest"); Johnston, *supra* note 78, at 4 (noting that the Fish and Wildlife Service "has seemingly tilted the scales in favor of studies and methodologies that favor finding a su[b]species, triggering ESA listing").

[85] *See* 50 C.F.R. § 424.11(a).

[86] *See, e.g.*, *12-Month Finding on a Petition To Delist the Coastal California Gnatcatcher*, 81 Fed. Reg. 59,952, 59,960-61 (Aug. 31, 2016) ("[W]e consider multi-evidence criteria involving multiple lines of genetic, morphological, and ecological scientific data to provide the best approach to determining the taxonomic status of the coastal California gnatcatcher.").

[87] *See* Holly Doremus & A. Dan Tarlock, *Science, Judgment, and Controversy in Natural Resource Regulation*, 26 PUB. LAND & RESOURCES. L. REV. 1, 27 (2005) (noting that "those scientists who study ecology, conservation biology, or an individual endangered species tend to be unusually devoted to their work," that "most of them share the view that conservation is more important than economic development," and, consequently, that they "will tend to push their judgments in a more protectionist direction").

[88] *See* Patten & Unitt, *supra* note 79, at 27 (criticizing the practice of the "naming of subspecies even along perfectly smooth clines, where in principle a near limitless number could be named provided sample sizes from each point were extremely large").

[89] *See* FRANKHAM, *supra* note 18, at 371 ("[Subspecies] are distinguishable from other subdivisions of the species by multiple, independent, genetically based traits.").

geographic variation in at least 1 morphological, ecological, physiological, genetic, or behavioral characteristic," and that "it is possible to subdivide this variation taxonomically in numerous ways without yielding evolutionarily significant taxa."[90] The proposed definition therefore would help to ensure that only those populations truly representing unique evolutionary development will be so classified.[91] Finally, because diagnosability (unlike reproductive isolation) transcends distinctions among living things, the proposed definition can be applied to all organisms based on any type of data. Hence, it would avoid the frequent controversies over the relevance of certain types of data in diagnosing populations.[92]

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[90] Robert M. Zink, *Genetics, morphology, and ecological niche modeling do not support the subspecies status of the endangered Southwestern Willow Flycatcher (Empidonax traillii extimus)*, 117 THE CONDOR 76, 76-77 (2015). With modern genetic techniques, one can diagnose down to an individual, family, or subpopulation level with a high level of statistical certainty. But the biological significance of this diagnosability is often questionable, because statistical significance is not coextensive with biological significance. Erica Beecher-Monas, *The Heuristics of Intellectual Due Process: A Primer for Triers of Science*, 75 N.Y.U. L. REV. 1563, 1603 (2000) ("Statistical significance, which is a function of the size of the study, may be present in the absence of biological significance. Conversely, biological significance may be present in the absence of statistical significance.") (footnote omitted).

[91] *See* MAYR, PRINCIPLES, *supra* note 25, at 31 ("In particular, the acquisition of morphological distinctness is not always closely correlated with the acquisition of reproductive isolation."). It is certainly possible that "subspecific variation that does not lead to speciation" may still be valuable for "for resilience and persistence [or] preventing extinction of existing species during episodes of environmental change." Winker, *supra* note 7, at 22. But, as noted in the Introduction, such an extreme application of the precautionary principle is not practicable. *See supra* nn.16-22. Social and economic constraints demand prioritization in conservation. Ordering based on demonstrated evolutionary potential is the most prudent approach.

[92] See, for example, the longstanding dispute over the validity of the subspecies classification for the coastal California gnatcatcher. *12-Month Gnatcatcher Finding*, 81 Fed. Reg. 59,952 (nuclear DNA

A looser standard would invite many of the problems of taxonomic inflation,[93] and would result in the misdirection of conservation resources.[94] Indeed, the traditional methods for diagnosing subspecies are commonly acknowledged to be inadequate under modern statistical and other scientific norms. For example, the "folklore of mammalogy is replete with humorous anecdotes such as two subspecies being named from individuals that were littermates."[95] Even prominent proponents of the subspecies concept have acknowledged that "many subspecies have been named on mean differences only," resulting in the identification of

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study inadequate to invalidate gnatcatcher's subspecies status); *90-Day Finding on a Petition to Delist the Coastal California Gnatcatcher as Threatened*, 76 Fed. Reg. 66,255 (Oct. 26, 2011) (mitochondrial DNA study inadequate to invalidate gnatcatcher's subspecies status); Endangered Species Comm. v. Babbitt, 852 F. Supp. 32 (D.D.C. 1994) (underlying data for principal study on which gnatcatcher's subspecies status is founded must be made available to the public before listing can be finalized).

