Come and "Take" It: Whooping Cranes, Texas Water Rights, Endangered Species Act Liability, and Reconciling Ecological Scientific Testimony Within the Context of Proximate Causation

*By: Brett A. Miller**

ABSTRACT

Tension between science and the law is a pervading feature of Endangered Species Act (ESA) jurisprudence. Incorporating the scientific discipline of ecology within the legal landscape presents distinct challenges, particularly in comparison with more traditional laboratory sciences. Within the realm of Endangered Species Act liability, the intricacies of nature exacerbate already complicated links of causation, challenging the ability to prove violations of the "take" prohibition. Because uncertainties permeate scientists' ability to understand complex ecosystem processes, courts should rely on the overarching practicality of common law principles when reviewing ecological testimony.

When evaluating claims that allege violations of the "take" prohibition, the proximate causation standard operates as a threshold to prevent assigning liability to a party or entity that otherwise may be just one insignificant link in an attenuated ecological chain. The proximate causation standard advanced by

* J.D. Candidate 2016, Texas A&M University School of Law, Fort Worth, TX.

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the Supreme Court in Babbitt v. Sweet Home *demonstrates the practicality of maintaining established legal principles, specifically as a limit to relying on scientific testimony as a means of proving causation. More recently, the reasoning in* Aransas Project v. Shaw, *where an environmental group alleged that the Texas Commission of Environmental Quality caused the "take" of endangered whooping cranes, illustrates the challenges associated with proving the cause of ecological injuries. Although the United States District Court for the Southern District of Texas assigned ESA liability based on scientific testimony, the Fifth Circuit reversed the lower court because this attenuated chain of causation lacked the required proximate cause analysis. In the context of ESA liability, where judges must understand complex ecosystem processes, this dichotomy reflects the reliability of proximate causation as a foundation to ensure equitable results.*

I.
INTRODUCTION

Despite the increasing importance of science in the legal arena, distinct scientific disciplines present courts with challenges. The successful preservation of endangered or threatened species requires an understanding of the scientific discipline of ecology.[1] In the realm of Endangered Species Act (ESA) liability, the inherent complexity associated with ecological injuries exacerbates the task of proving causation. The extension of ESA liability to attenuated links of causation has provoked much debate, particularly because these conditions are often prevalent in nature. Although environmentalists recognize that the ESA is essential to the survival of listed species, private landowners often denounce these same provisions as overreaching intrusion by a governmental entity.[2]

In this light, the proximate causation standard can function as a necessary safeguard to prevent assigning liability to a party or entity that otherwise may be just one insignificant link in an attenuated ecological chain. In the context of proving causation for ESA liability, ecological testimony may degrade the court's ability to reach an equitable outcome. Thus, proximate causation is an essential piece of the ESA liability puzzle. Regarding the unique challenges encountered within the discipline of ecology, this article explores the practicality of the proximate causation requirement—particularly as a necessary restraint on the principles set forth in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[3]

In *The Aransas Project v. Shaw*, the United States District Court for the Southern District of Texas held that the Texas Commission on Environmental Quality (TCEQ), in its authority

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1. J. PEYTON DOUB, THE ENDANGERED SPECIES ACT: HISTORY, IMPLEMENTATION, SUCCESSES, AND CONTROVERSIES 19 (2013).

2. JOHN COPELAND NAGLE & J.B. RUHL, THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT 141 (2d ed. 2006) (describing the "lively theoretical debate" that follows the imposition of ESA liability for indirect takings of endangered species as a result of habitat modification).

3. *See* Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).

to manage state water rights, was liable for the "take" of whooping cranes in violation of ESA § 9. The Fifth Circuit Court of Appeals reversed the holding because the Aransas Project failed to prove that TCEQ's water permitting program was the proximate cause of the deaths of twenty-three endangered whooping cranes during the drought of 2008-09. As seen during the course of the *Aransas Project* litigation, proximate causation ensures that trial court decisions are founded upon established legal theory, rather than the complexities of understanding scientific methodology.

This article does not dispute the importance of science within the legal discipline. Rather, it explores the practicality of incorporating various scientific disciplines into the law, such that the principles underlying these disciplines present inherently different challenges. The dichotomy is apparent from a broad perspective: "In environmental policy, the data gaps between what the law demands and what science supplies reflect the disparate objectives and epistemological approaches of the two fields."[4] Although scientific evidence and testimony will obviously continue their essential roles, the presence of science in the courtroom should not detract from the established truism of proximate causation when examining causal links in complex ecosystems.

This article begins by outlining the conflict in *Aransas Project*, describing the relationship between the endangered whooping crane, their essential habitat, and Texas water rights. In Part III, the article reviews the ESA "take" prohibition, specifically elaborating on the importance of Justice O'Connor's adherence to the standard of proximate causation in *Babbitt v. Sweet Home*.[5] Part IV explores the challenges associated with proving the cause of an ecological injury, an issue exacerbated by the *Daubert* trilogy, which enumerated a framework for courts to address the admissibility of scientific testimony.[6] Finally, Part V

4. Robert L. Fischman, *The Divides of Environmental Law and the Problem of Harm in the Endangered Species Act*, 83 IND. L.J. 661, 661 (2008).

5. Babbitt v. Sweet Home Chapter of Cmtys. for a Great Or., 515 U.S. 687, 712-13 (1995).

6. *See infra* notes 96-127 and accompanying text.

analyzes the *Aransas Project* litigation, illustrating the dichotomy between the district court's dependence on scientific testimony and the Fifth Circuit's reliance on proximate causation. Part VI concludes by framing the *Aransas Project* decisions as precedent within the broader ESA debate. In the realm of ecology and the ESA, traditional scientific research settings, such as the laboratory or field, are the best arena for scientific debate, particularly when adherence to proximate causation may enhance the court's ability to reach an equitable decision.

II.
BACKGROUND

A. The Plight of the Whooping Crane

Whooping cranes (*Grus americana*) currently face the threat of extinction, with merely 500 individuals estimated to exist worldwide.[7] This "majestic bird" is the largest bird in North America, standing an imposing height of five-feet and possessing a wingspan greater than eight-feet.[8] In 1970, the United States Fish and Wildlife Service (USFWS) listed the species as endangered, affording the crane protection under the Endangered Species Act (ESA).[9] The world's only wild population of whooping cranes is the Aransas-Wood Buffalo (AWB) flock, comprised of approximately 300 individuals.[10] The flock annually migrates thousands of miles: from Canada's Wood Buffalo National Park in the northern Alberta province, to their wintering grounds in Aransas National Wildlife Refuge, Texas (Aransas Refuge).[11]

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7. Aransas Project v. Shaw (*Aransas Project I*), 930 F. Supp. 2d 716, 723 (S.D. Tex. 2013).

8. Aransas Project v. Shaw (*Aransas Project II*), 756 F.3d 801, 806 (5th Cir. 2014).

9. 16 U.S.C. §§ 1531-44. The whooping cranes endangered listing was "grandfathered" in to the Endangered Species Act when it was passed in 1973. *Aransas Project I*, 930 F. Supp. 2d at 723.

10. *Aransas Project II*, 756 F.3d at 806.

11. *Id.*

Robert Porter Allen, a prominent ornithologist in the early twentieth century, initiated conservation efforts to bring this iconic bird back from the brink of extinction. Allen best described the plight of this species: "If we succeed in preserving the wild remnant that still survives, it will be no credit to us; the glory will rest on this bird whose stubborn vigor has kept it alive in the face of increasing and seemingly hopeless odds."[12] Despite being on the verge of extinction in 1941 with just fifteen wild-birds remaining, federal and state conservation efforts have continued the arduous and resource-intensive process of species recovery.[13]

B. *Guadalupe Estuary*

Each fall, whooping cranes embark on their annual migration from the Canadian breeding grounds to the species' winter habitat in the Aransas Refuge, subsequently returning to Canada in April of the following year. The Aransas Refuge, located along the Texas gulf coast, is comprised of 9,000 hectares of salt flats and surrounding estuarine areas.[14] San Antonio Bay, commonly referred to as the Guadalupe estuary, is adjacent to the crane's wintering ground in the Aransas Refuge and considered part of the flock's critical habitat.[15]

An estuary is a semi-enclosed body of water where the freshwater and saltwater mix, often described as the area "where the river meets the sea."[16] As a result, estuaries are one of the most highly productive natural systems on earth. The Guadalupe estuary receives freshwater inflows from the San

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12. *See The Whooping Crane*, OPERATION MIGRATION (last visited Feb. 24, 2015), http://www.operationmigration.org/the-whooping-crane.asp. *See generally* KATHLEEN KASKA, THE MAN WHO SAVED THE WHOOPING CRANE: THE ROBERT PORTER ALLEN STORY (2012) (describing Robert Allen's work on behalf of the whooping crane).

13. *Aransas Project I*, 930 F. Supp. 2d at 756.

14. *Id.* at 723.

15. *See Aransas Project II*, 756 F.3d at 806; *Aransas Project*, 930 F. Supp. 2d at 722-23.

16. *Aransas Project I*, 930 F. Supp. 2d at 723 (explaining that the San Antonio River flows into the Guadalupe River system, which flows directly into the Aransas Refuge before emptying into the Guadalupe Estuary).

Antonio and Guadalupe Rivers, maintaining a dynamic ecosystem that provides the whooping crane flock with essential foraging habitat.[17] Foraging behavior greatly affects a population's health, ability to survive, and reproductive ecology, as an animal's search for food resources is fundamentally intertwined with its environment.

C. *Relationship Between Texas Water Rights and Freshwater Inflow in the Guadalupe Estuary*

The quantity of freshwater flowing into the cranes' critical habitat in the Guadalupe estuary is related to the Texas Commission on Environmental Quality's (TCEQ) permitting authority for Guadalupe River withdrawals.[18] The TCEQ has general jurisdiction over both "surface water and water rights" in Texas.[19] The surface waters are owned by the State of Texas, such that "the water of the ordinary flow. . .of every flowing river, natural stream, and lake, and of every bay or arm of the Gulf of Mexico."[20] Unless exempted by a statute, no person may divert, store or impound state-owned water without TCEQ's authorization.[21]

TCEQ authorizes withdrawals of surface water by issuing withdrawal permits or certificates of adjudication.[22] In Texas, the right to withdraw surface water is usufructuary, such that the owner has a right of use, but not complete ownership.[23] The prior appropriation doctrine governs Texas' water rights, invoking the principle of "first in time, first in right." This provision regulates the allocation process and resolves conflicts between lawful appropriators in times of water shortage.[24] The

17. *See Aransas Project II*, 756 F.3d at 806.

18. *Id.*

19. TEX. WATER CODE ANN. § 5.013(a) (West 2015).

20. *Id.* § 11.021.

21. *Id.* § 11.081.

22. *Id.* § 11.121, 11.042. Some water rights, such as domestic and livestock uses, are exempt from the permitting or adjudication process. *Id.* § 11.142.

23. *See* Edwards Aquifer Auth. v. Day, 369 S.W.3d 814, 842 (Tex. 2012).

24. *See Aransas Project I*, 930 F. Supp. 2d 716, 738 n. 28-29 (S.D. Tex. 2013); *see generally* Ronald Kaiser, 6-TX WATERS AND WATER RIGHTS II (LexisNexis/Matthew Bender 3rd ed. 2015) (describing the evolution and

oldest water right is the most senior and enables its owner to withdraw all of the water to which he is entitled before a more junior right holder can take his allocation.[25]

Although the Texas Water Code requires TCEQ to consider environmental impact in its permitting decisions, the Code does not authorize TCEQ to grant water rights for instream flows based on environmental concerns.[26] The regulatory scheme includes a "during emergencies" provision, such that permitting related to environmental flows might be suspended during drought conditions.[27] Texas water rights, through the TCEQ's permitting requirements and regulatory powers, may influence the quantity of freshwater reaching the state's estuaries, thus potentially affecting the availability of freshwater to users throughout the state.[28]

Involving a finite resource, the issue of sufficient freshwater flow will continue to be a source of conflict in this state, particularly as the dichotomy between those interested in the health of Texas estuaries and those interested in securing water

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current state of Texas permitting and water rights).

25. *See* TEX. WATER CODE ANN. § 11.027 (West 2015). In 1967, the Texas Water Rights Adjudication Act required all appropriators of surface waters to prove their usage in court. The adjudication process clarified who held a right to withdraw water, eliminated prior regimes, and recorded the priority of the rights to divert state water. *See* In re Adjudication of the Water Rights of the Upper Guadalupe Segment of the Guadalupe River Basin, 642 S.W.2d 438, 439-42 (Tex. 1982).

26. *See* TEX. WATER CODE ANN. § 11.0235(c)-(d)(1); *Aransas Project I*, 930 F. Supp. 2d at n. 26. In 2000, the San Marcos River Foundation sought to appropriate 1.3 million acre-feet of water to remain instream for the benefit of the Guadalupe/San Antonio Bay and estuary system. The TCEQ denied the permit in 2003 and the Foundation challenged the denial. Before the lawsuit was decided; however, the Texas legislature enacted § 11.0237(a), prohibiting the issuance of permits to leave water instream for the benefit of bays and estuaries. *See* Tex. Comm'n on Envtl. Quality v. San Marcos River Found., 267 S.W.3d 356, 357-360 (Tex. App. 2008).

27. TEX. WATER CODE ANN. § 11.0235(c) (West 2015). "The key question is whether TCEQ actually has authority to remedy the problem: that is, whether, given a drought (which constitutes an emergency), TCEQ can still provide water for the cranes. Pursuant to § 11.0235(c), TCEQ appears not to have that power." *Aransas Project II*, 756 F.3d 801, 813 (5th Cir. 2014).

28. *Aransas Project I*, 930 F. Supp. 2d at 806.

supplies for agricultural, industrial, or municipal uses becomes more apparent.

D. *The Aransas Project's Allegations Against TCEQ*

During the winter of 2008-09, coinciding with a severe drought, Aransas Refuge researchers noted an increase in whooping crane deaths within the Guadalupe Estuary and surrounding areas.[29] The incident motivated environmentalists, coastal businesses, bird enthusiasts, and others to form "The Aransas Project" (TAP), a non-profit Texas-based entity. The purpose of the alliance was to promote responsible water management of the Guadalupe River basin and to ensure that freshwater continues to flow from the Texas Hill Country to the bays.[30]

In hopes of alleviating this concern, TAP argued that TCEQ's management of water diversions along the San Antonio and Guadalupe River systems caused the deaths of endangered whooping cranes.[31]

On March 10, 2010, TAP filed a lawsuit alleging that the TCEQ violated the ESA's "take" prohibition.[32] TAP requested injunctive relief to ensure that the AWB flock has sufficient water resources to prevent future "takes" of whooping cranes.[33] TAP alleged that TCEQ water permitting reduced the quantity of freshwater that flowed to the coast, resulting in high salinity levels throughout the Guadalupe estuary.[34]

TAP argued, most importantly, that these high salinity levels decreased the abundance of blue crabs (*Callinectes sapidus*) and wolfberries (*Lycium carlinianum*),[35] which are the primary nutritional resources for whooping cranes. According to TAP, the cranes experienced food stress upon altering their foraging

29. *Id.* at 724.

30. *About The Aransas Project*, THE ARANSAS PROJECT, http://thearansasproject.org/about (last visited Jan. 16, 2015).

31. *Aransas Project I*, 930 F. Supp. 2d at 725.

32. *Id.*

33. *Id.* at 726.

34. *Id.* at 725.

35. *Id.*

behavior to search for additional resources.[36] TAP suggested that the birds expended more energy foraging for alternative prey—ultimately resulting in emaciation and increased susceptibility to disease, followed by eventual death.[37]

The crux of TAP's argument was that both TCEQ's actions (and inaction), with regard to the management of freshwater diversions along the San Antonio and Guadalupe River systems, caused "harm" to the endangered whooping cranes by actually injuring and killing an estimated twenty-three birds.[38] TAP named several TCEQ officials as defendants, including Chairman Bryan Shaw.[39] The court granted leave to intervene for multiple parties, including the Guadalupe-Blanco River Authority, the Texas Chemical Council, and the San Antonio River Authority.[40] For purposes of this article, all state and intervening defendants are hereinafter referred to collectively as "TCEQ." The numerous amicus curiae briefs filed on behalf of both parties highlight the statewide ramifications of the decision, particularly for agricultural and municipal interests, as well as environmentalists.[41]

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36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.* at 725. TAP also named as defendants, in their respective official capacities: Carlos Rubinstein, a TCEQ Commissioner; Buddy Garcia, a former TCEQ Commissioner; Mark Vickery, a former TCEQ Executive Director; and Al Segoiva, the South Texas Watermaster. *Id.* at 725 n.12.

40. *Id.* at 725. The court also denied the motion for leave to intervene for several parties, including Union Carbide, Texas Farm Bureau, San Antonio Water System, and San Antonio City Public Service. *Id.*

41. *Aransas Project II*, 756 F.3d 801, 808 n.2 (5th Cir. 2014). In support of TAP, Defenders of Wildlife, Nature Canada, and various law professors filed amicus briefs. The Texas Public Policy Foundation, the City of Kerrville, CPS Energy, City of Victoria, Texas Water Conservation Association, and Texas Farm Bureau, each filed amicus briefs on behalf of TCEQ. *Id.*

III.
ENDANGERED SPECIES ACT (ESA) LIABILITY

Described as the "pit bull" of environmental laws, the Endangered Species Act is among the most "revered and reviled" tools for ecosystem protection.[42] The ESA scrutinizes activities that may affect listed species and provides rigorous protection through the conservation of ecosystems, particularly those that serve as critical habitat for threatened and endangered species.[43] Although decisions to assign liability may positively affect the health of certain populations, these same decisions may serve as a detriment to the development or use of natural resources, including land and water.[44]

In *Tennessee Valley Authority v. Hill*, the U.S. Supreme Court broadly proclaimed that the ESA's purpose was "to halt and reverse the trend toward species extinction, whatever the cost."[45] This comprehensive legislation represented a regulatory scheme to preserve biodiversity, whereby populations could increase through conservation and protection measures.[46]

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42. *See* Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (2014); Steven P. Quarles, *The Pit Bull Goes to School*, 15 ENVTL. F. 55, 55 (1998) (discussing the origins of the pit bull reputation); NAGLE & RUHL, *supra* note 2, at 141. Nagle and Ruhl offer insight regarding ESA's controversial reputation:

> Its champions praise it for saving the bald eagle from extinction, for blocking many misconceived development projects, and for providing a tool to protect ecosystems ranging from the southern California coast to the majestic forests of Pacific northwest. Its detractors accuse it of sacrificing timber jobs for obscure owls, nearly completed dams for tiny fish, and small farmers for unknown rodents. The basis for these claims lies in the *unparalleled stringency* of the ESA's provisions.

Id. (emphasis added).

43. *See generally* DOUB, *supra* note 1, at 9, 12 (discussing the use of the ESA to protect against adverse impacts, such as habitat destruction).

44. *See* Eugene H. Buck, M. Lynee Corn, & Pamela Baldwin, *The Endangered Species Act and "Sound Science," in* THE ENDANGERED SPECIES ACT: PRIMER, EVALUATION AND PROSPECTS 147 (Harold B. Carleton ed., 2009).

45. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 184 (1978).

46. *See* NAGLE & RUHL, *supra* note 2, at 255 (discussing the destruction of critical habitat and labeling it as the primary factor influencing the decline of many listed species, especially in consideration of the deleterious effects of limited resource availability).

Congress enacted the ESA in 1973 to prevent the further elimination of threatened and endangered species in the United States.[47] Scientific review is at the core of ESA jurisprudence, as science is particularly important to the listing process, designating critical habitat, and to proving the "take" of a protected species.[48] Section 4 authorizes the USFWS and the National Oceanic and Atmospheric Administration (NOAA) to identify and list species as endangered or threatened.[49] The ESA requires that agencies found their decisions "solely on the basis of the best scientific and commercial data available."[50] These agencies may then designate critical habitat and develop recovery plans, further incorporating scientific considerations into the agency consultation process.[51]

A. *Section 9 "Take" Prohibition*

ESA §9 prohibits both indirect and deliberate "takes" of all species listed as endangered.[52] The ESA broadly defines "take"

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47. 16 U.S.C. § 1531(b)-(c).

48. *Id.* § 1533(b). Implementation of the ESA depends on expert agencies, such as the USFWS for terrestrial species and NOAA for marine species. Section 7 allows Courts to incorporate scientific data, perhaps more appropriately, into their decisions. Pursuant to § 7(a)(2), any action authorized, funded, or carried out by a federal agency cannot jeopardize the existence of listed species or destroy its critical habitat. *Id.* § 1536(a)(2). TAP's allegation of liability did not proceed under this part of the ESA because the TCEQ did not have a federal nexus, such that the TCEQ's water-permitting decisions were not funded, authorized, or carried out by a federal agency. *Id.*

49. *See generally id.* § 1533 (providing regulatory authority to determine whether a species is endangered or threatened).

50. *Id.* § 1533(b)(1)(A); *see also* N. Spotted Owl v. Hodel, 716 F. Supp. 479, 483 (W.D. Wash. 1988) (suggesting that the USFWS rely on expert scientific analysis to support a determination to not list a species). Under this evidentiary standard, the decision to list a species only considers the best scientific data available, whereas the decision to designate critical habitat considers both scientific data and economic impacts. *See* 16 U.S.C. § 1533(b)(1)-(2).

51. 16 U.S.C. § 1533(b)(1)-(2), (f).