[93] *See, e.g.*, Ramey, *supra* note 9, at 82 ("Taxonomic inflation has the effect of both increasing the perception of widespread endangerment while devaluing the basic currency of conservation: species."); Berry J. Brosi & Eric G. Biber, *Statistical inference, Type II error, and decision making under the US Endangered Species Act*, 7 FRONT. ECOL. ENVIRON. 487, 493 (2009) ("[S]electing a very low threshold of difference between taxa could result in the identification of many more conservation units (taxa) for protection, with potentially important economic and political consequences."); MAYR, PRINCIPLES, *supra* note 25, at 189-90 (noting "extreme 'splitters' [who] called every population a different subspecies that could be shown by statistical tests to be different"). *See generally* Isaac, *supra* note 84.

[94] Brosi & Biber, *supra* note 93, at 487 ("Protection of a spurious subspecies (i.e. a population that is not truly biologically distinct from its abundant and widespread conspecifics) takes away resources from other species, subspecies, or populations that need protection."); Rob Roy Ramey II, *et al.*, *Genetic relatedness of the Preble's meadow jumping mouse* (Zapus hudsonius preblei) *to nearby subspecies of* Z. hudsonius *as inferred from variation in cranial morphology, mitochondrial DNA and microsatellite DNA: implications for taxonomy and conservation*, 8 ANIMAL CONSERVATION 329, 341 (2005) (the listing of "an invalid taxon . . . . affects other species because limited conservation resources are then misallocated").

[95] Doremus, *Static Law*, *supra* note 8, at 187 n.62 (quoting Oliver A. Ryder, *Species Conservation and Systematics: The Dilemma of Subspecies*, 1 TRENDS ECOLOGY & EVOLUTION 9, 9 (1986)).

subspecies "even along perfectly smooth clines," a "careless" practice that "was rife for decades."[96] Similarly, another well-known subspecies supporter has admitted that "the majority of subspecies were described in a prestatistical era," and that even "the term 'statistics' and . . . the simplest statistical analyses . . . postdate the majority of subspecies descriptions."[97]

An extreme example of careless subspecies diagnosis is "the subspecies *O. v. leucurus*, from the Columbia River area, [whose subspecies classification] was based on a single individual that was not preserved but eaten."[98] A like example can be found in the coastal California gnatcatcher, whose subspecies designation derives ultimately from nearly century-old narrative descriptions, based on a dozen or so specimens of questionable quality, of remarkably slight and very subjective differences of color and size.[99] Given that, by the Fish and

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[96] Patten & Unitt, *supra* note 79, at 27.

[97] Remsen, *supra* note 20, at 71.

[98] Zink, *supra* note 20, at 53.

[99] Joseph Grinnell, *A Critical Inspection of the Gnatcatchers of the Californias*, 15 PROC. CAL. ACAD. SCI. 493, 498 (1926) (distinguishing among purported gnatcatcher subspecies based on descriptions like "a little smaller, tones of color . . . a trifle deeper [and] as compared with [another subspecies], tail somewhat shorter, and upper and lower surfaces decidedly paler (less darkly slaty)").

Wildlife Service's own estimate, the negative economic impact from gnatcatcher regulation approaches one billion dollars,[100] basing that regulation on such obviously inadequate and outmoded science compromises wildlife conservation efforts generally. The 75% rule will help to avoid these oft-occurring consequences of a loose taxonomic regime.

CONCLUSION

Determining whether a population qualifies as a "species" or "subspecies" is critical to the Endangered Species Act's implementation. Existing regulation is unhelpful because it presupposes a consensus on taxonomic definition that does not exist. Advocates for property rights and smart conservation alike—not to mention the Services' staff—need direction. This petition offers two scientifically, legally, and

[100] ECON. & PLANNING SYS., ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE CALIFORNIA GNATCATCHER 8 (2004); ECON. & PLANNING SYS., REPORT ADDENDUM, ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE CALIFORNIA GNATCATCHER, Tbl. 1, at 4 (2007).

operationally defensible definitions for these two key statutory terms. Petitioners strongly recommend their adoption.

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