52. *Id.* § 1538(a)(1)(B); *see generally* Babbitt v. Sweet Home Chapter of Cmtys. for a Great Or., 515 U.S. 687, 700 (1995) (stating that Congressional action strongly suggested that Congress understood ESA §9 "to prohibit indirect takings as well as deliberate takings"); Strahan v. Coxe, 127 F.3d 155, 163 (1st Cir. 1997) (stating that "a governmental third party pursuant to whose authority an actor directly exacts a taking of an endangered species may be

as any actions or inactions that "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" a protected species.[53]

More specifically, the term "harm" prohibits "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[54]

The ESA authorizes citizen-suits, as federal district courts have jurisdiction to enforce ESA provisions.[55] The party alleging the "take" must satisfy the requirement of standing by demonstrating they have suffered an injury in fact, that the injury is "fairly traceable" to the defendant's actions, and that a favorable decision will likely redress the injury.[56]

The "take" prohibition governs the actions or inactions of all "persons," including any "officer, employee, agent, department, or instrumentality of. . .any state."[57] Much controversy surrounds the extension of ESA liability to private landowners and developers, as the discovery of an endangered species on individual's property may prevent the landowner from using that property.[58]

Perhaps even more controversial, this prohibition also applies to actions by state agencies that adversely affect the habitat of a species, potentially resulting in the indirect "take" of an endangered species.[59] In fact, citizens have challenged this

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deemed to have violated the provisions of the ESA").

53. 16 U.S.C §§ 1532(19), 1538(a)(1).

54. 50 C.F.R. § 17.3 (2006); *Sweet Home*, 515 U.S. at 690-91, 696 (upholding definition).

55. 16 U.S.C. § 1540(g)(1) (without regard for the amount-in-controversy or party citizenship requirements).

56. *See* Lujan v. Defenders of Wildlife, 504 U.S. 555, 560-61 (1992); Aransas Project v. Shaw, 930 F. Supp. 2d 716, 728 (S.D. Tex. 2013).

57. 16 U.S.C. § 1532(13).

58. *See* NAGLE & RUHL, *supra* note 2, at 255.

59. *See generally id.* at 291(referencing use of the ESA to alter fireworks celebrations in Connecticut, development of beach properties on Long Island, and using trucks on a beach in Long Island while filming a movie); Shannon Petersen, *Endangered Species in the Urban Jungle: How the ESA Will Reshape American Cities*, 19 STAN. ENVTL. L.J. 423, 438-40 (arguing that *Strahan* and *Loggerhead Turtle* were wrongly decided because state regulatory regimes governing private activities cannot be the proximate cause of an ESA take violation).

prohibition under a range of situations. In *Strahan v. Coxe*, citizens challenged the issuance of licenses by a Massachusetts agency that allowed fishermen to use gear that entangled and harmed northern right whales.[60] As a "third-party taking" situation, the court enjoined the state from permitting the entire fishing industry to use the harmful gear, rather than adjudicating multiple citizen-suits against each individual commercial fishermen.[61]

An alleged activity need not directly kill or injure the species to violate ESA §9; rather, the activity may indirectly harm the species by modifying its essential habitat. When the connection between the activity and alleged "take" is less direct, establishing remote chains of causation impedes a court's ability to rule on the "take" prohibition.

Although science plays a vital role in the listing process and ability to promulgate other ESA provisions,[62] using science as a vessel to establish causation is a much more convoluted enterprise, especially with regard to proving a violation of the "take" prohibition.

B. *Justice O'Connor's Reliance on Proximate Causation in the Realm of ESA Liability*

In her *Babbitt v. Sweet Home* concurring opinion, Justice Sandra Day O'Connor qualified the Court's understanding of the "take" definition, noting that the prohibition is subject to

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60. *See* Strahan v. Coxe, 127 F.3d 155, 158-59 (1st Cir. 1997).

61. *See generally id.* at 161-63, 171-72 (discussing the various types of harmful gear subjected to permitting requirements and the court's support of the injunctive relief provided by the lower court). Citizens have also alleged ESA liability against Maine for the state's authorization of foothold traps that harmed lynx and against a Florida county for its refusal to ban beach driving during turtle nesting season. *See* Animal Welfare Inst. v. Martin, 623 F.3d 19, 21-22 (1st Cir. 2010); Loggerhead Turtle v. Cnty. Council of Volusia Cnty., 148 F.3d 1231, 1234-35 (11th Cir. 1998).

62. The ESA requires that listing of endangered and threatened species be based solely on the "best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A). In addition, formal consultation under § 7 requires the submission of a *biological assessment*, which identifies whether any threatened or endangered species are likely to be affected by the proposed federal action at issue. *Id.* § 1536(c)(1) (emphasis added).

"ordinary principles of proximate causation, which introduce notions of foreseeability."[63] Proximate cause serves to limit the ramifications of the "take" prohibition because it is inequitable to assign liability "for every effect that could be causally linked to [an actor's] conduct regardless of how remote, unusual, or unforeseeable the consequence."[64]

Sweet Home tightened the proof of "take" analysis by implementing the tort-like tests of "proximate" and "but-for" causation.[65] According to the Supreme Court, Congress intended to assign ESA liability to foreseeable events—rather than accidental effects on protected species.[66]

Although courts encounter "difficult questions of proximity and degree" when assessing "limitless fact patterns" to determine whether an activity caused the "take" of a species, principles of proximate causation offer a familiar guide for the judiciary.[67] The blurred line of demarcation between punishable

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63. Babbitt v. Sweet Home Chapter of Cmtys. for a Great Or., 515 U.S., 687, 709 (1995) (O'Connor, J., concurring). The Court did not actually rule on whether there was a "take" in the case. Instead, the Court sought to determine whether the Secretary of Interior overreached his authority under the ESA by extending the definition of "takings" to include the more robust definition of "harm", such that any "significant habitat modification or degradation that actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering," violates the "take" prohibition. *Id.* at 691-99.

64. *Id.* at 713; *Fischman*, *supra* note 4, at 688. Professor J.B. Ruhl describes the Sweet Home holding as a "Pyrrhic" victory for environmental groups, particularly because principles of proximate cause were a "stunning blow to the statute's vitality" that cannot be interpreted as a "shot of adrenaline for the ESA." J.B. Ruhl, *The Endangered Species Act's Fall From Grace in the Supreme Court*, 36 HARV. ENVTL. L. REV. 488, 502-03 (2012).

65. *See Sweet Home,* 515 U.S. at 700 n.13; *See* Ruhl, *supra* note 64, at 502.

66. *Sweet Home*, 515 U.S. at 700. Additionally, the decision required plaintiffs to establish that specific individuals were injured, rather than the protected population as a whole. Commentators suggest that the Court based its adherence to principles of proximate cause on the fact that the harm regulation emphasizes the word "actually." *See Fischman*, *supra* note 4, at 688.

67. *Sweet Home*, 515 U.S. at 708, 713. *See* Tara L. Mueller, *Babbitt v. Sweet Home Chapter of Communities: When is Habitat Modification a Take?*, 3 HASTINGS W.-NW. J. ENVTL. L & POL'Y 333, 338 (1996). *See generally* Alan M. Glen & Craig M. Douglas, *Taking Species: Difficult Questions of Proximity and Degree*, 16 NAT. RESOURCES & ENV'T 65 (Fall 2001) (discussing the burden of proving harm given "difficult questions of proximity and degree" after *Sweet*

and non-punishable "takes" illuminates the daunting issues encountered when proving causation.[68]

In her *Sweet Home* concurrence, Justice O'Connor expounded upon the majority ruling in two aspects. First, she specified that the "significant habitat modification" prohibition was limited to situations that cause "actual, as opposed to hypothetical or speculative, death or injury to identifiable protected animals."[69] Next, Justice O'Connor criticized the imposition of ESA liability in *Palila v. Hawaii Dep't of Land and Natural Resources*, indicating that the decision lacked the requisite proximate causation analysis.[70] In *Palila*, plaintiffs alleged that the State violated the ESA when it allowed feral mouflon sheep and goats to graze on seedlings, thereby preventing the growth of essential habitat used by the endangered palila bird.[71] The Ninth Circuit held that the Hawaii state agency violated the ESA by allowing feral sheep to eat seedlings, a resource that might have fed and sheltered the endangered bird once the seedlings were fully-grown.[72] In her analysis of *Palila* II, Justice O'Connor articulated the flaws in the Ninth Circuit's reasoning, which imposed ESA liability "no matter how long the chain of causality between modification and injury."[73] According to Justice O'Connor, the state agency could not have proximately caused the death of the protected birds by allowing the sheep to consume and ultimately

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Home); LAWRENCE R. LIEBESMAN & RAFE PETERSEN, ENDANGERED SPECIES DESKBOOK 68 (2d ed. 2010) (discussing the *Sweet Home* Court's emphasis on foreseeability during "take" analyses).

68. *See* LIEBESMAN & PETERSEN, *supra* note 67, at 68-69. Justice Stevens' majority ruling allowed for the possibility that some harm proceeding from habitat modification will be "minimal and unforeseeable," and not in violation of the ESA. *See Sweet Home*, 515 U.S. at 699-700.

69. *Sweet Home*, 515 U.S. at 708-09 (O'Connor, J., concurring).

70. *Id.* at 709, 713-14 (referencing Palila v. Haw. Dep't of Land and Natural Res., 852 F.2d 1106 (9th Cir. 1988)).

71. *See Palila*, 852 F.2d at 1107.

72. *See id.* at 1110-11.

73. *See Sweet Home*, 515 U.S. at 711-12, 714. *See generally* Frona M. Powell, *Defining Harm Under the Endangered Species Act: Implications of* Babbitt v. Sweet Home, 33 AM. BUS. L.J. 131 (1995) (examining the implications of *Sweet Home* for future cases).

destroy the seedlings, a resource which may or may not have grown into trees and suitable habitat.[74]

The proximate causation standard is contingent upon considerations of fairness, which prevent "imposing liability for *remote consequences*."[75] Because the concept of proximate causation does not have a precise definition, Justice O'Connor instead illustrated both ends of the spectrum:[76] for example, the element of proximate causation is not satisfied when a farmer's fertilizer is diverted by a tornado and deposited in a wildlife refuge, causing the death or injury of protected species.[77] Conversely, when an individual extracts water from a reservoir on his property and kills an endangered fish, the proximate causation standard is more likely to be satisfied.[78]

Proximate causation acts as a threshold to eliminate the opportunity to assign liability in the context of bizarre situations.[79] More precisely, the standard functions as an equivalent to foreseeability and duty in normal tort cases, particularly because it considers the "natural and probable consequences" of an act.[80]

In ESA liability cases, federal courts determine whether there is sufficient proof to uphold the proximate causation standard by performing "the type of case-by-case analysis prescribed by *Sweet Home*."[81] Two years after *Sweet Home*, the district court in *Strahan* held that the state of Massachusetts had violated the "take" prohibition by allowing commercial fisheries to trawl in endangered right whale habitat.[82]

The First Circuit evaluated scientific evidence indicating that over one-half of the examined right whales bore scars from

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74. *Sweet Home*, 515 U.S. at 713-14.

75. *Id.* at 713 (emphasis added).

76. *Id.*

77. *See id.*

78. *See id.*

79. *See id.*

80. *Id.* (citing Palsgraf v. Long Island R. Co., 248 N.Y. 339 (1928); Grubart v. Great Lakes Dredge & Dock, 513 U.S. 527, 536 (1995); Consol. Rail Corp. v. Gottshall, 512 U.S. 532, 546 (1994)).

81. *See* LIEBESMAN & PETERSEN, *supra* note 67, at 69.

82. *See* Strahan v. Coxe, 127 F.3d 155, 168 (1st Cir. 1997).

fishing equipment.[83] The court noted examples of actual entanglement, and though the circumstances of causation were not particularly direct, they were not attenuated to the point of being outside the realm of foreseeability:[84] Entanglement was a foreseeable type of harm of which the agency authorized despite having knowledge that endangered right whales could be caught in the devices.[85]

Even with robust scientific testimony, proving the "take" of an endangered species is difficult when trying to establish chains of causation within complex ecosystems. In *Greenpeace Foundation v. Mineta*, the plaintiffs alleged that the commercial lobster fishery was causing the "take" of the endangered Hawaiian monk seal.[86] Greenpeace argued that the seal population was dwindling because of low birth rates and shrinking food supplies, primarily as a result of commercial fishing operations. Although the fishery may have modified essential habitat by reducing the prevalence of lobster, Greenpeace did not sufficiently prove that the lobster was "absolutely critical" to the monk seal's diet.[87] Despite using traps, the lobster fishery did not physically harm the seals.[88] This broken link in the chain of causation impeded the court's ability to assign ESA liability. Although important to the seal's diet, the declining lobster population was not enough to prove a violation of the "take" prohibition.

Portraying the dichotomy between direct and indirect "takings," the court in *Greenpeace Foundation* also examined the commercial bottomfish operation. The court found that this fishing method had accidentally killed several seals.[89] Fishermen

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83. *Id.* at 164-65.

84. *See id.* at 165.

85. *See id.*

86. *See* Greenpeace Found. v. Mineta, 122 F. Supp. 2d 1123, 1126-27 (D. Haw. 2000). *See generally* LIEBESMAN & PETERSEN, *supra* note 67, at 68-69 (discussing various cases in which scientific testimony either did or did not establish causation chains).

87. *Greenpeace Found.*, 122 F. Supp. 2d at 1134. To be "absolutely critical," the plaintiffs had the burden of proving that the availability of lobster was the difference between life and death for the seal. *Id.*

88. *See id.* at 1127, 1133.

89. *See id.* Seals were directly killed by this fishing operation when the seals become entangled with the gear while trying to take the catch from the hooks.

had also directly killed additional seals to prevent them from stealing catch from lines.[90] Contrary to the lobster fishery, the court in this instance did not hesitate to find that both the accidental and intentional killings were "takes" in violation of the ESA.[91] This case portrays Justice O'Connor's spectrum of proximate causation in the context of "take" liability. Although entanglement in fishing lines was sufficient to prove causation, establishing the more attenuated chain of causation to establish the "take" of a protected species is more much problematic, such as the allegations against the lobster fishery, even when founded upon scientific data.

The *Sweet Home* decision subjected the proof of "take" analysis to principles of proximate causation and foreseeability, as seen by the holdings in *Strahan* and *Greenpeace Foundation*. Although the standard is not required, a majority of courts consider proximate causation in their reasoning.[92] Courts should continue to employ the common law framework, particularly in ESA liability cases, because incorporating the proximate causation standard functions "to prevent unfairness in attaching liability."[93]

From a liability perspective, proximate cause refers to the reasonably anticipated consequences and intervening forces between an activity and its alleged harm.[94] Considering that as of June 2015 the ESA lists over 2,200 plants and animals as either threatened or endangered, with many more under consideration for listing—proximate causation represents a

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LIEBESMAN & PETERSEN, *supra* note 67, at 70.

90. *Greenpeace Found.*, 122 F. Supp. 2d at 1135.

91. *Id.* at 1134-36. *See* LIEBESMAN & PETERSEN, *supra* note 67, at 69-70.

92. *See generally* Glen & Douglas, *supra* note 67, at 132 (explaining that strictly construing the *Sweet Home* rule has led most lower courts to require plaintiffs to bear a heavy burden of proof); Steven Richardson et al., *The Return of* Sweet Home *in the Texas Whooping Crane Case, and a Sign that ESA Is on Its Way to SCOTUS*, NAT. RESOURCES & ENDANGERED SPECIES REP. (Aug. 2014), *available at* http://www.wileyrein.com/newsroom-newsletters-item-5093.html (suggesting that although not every circuit has followed the *Sweet Home* proximate causation analysis, including the 9th and 11th circuits, *Aransas Project* may still be persuasive).

93. Fischman, *supra* note 4, at 685.

94. *Id.* at 688.

critical safeguard for judges as they preside over future ESA "take" litigation and the multifaceted chains of causation within these cases.[95]

IV.
CHALLENGES WITH USING ECOLOGICAL RESEARCH AS SCIENTIFIC EVIDENCE TO PROVE CAUSATION IN THE CONTEXT OF ESA LIABILITY

> Science, and the science of ecology, is not equivalent to truth. Rather, science is a specialized language and method that we employ to learn about truth (objective reality) and to explain errors (arising from non-scientific, objectively false versions of reality).[96]

A. *The* Daubert *Trilogy*

The task of proving causation is an "inferential process," such that the trier of fact weighs evidence and concludes whether an effect is the result of a particular stimulus.[97] The interpretation of scientific evidence complicates issues of causation—whereas the *Daubert* trilogy dramatically altered the landscape of incorporating expert scientific testimony to establish a sequence of inferences, specifically with regard to questions of admissibility.[98] This article questions whether the Supreme

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95. *Summary of Listed Species, Listed Populations, and Recovery Plans as of Wed, 17 Jun 2015 21:49:25 GMT*, U.S. FISH & WILDLIFE SERV., http://ecos.fws.gov/tess_public/pub/boxScore.jsp (last visited June 17, 2015). The USFWS protects over 480 endangered animals and 725 endangered plants, with even more additional species receiving threatened species protections. *Id.* In fact, the state of Texas alone is home to almost seventy listed animals. *See Listed Species Believed To or Known to Occur in Texas,* U.S. FISH & WILDLIFE SERV. http://ecos.fws.gov/tess_public/reports/species-listed-by-state-report?state=TX&status=listed (last updated Feb. 13, 2015).

96. Aaron M. Ellison, *Statistics and Science, Objectivity and Truth: Comments on Dennis*, *in* THE NATURE OF SCIENTIFIC EVIDENCE: STATISTICAL, PHILOSOPHICAL, AND EMPIRICAL CONSIDERATIONS 363 (M.L. Taper & S.R. Lele eds., 2004). Dr. Ellison is a Senior Research Fellow in Ecology with Harvard University and is renowned in the fields of ecology and experimental statistics.

97. *See* Jerome P. Kassirer & Gladys Kessler, *Preface*, *in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE xiv (3d ed. 2011).

98. *See* Margaret A. Berger, *The Admissibility of Expert Testimony*, *in*

Court's intention was to apply *Daubert* principles to all scientific disciplines or just those disciplines encountered within the *Daubert* trilogy. More precisely, perhaps the principles expounded in *Daubert* should not apply in the same manner across all scientific disciplines, particularly those not rooted in traditional laboratory methodology.

The *Daubert* trilogy consists of three Supreme Court cases relating to the evidentiary validity and reliability of expert testimony.[99] Each case disputed the issue of causation, though the particular scientific disciplines involved were traditional "hard" sciences (e.g., health sciences, clinical studies, epidemiological studies, toxicology). In the trilogy's seminal case, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the Court enumerated a stringent test for the admissibility of scientific evidence.[100] Further, the Court established basic principles to guide trial judges in determining the admissibility of scientific expert testimony pursuant to Rule 702 of the Federal Rules of Evidence.[101] The Court reasoned that trial courts have an obligation to act as a gatekeeper by vetting the relevance and reliability of expert testimony.[102] As an underlying theme in *Daubert*, the Court recognized the standard that "evidentiary reliability will be based on scientific validity" when courts review the testimony of scientific experts.[103]

According to *Daubert*, trial judges must ensure that the substance of an expert's testimony is entrenched in "scientific

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REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 36 (3d ed. 2011); Kassirer & Kessler, *supra* note 97, at xiii.

99. *See* Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137 (1999); Gen. Elec. Co. v. Joiner, 522 U.S. 136 (1997); Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993). Forensic DNA analyses, most certainly conducted in laboratories, have also been subjected to the *Daubert* evidentiary standard. *See* Berger, *supra* note 98, at 26.

100. *See Daubert*, 509 U.S. at 589.

101. *See id.* at 588, 591. FRE Rule 702 states:

"If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise." FED. R. EVID. 702.

102. *Daubert*, 509 U.S. at 589.

103. *Id.* at 590 n.9.

knowledge."[104] To qualify as "scientific," inferences must be derivative of scientific methods and procedures.[105] Conjunctively, the term "knowledge" pertains to more than mere subjective beliefs and unsupported speculation.[106] The Court qualified this interpretation, noting that validity of scientific testimony is not an absolute, because "there are no certainties in science."[107]

Although not a definitive test, *Daubert* enumerated several considerations to determine whether an expert's testimony is validly rooted in scientific methodology.[108] The Court emphasized the empirical nature of science, such as the use of hypotheses to examine the falsifiability, refutability, and testability of a theory.[109] As an additional indicator of "good science," the Court examined whether the theory has been through the peer-reviewed publication process and subjected to the scrutiny of the scientific community.[110] Nevertheless, scholars have expressed concern with *Daubert*'s "unduly cramped" approach to the philosophy of science.[111] Rather than focusing on whether the expert witness may "assist" a lay person in seeking the truth about their respective scientific discipline—many courts have come to treat the *Daubert* considerations "not

104. *Id.* at 589-90.

105. *Id.* at 590.

106. *Id.*

107. *Id.*

108. *See id.* at 594-95 (describing the applicability of the factors, "The inquiry envisioned by Rule 702 is, we emphasize, a flexible one").

109. *Id.* at 593.

110. *See id.* at 591-95 (considering whether the known or potential error rates of the method are determined and whether standards exist to control the techniques within the methodology). Another consideration is the "general acceptance" of the technique within the relevant scientific community, although this factor is no longer dispositive. In regards to scientific evidence, the Court noted that it must relate to and fit with a fact at issue. *Id.*

111. David Crump, *The Trouble with* Daubert-Kumho*: Reconsidering the Supreme Court's Philosophy of Science,* 68 MO. L. REV. 1, 2 (2003). Crump expressed concern that the *Daubert* test may unwisely exclude certain renowned scientific experts: "[I]f the Court's conception of science in *Daubert* were to be applied according to its terms, Sir Isaac Newton probably would be disqualified from testifying to a question within his competence. The opinions of Sigmund Freud and Albert Einstein likely would meet the same fate." *Id.* at 2.

as flexible criteria, but as technical hurdles, tests to be rigorously surmounted."[112]

Courts have traditionally considered *Daubert* principles in the context of regimented laboratory sciences rather than field sciences. In *Daubert*, the case focused on an alleged link between a prescription drug and birth defects in children born to mothers' who had ingested the pharmaceutical.[113] Attempting to prove causation, the plaintiffs' experts sought to testify on findings based on animal studies performed in the laboratory.[114] The experts also sought to testify about epidemiological studies and chemical-structure analyses.[115] In general, the science in *Daubert* focused on laboratory experiments performed in controlled situations with controlled variables. Because the Court derived its considerations within the context of these laboratory studies, it is unclear whether the Court considered the applicability of the considerations in regards to the validity of scientific testimony based on "soft" sciences, such as field studies within the discipline of ecology.

In *Daubert*, the plaintiffs' sought to prove the alleged link of causation with scientific evidence derived from clinical and laboratory studies. In comparison, ecological field studies are often the focus when attempting to establish causation for violations of the ESA's "take" prohibition. Judges may not recognize the distinctions between the laboratory science in *Daubert* and ecological research, such as in the *Aransas Project* and other ESA cases. Field research variables may be difficult to identify, unlike controlled laboratory variables, because random mechanisms and sampling schemes are often encountered in nature. In fact, the scientific method is not precisely the same across all disciplines of science.[116] Because the *Daubert* ruling focused on the admissibility of scientific testimony in products liability litigation, the Court "did not discuss the relevance of its

112. *Id.* at 1-2.

113. *See Daubert*, 509 U.S. at 582.

114. *Id.* at 583.

115. *Id.* at 584.

116. *See* Paul S. Milich, *Controversial Science in the Courtroom:* Daubert *and the Law's Hubris*, 43 EMORY L.J. 912, 920 (1994).

analysis to the review of regulatory science[s]," such as environmental sciences.[117]

In the dissenting opinion, Chief Justice William Rehnquist emphasized his concern that the majority's decision went beyond the question presented, ruling on an area of law before it was fully developed.[118] Although *Daubert* principles have encountered widespread acceptance, there are inherent difficulties that arise when referring to the institution of science generically, without any plausible limitations. According to the Chief Justice, the duty of the judiciary is not "to become amateur scientist[s]."[119] He elaborated on this apprehension, "I defer to no one in my confidence in federal judges, but I am at a loss to know what is meant when it is said that the scientific status depends on its 'falsifiability,' and I suspect some of them will be, too."[120]

Scientific knowledge is dynamic, such that it changes as new information becomes available. This is primarily because scientific explanations are based on observations and experiments and consequently can be substantiated by other scientists.[121] Issues with causation are manifest in the realm of expert testimony, particularly when judges must determine the evidentiary reliability of the testimony to assess the cause of ecological injuries. Despite being familiar to experts, concepts of scientific causation and statistical correlation may not resonate with judges.[122] This posits a dilemma when courts must decide whether to assign liability on the merits of scientific data, because "*science does not reveal the truth*, so much as produce

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117. A. Dan Tarlock, *The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law*, 27 LOY. L.A. L. REV. 1121, 1138 (1994). Tarlock describes "regulatory science" as an applied science that promotes an interdisciplinary approach, relevant here because it encompasses research involving ecology, conservation biology, and other environmental sciences. *See id.* at 1138-39.

118. *See Daubert*, 509 U.S. at 601 (Rehnquist, C.J., dissenting).

119. *Id.* at 600-01.

120. *Id.* at 600. Judges may be in a less favorable position to make causal assessments than scientists—because judges make causation rulings based on existing information—whereas scientists, based on the availability of data, may delay in making conclusions. *See* Kassirer & Kessler, *supra* note 97, at xiv.

121. *See* Buck et al., *supra* note 44, at 152-53.

122. *See* Kassirer & Kessler, *supra* note 97, at xiii-xvi.

the best available or most likely explanation of natural phenomena, given the information available at the time."[123]

District courts have great discretion in determining the validity of evidence from different scientific disciplines, prompting inconsistencies with how courts handle proof of causation.[124] Judge Alex Kozinski, while presiding on *Daubert*'s remand to the Ninth Circuit, expressed his concern with the task assigned to federal judges with regard to scientific testimony:

> Our responsibility, unless we badly misread the Supreme Court's opinion, is to resolve disputes among respected, well-credentialed scientists about matters squarely within their expertise, in areas where there is no scientific consensus as to what is and what is not 'good science,' and occasionally to reject such expert testimony because it was not 'derived by the scientific method' . . . [W]e take a deep breath and proceed with this heady task.[125]

Judge Kozinski's hesitation, though directly referring to the clinical trials in *Daubert*, is even more concerning in the context of reviewing ecological testimony. This concern is magnified when coupled with the notion that any scientific consensus regarding a given theory is in perpetual fluidity; thus, the fundamental differences among the various scientific disciplines amplify the challenges associated with reconciling science and the law.

Examining the role of science in the courtroom, Justice Stephen Breyer proclaimed, "A judge is not a scientist, and *a courtroom is not a scientific laboratory*."[126] Although various issues proliferate from this declaration, Justice Breyer's use of the term "laboratory" suggests that controlled experiments within the realm of "hard" sciences were the origin of the *Daubert* principles, rather than ecological studies and other "soft" sciences.

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123. Buck et al., *supra* note 44, at 153 (emphasis added).

124. *See* Berger, *supra* note 98, at 24-25.

125. *Id.* at 52 n.20 (citing *Daubert*, 43 F.3d at 1316).

126. Stephen Breyer, *Introduction*, *in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 4 (3d ed. 2011) (emphasis added).

This distinction is important because "hard" sciences, such as chemistry and toxicology, maintain fundamentally different methodologies and assumptions than those in ecological studies. Specifically, "controlled experiments of chemistry and toxicology provide a different set of challenges for integrating information into law than do the ecological issues associated with conservation biology."[127] According to some scholars, *Daubert* raised the possibility that conservation biology and other "soft" sciences may be unacceptable as a basis for deciding causation.[128]

Ecologists face complexities and unpredictable natural forces when analyzing causation in the environment. This underscores the significance of using proximate causation in conjunction with judicial reliance on scientific experts, particularly when assigning ESA liability based on ecological testimony. Proximate causation is a necessary restraint when courts apply *Daubert* principles in their review of ecological testimony within the context of proving violations of the "take" prohibition, primarily because the principles in *Daubert* may be better suited to evaluate the admissibility of laboratory sciences.

B. *Challenges Associated with Proving Ecological Injuries in the Daubert Context*

1. "Hard" Science vs. "Soft" Science

Daubert presents challenges when reviewing the reliability of ecological data as scientific evidence. Trial judges are not "supposed to make global judgments about either a discipline or all of an expert's theories," but rather the court should direct its focus on "the task at hand."[129] Instead, as scholars suggest, the

127. Fischman, *supra* note 4, at 661 (noting that the assumptions and uncertainties of applied science compound the already difficult task of determining how human activities translate into environmental impacts).

128. Tarlock, *supra* note 117, at 1138.

129. Crump, *supra* note 111, at 25-26; *see generally* D. Michael Risinger, *Defining the "Task at Hand": Nonscientific Science after* Kumho Tire Co. v. Carmichael, 57 WASH. & LEE L. REV. 767, 772 (2000) (discussing how the Federal Rules of Evidence square with Daubert's holding with regards to both "non-science" and "clinical" claims).

"reverberating clang" of *Daubert*'s specifically enumerated considerations have the tendency to "drown[] everything else out."[130] Because *Daubert* did not consider the applicability of its considerations in the context of non-laboratory sciences like ecology, the differences between "hard" and "soft" sciences underscore the complications presented to courts.

Amplifying the distinction between "hard" and "soft" scientific disciplines are the fundamental challenges that scientists themselves face in proving the cause and effect of an ecological injury. As the *Aransas Project* litigation illustrates, perhaps courts should approach ecological data with caution, especially with regard to the ESA's "take" prohibition.

Jared Diamond, prominent author and scientist, scrutinized the intrinsic differences between "hard" and "soft" sciences.[131] Representing the minority of scientists who have researched in both "hard" and "soft" scientific disciplines, Diamond offers a unique perspective. According to Diamond, the complex variability of "soft" sciences makes the field of ecology, "one of the softer of the biological sciences" and more difficult to study than "hard" sciences.[132]

"Hard" sciences, such as chemistry and molecular biology, utilize evidence provided by "controlled, repeatable experiments"

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130. Crump, *supra* note 111, at 26.

131. Jared Diamond, Opinion, *Soft Sciences Are Often Harder than Hard Sciences*, DISCOVER 34, Aug. 1987 [hereinafter Diamond, *Soft Sciences*]. The subject of Diamond's opinion letter disputed a colleagues' induction (or lack thereof) into the National Academy of Sciences because of the sentiment between "hard" or "soft" scientists. Although he is a noted scientist who received a Ph.D. from the University of Cambridge, Diamond is best known for authoring transcendent popular science books, such as *Guns, Germs and Steel: The Fates of Human Societies and Collapse: How Societies Choose to Fail or Succeed*, as well as a host of articles in well-respected peer-review journals. Diamond is uniquely qualified to discuss the differences because of his experiences in various scientific disciplines, including anthropology, ecology, geography, evolutionary biology, ornithology, and physiology. *See generally* Jared Diamond, *Further Reading*, JARED DIAMOND, http://www.jareddiamond.org/Jared_Diamond/Further_Reading.html (last visited Feb. 28, 2015); Jared Diamond, *My Books*, JARED DIAMOND, http://www.jareddiamond.org/Jared_Diamond/My_Books.html (last visited Feb. 28, 2015) (highlighting a selection of books and articles by Diamond which may be of interest to those so inclined).

132. Diamond, *Soft Sciences, supra* note 131, at 35, 38.

in the laboratory.[133] Based on well-understood assumptions, "hard" sciences often yield "high[ly] accurate measurements."[134] "Hard" sciences comport to traditional stereotypes, invoking images of science confined to the laboratory, with researchers donned in white coats and holding test tubes.[135]

On the contrary, "soft" sciences, such as ecology and other observational field studies, are theoretically more difficult to research. They "can't be measured to several decimal places in labs," primarily because "the world is full of phenomena that are intellectually challenging."[136] Presumably, courts may also struggle to understand the differences between "hard" and "soft" sciences in the context of ESA cases, particularly when reviewing ecological testimony to establish chains of causation.

The dichotomy between laboratory and field research is evident when scientists examine specific variables within a study. Laboratory research has predetermined sample sizes and known variables, and readily lends itself to scientific hypotheses. In stark contrast, ecological research, generally conducted in nature, challenges researchers: "You can't start it and stop it whenever you choose. You can't control all the variables; perhaps you can't control *any* variable. You may even find it hard to decide what a variable is."[137]

These differences are often misunderstood by scientists themselves, suggesting that courtroom debate is an inefficient platform to settle this contention. Even statistical models do not fully describe the random mechanisms and sampling schemes encountered in nature.[138] Especially in the *Daubert* context, testing an ecology hypothesis is challenging because non-

133. *Id.* at 35.

134. *Id.*

135. *Id.*

136. *Id.*

137. *Id.* (emphasis in original).

138. *See generally* Brian Dennis, *Statistics and the Scientific Method in Ecology*, *in* THE NATURE OF SCIENTIFIC EVIDENCE: STATISTICAL, PHILOSOPHICAL, AND EMPIRICAL CONSIDERATIONS 347-49 (M.L. Taper & S.R. Lele eds., 2004) (observing that a primary principle in Bayesian statistics is that "sample space probabilities are irrelevant to inferences about unknown parameters").

standard data routinely confronts researchers, as populations rarely follow patterns of normal distribution.[139]

The scientific discipline of ecology accounts for "the relationships between organisms and their past, present, and future environments. These relationships include physiological responses of individuals, structure and dynamics of populations, interactions among species, organization of biological communities, and processing of energy and matter in ecosystems." [140] More precisely, an understanding of ecology allows scientists to comprehend the mosaic of factors that influence a species' interaction with the physical environment.[141] Through observational studies, ecologists can examine situations in which nature is allowed to take its course without interference or laboratory manipulations by the ecologist. Ecology is broader than most other sub-disciplines of biology because it necessarily evaluates the interaction between multiple groups of organisms and various elements of their physical environment.[142]

In comparison, researchers directly control the conditions and variables within experimental studies conducted in the laboratory.[143] Because the predictive nature of science emphasizes the probability of various outcomes rather than absolute certainty, the complexity and risk associated with assigning ESA liability can frustrate the interaction between scientists and courts.[144] Although founded upon "elegant hypothesis construction and testing," otherwise valid scientific research may actually be insufficient "to provide the necessary

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139. *See id.* at 350-54.

140. DOUB, *supra* note 1, at 17-18 (citing *About ESA*, ECOLOGICAL SOC'Y OF AM., http://www.esa.org/esa/about/ (last visited Feb. 27, 2015)).

141. *Id.* at 19 (arguing that successful preservation of endangered species requires keeping species in their natural surroundings and thus, an understanding of ecology).

142. *See id.* (arguing that ecology is perhaps broader than scientific disciplines concerned with either, specific taxa (e.g., zoology, botany, entomology, microbiology) or disciplines concerned with specific elements of these organisms (e.g., anatomy, cell biology, biochemistry, physiology).

143. *See generally* Michael D. Green, D. Michal Freedman & Leon Gordis, *Reference Guide on Epidemiology*, *in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 623 (3d ed. 2011) (defining experimental study).

144. *See* Buck et al., *supra* note 44, at 155.

information and thus, the rational guidance for scientifically sound decision making."[145]

Consequently, the Supreme Court may not have fully considered the complexities of "soft" sciences or field research when they first employed the *Daubert* principles in the context of scientific testimony. Rather than assigning judges with the responsibility of "determining the validity of a scientific theory as a kind of amateur scientist," some scholars advocate for a return to Rule 702's "helpfulness" or "assist" standard in regards to the review of expert testimony.[146] In the context of complex ecological injuries, perhaps it would benefit trial judges to assess these situations under the guidance of established legal principles, such as proximate causation.

2. Complexities of Ecological Field Research Compared with Laboratory Methodology

Although scientific disciplines share similar attributes, including hypothesis testing and empirical data, it is essential to highlight the unique complexities of the respective disciplines. Within the realm of expert testimony, courts must consider the inherent principles of ecological research.

In an article reviewing the prevailing data gaps between science and the law, Professor Robert L. Fischman remarked, "If Einstein was correct that God does not play dice with the universe, then an understanding of modern ecology recruits the divine spirit for some other game of chance."[147] This ecological paradigm is defined by the realization that because "nature operates stochastically," it is rooted in unpredictable and random forces.[148]

Redressing ecological injuries within the parameters of the law is difficult, particularly because regulatory schemes for environmental protection focus on the cause and effect of these injuries.[149] Richard J. Lazarus, noted environmental law scholar

145. Tarlock, *supra* note 117, at 1133.
146. Crump, *supra* note 111, at 41.
147. Fischman, *supra* note 4, at 685.
148. *Id.*
149. *See* Richard J. Lazarus, *Restoring What's Environmental About*

and professor of law, articulated the challenges that permeate the conflict between ecological injuries and a legal regime addressing these injuries.[150] The environment, shared by many cohabitating species, is subject to "many simultaneous and sporadic actions over time and space."[151]

Difficulties arise when seeking to prove causation, because environmental harm is dynamic and not static, as the severity of the harm often increases over time.[152] Because nature is not confined to a laboratory, "[a]ctions in one location may have substantial adverse effects in very distant locations."[153] The cause and effect of an ecological injury may be physically distant.[154] Further compounding these spatial challenges, ecological injuries may also be temporally distant.[155] This lack of imminence may prevent an injury from being fully-realized until some point in the distant future.[156]

The uncertainty that permeates ecological injuries, influencing both cause and effect, is perhaps the most fundamental challenge associated with proving environmental harm in court.[157] Expounding on the root of these difficulties, Professor Lazarus explains: "The primary source of this

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Environmental Law in the Supreme Court, 47 U.C.L.A. L. REV. 703, 745 (2000).

150. *See id.* at 745-48 (discussing six features of typical ecological injuries that pose challenges to lawmakers and highlighting the dichotomy between science and the law as part of a larger article reviewing the Supreme Court's approach to Environmental Law, including the ESA). The features Professor Lazarus discusses include: Irreversible, Catastrophic, and Continuing Injury; Physically Distant Injury; Temporally Distant Injury; Uncertainty and Risk; Multiple Causes; and Noneconomic, Nonhuman Character. *Id.*

151. *Id.* at 747.

152. *See id.* at 745 (expressing concern with "legal regimes that are inherently cautious and slow to react," because they "do not readily lend themselves to the quick action often necessary in the ecological context.").

153. *Id.*

154. *Id.*

155. *Id.* at 746. Legal scholars debate the interaction between present and future harm in an environmental harm setting. Lazarus references an article by Lisa Heinzerling, postulating that "interaction works in both directions: the future reaches into the present, and the present into the future." *Id.* at 746 n.229 (citing Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2026 (1999)).

156. *Id.* at 746.

157. *See id.* at 747.

uncertainty is the sheer complexity of the natural environment and, accordingly, *how much is still unknown about it*."[158] This uncertainty makes it difficult for judges to assign liability for environmental harm on several fronts.

With regard to the doctrinal importance of foreseeability, "uncertainty expresses itself in our inability to know beforehand the environmental impact of certain actions."[159] Even more substantial, "[i]t equally undermines our ability to apprehend, after the fact, what precisely caused certain environmental impacts," a feature that further compounds the challenges that judges face when considering scientific testimony in the ESA context.[160]

Similarly, Professor Fischman also recognized the pervading conflict between courts and ecology, particularly with regard to notions of scientific uncertainty. He explained, "the best we can do about predicting outcomes or explaining occurrences is to describe relative likelihoods."[161] The notion that science is uncertain, and not just an aggregation of unconnected facts, both complicates and foreshadows the overarching conflict between science and proximate cause.[162]

The mechanisms that influence ecosystem productivity further compound the difficulty in proving causation for long-term ecological injuries. Although complex, natural systems share a dynamic connection in the sense that any changes may result in cascading impacts felt throughout the ecosystem.[163] For instance, shifts in resource availability present a challenge to scientists because proving causation can be problematic "due to lack of

158. *Id.* (emphasis added).

159. *Id.*

160. *Id.*

161. Fischman, *supra* note 4, at 685.

162. *See generally* Buck et al., *supra* note 44, at 156-57 (examining how a scientist's personal values or the influence of interest groups may threaten the objectivity of science by extrapolating from the cases of Wisconsin's yellowthroats and the snail darter).

163. *See* Sanne H. Knudsen, *The Long-Term Tort: In Search of a New Causation Framework for Natural Resources Damages*, 108 NW. U. L. REV. 475, 492 (2014) (describing the natural variations within a population that are driven by any number of dynamic influences within an ecosystem).

baseline data, natural variability, and problems of multiple stressors and multiple sources."[164]

From the perspective of the dynamic ecosystem at issue in the *Aransas Project* litigation, it is important to note that ecological injuries are often rooted in multiple causes; a truism that is especially relevant when assigning liability to a singular entity. Because these injuries are "rarely the product of a single action at an isolated moment in time," challenges pertaining to equitable decision-making abound when judges base their determinations solely on science, rather than consulting the established legal principles of proximate cause.[165]

Proving causation is especially problematic because ecological food chains are inherently attenuated, such as the whooping crane - blue crab nexus described in *Aransas Project*. As energy transfers sequentially between different trophic levels, it does so in the presence of multiple interconnected food chains.[166] The intrinsic complexities of the natural system illuminate the fact that endangered species are not isolated from the potential indirect effects of various sources.[167]

Relying solely on scientific testimony may further complicate the task of proving causation, primarily because species are in constant competition for food, resources, and space.[168] When judges look to scientific evidence to prove ecological injuries, they may not fully consider that "environmental harms are more typically the cumulative and synergistic result of multiple actions, often spread over significant time and space."[169]

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164. *Id.*

165. Lazarus, *supra* note 149, at 747.

166. *See* DOUB, *supra* note 1, at 19.

167. *See id.* Characterizing food webs as numerous interconnected terrestrial and aquatic food chains that are generally operating within any natural setting, Doub describes the interaction between species at varying trophic levels: "[Plants and other photosynthetic organisms [producers] convert energy from the sun into biological tissue that can be used as food by other organisms [consumers]. Progressively larger consumer organisms then feed on smaller organisms through sequential stages referred to as trophic levels." *Id.*

168. *Id.*

169. Lazarus, *supra* note 149, at 747.

Dr. R. Douglas Slack, testifying as an expert scientific witness in *Aransas Project*, described the challenges associated with incorporating science into the courtroom:

> But science advances. Science is not static. [We] may have a conclusion in one study at one time, but as we move forward and advance our knowledge of an ecosystem, that's going to change. And, so, I may be guilty of moving forward in science and changing my conclusions.[170]

Dr. Slack's quote underscores the dichotomy between science and law, which should serve to caution legal regimes that choose to overlook established proximate causation jurisprudence solely in favor of scientific testimony, particularly when assigning liability for violations of the "take" prohibition.

In general, science involves the construction of convincing explanations through the acquisition of reliable knowledge.[171] As debate throughout the scientific community ensues on a particular theory, not all testimony may be fundamentally neutral or rooted in objectivity.[172] The debate among credentialed ecologists is contentious, as limited funds for research are often controlled by agencies with agendas.[173] Scientists often have personal values that influence (consciously or unconsciously) their questions, their assumptions, and the interpretation of their experimental results.[174] These individuals work for various state and federal agencies, companies, research institutions, and other public interest groups.[175] As a result,

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170. Transcript of Testimony of Defendant's Expert Witness, R. Douglas Slack, Ph.D. at 233, *Aransas Project I*, 930 F. Supp. 2d 716 (S.D. Tex. 2013) (No. CA-C-10-075), 2011 WL 10904317.

171. *See generally* Dennis, *supra* note 138, at 349-52 (highlighting the case of Bayesian statistical analysis as one such instance of this phenomenon).

172. *See id.* at 329-30 (observing that ecological research is often funded by parties with agendas). A hypothesis provides a tentative statement that can be tested, whereas a theory is a well-substantiated explanation of some aspect of observable reality that can incorporate facts, inferences, and tested hypotheses. *See id.* at 330.

173. *See id.* at 329 (observing that ecology "has become a highly politicized science").

174. *See* Buck et al., *supra* note 44, at 156-57.

175. *Id.*

vigorous scientific debate and underlying personal biases may be difficult for courts to assess.

C. *Complications with Using Science to Prove Causation for Ecological Injuries in the ESA Context*

An underlying tension between science and the law permeates the ESA, "from which a 'law-science' decision-making process emerges, befuddling to lawyers and scientists alike."[176] The common law's judicial principles, rooted in linear models of cause and effect, may not adequately comprehend the complex and erratic characteristics of nature.[177]

Predictably, courts face a dilemma because "the common law concept of proximate causation fails to jibe with the way nature works."[178] Although this statement might suggest that courts should shift to incorporate more science when considering ESA liability, this reasoning emphasizes precisely the opposite. It instead proposes that perhaps we ask courts to do too much with regard to scientific comprehension within the courtroom. Because judges are experts in the field of law, it is unrealistic to require them to look beyond their legal expertise in an effort to understand the complex mechanisms of nature.

Requiring judges to reach the same level of understanding as an established scientist during a week-long bench trial is not only impractical, but may also lead to inequitable results. Uncertainty and multiple causes permeate ecological injuries, further supporting the reason why courts should continue to use proximate cause as a limit when reviewing scientific testimony, especially in the context of the "take" prohibition.

Aside from requiring all judges to obtain doctoral degrees in ecology if they wish to hear ESA cases, perhaps it is correct to rely upon Justice O'Connor's tort principles as an overarching

176. Ruhl, *supra* note 64, at 514.

177. *See generally* Fischman, *supra* note 4, at 685 (explaining that the "current ecological paradigm is that nature operates stochastically"). "Another powerful argument recommending proximate cause is that, as a common law concept, it is well tested by far more cases than will ever be brought under the ESA." *Id.* at 688.

178. *Id.* at 686.

safeguard.[179] Although some scholars disagree, additional commentators suggest that courts should continue to borrow from the common law by applying proximate cause principles when resolving disputes regarding the "take" prohibition.[180]

Scientists make predictions based on the probability of an aggregated behavior occurring within an ecosystem; yet the exact same ecosystem may still "defy identification of direct cause-effect for their components."[181] Despite the difficulties encountered by scientists in proving causation within their own respective research, some scholars nevertheless continue to advocate against incorporating tort principles into the take analysis.[182]

Seemingly, this uncertainty makes it more difficult to prove causation. "What is easily foreseeable to those with a modicum of training in natural history may not be foreseeable to those who hold widely prevalent, but erroneous, views of ecology and

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179. Obtaining a Ph.D. in science, particularly in ecology, requires a substantial commitment. Degrees often take five to six years to complete, require defenses of dissertations, multiple publications, oral examinations, teaching courses, and years of field research. This is generally after completing a two to three-year master's degree and a four-year undergraduate degree concentrated in science. *See generally* Walter P. Carson, *A Primer on How to Apply to and Get Admitted to Graduate School in Ecology and Evolutionary Biology*, ECOLOGICAL SOCIETY OF AMERICA, http://www.esa.org/esa/education-and-diversity/ecology-as-a-career-2/ (last visited Feb. 27, 2015) (outlining requirements and recommendations to pursue graduate studies in ecology).

180. *See* Fischman, *supra* note 4, at 686. *See generally* Paul Boudreaux, *Understanding "Take" in the Endangered Species Act*, 34 ARIZ. ST. L.J. 733, 734 (2002) (arguing that courts should use common law precedent in interpreting the ESA); *See* Steven P. Quarles, John A. MacLeod & Thomas R. Lundquist, Sweet Home *and the Narrowing of Wildlife "Take" Under Section 9 of the Endangered Species Act*, 26 ENVTL. L. REP. 10,003, 10,004-12 (1996) (analyzing the effects of *Sweet Home* on subsequent ESA applications, and questioning the range of cases, in light *Sweet Home*'s focus on proximate cause, where habitat modification violates the "take" prohibition); James R. Rasband, *Priority, Probability, and Proximate Cause Lessons from Tort Law about Imposing ESA Responsibility for Wildlife Harm on Water Users and Other Joint Habitat Modifiers*, 33 ENVTL. L. REV. 595, 613-14 (2003) (explaining that although courts are incorporating Justice O'Connor's standard with more frequency, "there remains significant uncertainty about the extent of behavioral impairment necessary to show harm," particularly at the population-level).

181. Fischman, *supra* note 4, at 685.

182. *See* Ruhl, *supra* note 64, at 502.

animal behavior."[183] This proposition echoes Justice Breyer's aforementioned reluctance to turn the courtroom into a scientific laboratory. More precisely, determining whether the cause and effect are foreseeable "will depend upon the judge's scientific understanding of the direct relationship between species survival and habitat preservation . . . both in the abstract and in the context of a particular case."[184] This propensity to obscure the role of the judiciary reflects the importance in letting courts rule on established legal principles, rather than complicated scientific theories.

The pervading tension between the limits of science and the standards of proximate causation has been an enduring problem in environmental law.[185] According to prominent legal scholarship, the Supreme Court's "lack of deep understanding of ecological processes" explains the ESA's fall from grace within the purview of the Court.[186]

The challenges faced by our country's greatest legal minds, especially concerning ecological uncertainties, underscores the practical benefits of proximate cause in relation to the ESA's "take" prohibition. While advocating against proximate cause in the ESA context, scholars have noted that scientists "do not think like tort lawyers."[187] While accurate, this statement fails to appreciate the fact that judges are in fact better equipped to think like tort lawyers—even if scientists are not.

Given the consequences associated with assigning ESA liability, maintaining proximate causation as a consistent

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183. Ruhl, *supra* note 64, at 502 n.96 (quoting MICHAEL J. BEAN & MELANIE J. ROWLAND, THE EVOLUTION OF NATIONAL WILDLIFE LAW 216 (3d ed., 1997)).

184. Branden L. Jensen, *Litigating the Crossroads Between* Sweet Home *and* Daubert, 24 VT. L. REV. 169, 179 n.69 (1999) (quoting Tara L. Mueller, Babbitt v. Sweet Home Chapter of Communities: *When is Habitat Modification a Take?*, 3 W.-NW. J. ENVTL. L. & POL'Y 333, 338 (1996)).

185. *See* Tarlock, *supra* note 117, at 1133 (explaining that "[t]he research may be scientifically valid, but it may lack the cross-disciplinary integration and informed speculation needed to be useful to a policy maker").

186. Ruhl, *supra* note 64, at 513. *See generally* Lazarus, *supra* note 149, at 744-71 (arguing that the Supreme Court's treatment of environmental cases shows a lack of consideration for, and understanding of, the unique character of environmental injuries).

187. Ruhl, *supra* note 64, at 513-14.

threshold will prevent the courtroom from becoming an inappropriate arena for scientific debate.

V.
THE ARANSAS PROJECT V. SHAW LITIGATION

A. *District Court's Reliance on Expert Scientific Testimony*

TAP sought to enjoin TCEQ's licensing for surface water withdrawals from the San Antonio and Guadalupe Rivers as an alleged violation of the ESA.[188] TAP's allegations focused on the reduced freshwater inflow entering the Guadalupe Estuary, that when coupled with local drought conditions, increased the salinity of the bay.[189]

TAP argued that the increasing salinities reduced the abundance of the whooping cranes primary diet food resources, specifically blue crabs and wolfberries.[190] Because of the reduced prey abundance, TAP argued that this prompted cranes to engage in stress behavior, leading to emaciation and the deaths of twenty-three cranes during the winter of 2008-09.[191] Contending that TCEQ violated the ESA, TAP sought injunctive relief to ensure that the flock would have sufficient water resources to prevent future "takes."[192]

The court reasoned that TCEQ's actions and inactions caused an unlawful "take" of at least twenty-three whooping cranes.[193] Accordingly, it enjoined the TCEQ from approving or granting new water withdrawal permits from the Guadalupe or San

188. *Aransas Project I*, 930 F. Supp. 2d 716, 725-26 (S.D. Tex. 2013).

189. *Id.* at 725.

190. *Id.*

191. *Id.* Dr. Chavez-Ramirez testified that "a lack of adequate food and drinkable water in the territories can cause the [Aransas-Wood Buffalo] cranes to leave and fly to the uplands to locate freshwater ponds." *Id.* at 766.

192. *See id.* at 726.

193. *See generally id.* at 780-88 (holding that TCEQ's diversion of freshwater flow resulted in increased salinity in the bay and ultimately caused the take of at least twenty-three whooping cranes in violation of the ESA).

Antonio Rivers until the State determined that the issuance of these water permits would not violate the ESA.[194]

TCEQ was liable for the "take" of whooping cranes because their water management practices altered the salinity of the cranes' critical habitat in the Guadalupe estuary.[195] According to the district court, scientific testimony demonstrated that TCEQ's water management practices caused the "take" of whooping cranes by "altering their behavior through habitat modification, depriving them of food and water resources, and ultimately, leading to malnourishment and death."[196]

Although the court acknowledged that "[o]rdinary requirements of proximate causation apply to ESA cases," this important aspect of ESA "take" jurisprudence was notably absent from the court's in-depth analysis.[197] Quite succinctly, the court simply noted that an activity authorized by a government agency satisfies the proximate causation standard when it causes the "take" of endangered species.[198]

The court did not consider concepts of remoteness, attenuation, foreseeability, or the natural and probable consequences of actions.[199] Without further consideration, it only briefly mentioned Justice O'Connor's proximate causation standard, "[T]he Court finds that the actions, inactions and refusal to act by the TCEQ defendants proximately caused an

194. *Id.* at 789. The district court required the TCEQ to seek an Incidental Take Permit to lead to the development of a Habitat Conservation Plan pursuant to 16 U.S.C. § 1539(a). *Id.* The court also awarded TAP, the prevailing party, to its reasonable attorney's fees and costs, as well as expert witness fees pursuant to 16 U.S.C. § 1540(g)(4). *Id.*

195. *Id.* at 780.

196. *Id.*

197. *Id.* at 786. The district court cited Justice O'Connor's *Sweet Home* concurrence, though without a detailed proximate causation analysis. *Id.* at 727.

198. *Id.* at 786 (citing Strahan v. Coxe, 939 F. Supp. 963, 978-79 (D. Mass. 1996) and Loggerhead Turtle v. Cnty. Council of Volusia Cnty., 148 F.3d 1231,1247-53 (11th Cir. 1998)). The court did analyze "but-for" causation: "But-for the regulatory and permitting scheme overseen by the TCEQ defendants, no state-owned water could be legally diverted, impounded or consumed." *Id.*

199. *See Aransas Project II*, 756 F.3d 801, 818 (5th Cir. 2014).

unlawful take of at least twenty-three Whooping Cranes in the 2008-09 winter in violation of the ESA."[200]

Rather than adhering to Justice O'Connor's proximate causation standard, the court's finding of ESA liability instead focused on its assessment of the expert scientific testimony offered by both parties. The court focused its review of each expert's credibility through the lens of their respective careers and accolades—rather than the scientist's precise contribution towards potentially understanding the chain of causation at issue.[201] Although the court did examine the science in extensive detail, it reviewed each inferential step in isolation, rather than in the context of a dynamic ecosystem with multiple factors contributing to cause the "take" of the whooping cranes.[202] As the Fifth Circuit suggested in its reversal, the issue was with foreseeability and not with the number of steps in the chain of causation, as the lower court failed to "establish that the state could have reasonably anticipated the synergy among the links on the chain in 2008-09."[203]

Acting as the "gatekeeper" for the admissibility of scientific testimony, the court found all of TAP's experts to be credible.[204] In assessing the credibility of expert testimony, it generally focused on the considerations put forth in *Daubert*, especially when reviewing TAP's experts.

The court noted that the TAP experts were credible, world-renowned, and all had published numerous scientific papers in respected journals.[205] In contrast, it did not find credibility in the scientific methodology of the defendants' experts, expressing concern because they "had limited experience and insignificant knowledge of whooping cranes."[206] The court's disapproval of TCEQ's experts was contrasted by its review of TAP's experts,

200. *Aransas Project I*, 930 F. Supp. 2d at 780.
201. *See id.* at 744-45.
202. *See id.* at 744-75.
203. *Aransas Project II*, 756 F.3d at 821.
204. *See Aransas Project I*, 930 F. Supp. 2d at 744.
205. *Id.*
206. *Id.*

particularly by the court's unsubstantiated disparagement of Dr. R. Douglas Slack, as will be analyzed below.[207]

1. Inconsistent Review of Expert Scientists

TAP presented ten expert witnesses during the bench trial, some of whom were "world renowned in their respective fields."[208] The court primarily focused on the accolades of TAP's experts to determine their expertise and credibility. Concentrating on the accomplishments of TAP's experts, the court found credence in the fact that some TAP experts held "endowed chairs at prestigious universities, some are MacArthur Fellows, all have published numerous scientific papers in respected journals," even noting that one TAP expert was a Nobel Peace Prize recipient for his environmental work.[209]

The court specifically celebrated TAP's whooping crane experts, Dr. Felipe Chavez-Ramirez and refuge biologist Mr. Tom Stehn, for their years of field-work and devotion to the survival of the whooping crane.[210] Additionally, the court described these scientists as "leading authorities in their fields of biology, ornithology, and whooping cranes in particular."[211]

The court's positive view of TAP's experts is in stark contrast to its opinion of TCEQ's experts, and the court found an "alarming trend in the experts that [defendants] offered."[212] It

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207. *See id.* After teaching for almost four decades, Dr. Slack retired in 2011 from his position at Texas A&M as a wildlife and fisheries sciences professor after a prestigious career that included sixty peer-reviewed publications and countless research presentations. Dr. Slack's credentials include numerous grants to research Texas ecosystems, including a $1.4 million grant in 2002 to study the relationship between freshwater inflows and whooping cranes. He currently serves as Executive Director of the Texas Chapter of the Wildlife Society. *See* Court Filed Expert Resume, R. Douglas Slack, *Aransas Project I*, 930 F. Supp. 2d 716 (S.D. Tex. 2013), 2011 WL 10634582. *See also Beloved A&M Professor Gives Final Lesson,* BRYAN- COLLEGE STATION EAGLE (May 2, 2011, 12:00 am), http://www.theeagle.com/news/local/beloved-a-m-professor-gives-final-lesson/article_c7ee9091-3168-5e24-a7c6-de1bc57b731f.html.

208. *Aransas Project I*, 930 F. Supp. 2d at 744.

209. *Id.*

210. *See id.* at 744, 756-57.

211. *Id.* at 756-57.

212. *Id.* at 744 (describing the knowledge of TCEQ's experts, regarding the topic of whooping cranes, as "limited" and "insignificant").

did not afford the extensive resumes of the state's experts with the same deference it gave to TAP's experts. Instead, it criticized the defendant's methodology, seemingly looking beyond the same considerations that it used to analyze TAP's experts, such as experience and publication record.[213]

The court discredited Dr. Slack's expertise as it pertained to the chain of causation at issue in the case, despite his illustrious research career and direct connection to the study of whooping cranes.[214]

Although the court generally strayed from the *Daubert* considerations that it focused on to determine the credibility of TAP's experts, the court instead analyzed the scientific methodology employed in the defendants' research. This lack of consistency, even based on these unique circumstances, displays the challenges that judges face when entering the complex and uncertain arena of ecological injuries. The court took issue with the evidentiary reliability of a report designed by Dr. Slack. It questioned the methodology of Dr. Slack's report because it used data gathered by one of his graduate students, rather than a specific report compiled by TAP's experts, Dr. Chavez-Ramirez and Mr. Stehn.[215]

The court praised Dr. Chavez-Ramirez for his extensive experience as one of the foremost whooping crane ecologists and for his substantial publication record. While Dr. Chavez-Ramirez is unquestionably an expert on the subject, the court did not find it important that he studied under Dr. Slack while in graduate school.[216] In fact, Dr. Chavez-Ramirez received both his Master

213. *See id.* at 744-45, 753-54, 767-69.

214. *See* Court Filed Expert Resume, R. Douglas Slack, *supra* note 207. In particular, the court soundly criticized the expertise of Dr. Slack, an experienced ecologist who suffers from Parkinson's and diabetes, because of a single misinterpreted statement that he made towards the end of his intensive and lengthy cross-examination. Transcript of Testimony Of Defendant's Expert Witness, R. Douglas Slack, Ph.D., *supra* note 170, at 75-76.

215. *Aransas Project I*, 930 F. Supp. 2d at 744.

216. *See* Court Filed Expert Resume, R. Douglas Slack, *supra* note 207. With Dr. Slack as his advisor, Dr. Chavez-Ramirez completed both his Ph.D. in 1996 and M.S. in 1992 at Texas A&M University. Dr. Chavez-Ramirez was not Dr. Slack's first graduate student to research whooping cranes. In 1987, under Dr. Slack, Howard Hunt completed a Ph.D. dissertation on whooping cranes in the

of Science and Ph.D. in wildlife ecology under the guidance of Dr. Slack.[217] For almost a decade, Dr. Slack served as Dr. Chavez-Ramirez's advisor.[218] Dr. Chavez-Ramirez's doctoral research focused on the food availability, foraging ecology, and energetics of whooping cranes, suggesting that both he and Dr. Slack possess relatively similar expertise on the species.[219] Dr. Slack and Dr. Chavez-Ramirez co-authored at least eight publications together in peer-reviewed journals, with two articles specifically focused on whooping cranes.[220] In total, Dr. Slack has co-authored at least nine papers in peer-reviewed journals on whooping cranes, an extensive record that certainly indicates his scientific knowledge regarding the species.[221]

Scientists publish many studies in peer-reviewed journals, however. Publication record alone is not the basis of an individual scientist's ability to comprehend the subject at issue. Studies may be completed over different periods of time, involve multiple co-authors, and are cited at different rates based on

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Aransas National Wildlife Refuge. *See* Transcript of Testimony Of Defendant's Expert Witness, R. Douglas Slack, Ph.D., *supra* note 170, at 85.

217. *See* Transcript of Testimony Of Defendant's Expert Witness, R. Douglas Slack, Ph.D., *supra* note 170, at 83-84.

218. In 1992, with research that began in 1989, Dr. Chavez-Ramirez received his Master's degree while researching as part of Dr. Slack's laboratory at Texas A&M. Felipe Chavez-Ramirez, Food Availability, Foraging Ecology, and Energetics of Whooping Cranes Wintering in Texas (May 1996) (unpublished Ph.D. dissertation, Texas A&M University) (on file with ProQuest Dissertations and Theses). In 1996, Dr. Chavez-Ramirez received his Ph.D. under Dr. Slack's tutelage, while Dr. Slack sat as the Chair of the Dissertation Committee. As his advisor, presumably Dr. Slack also garnered significant knowledge regarding the ecology of whooping cranes. Dr. Chavez-Ramirez offered sincere gratitude towards Dr. Slack's tutelage in his acknowledgements: "My advisor, R. Doug Slack, provided extensive support and helpful discussions on different aspects of my field work and during the writing of this dissertation. I will always be grateful to Doug for the confidence that he showed in my ability and the opportunity to conduct this research." *Id.*

219. *See Aransas Project I*, 930 F. Supp. 2d at 757. As of 2013, Dr. Chavez-Ramirez works Gulf Coast Bird Observatory in Lake Jackson, Texas and is also a member of the International Whooping Crane Recovery Team. *Id.*

220. *See* Court Filed Expert Resume, R. Douglas Slack, *supra* note 207, at 84.

221. *See id.* at 82. The number of publications on the topic of whooping cranes was determined by enumerating from the publications that specifically referenced whooping cranes in Dr. Slack's resume filed with the court.

particular disciplines. Therefore, solely examining the number of publications may not be the most efficient approach to establish the credibility of experts.

Although the court reviewed the methodology in some instances, the deference afforded to the ecological testimony was mainly a product of the expert's reputation, rather than its legal significance with regards to "the task at hand."

2. The Notorious Blue Crab Debate

Perhaps the most important links in the causation chain were allegations that blue crab abundance declined because of decreased freshwater inflow.[222] The Court's opinion concerning the relevance of TCEQ expert Dr. Thomas Miller is particularly interesting, considering he is a definitive expert on blue crab ecology.

As director of Chesapeake Biological Laboratory, Dr. Miller's research centered on blue crab ecology and exploitation, as well as population dynamics and stock assessment.[223] The court's consideration of Dr. Miller's testimony displays the challenges associated with understanding the intricate natural processes within the environment.

Dr. Miller's extensive publication record includes more than seventy peer-reviewed articles addressing issues relevant to blue crab population dynamics, such as analyses comparing productivity across multiple ecosystems.[224] Further, Dr. Miller

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222. *See Aransas Project I*, 930 F. Supp. 2d at 752-54 (finding causation where the diversion of freshwater flow allegedly increased the bay's salinity, evidence was presented showing a negative effect of elevated salinity on blue crab abundance, blue crab is believed to be a main source of food for whooping cranes, and the death of several cranes was observed).

223. *See* Transcript of Testimony of Defendant's Expert Witness, Thomas James Miller, Ph.D., at 221-22, *Aransas Project I*, 930 F. Supp. 2d 716 (S.D. Tex. 2013) (No. CA-C-10-075), 2011 WL 10904321. In his own words, Dr. Miller described the primary focus of his studies as "blue crab in its natural environment and in particular . . . on the impacts of commercial and recreational harvests of blue crab in its natural environment." *Id.* at 221.

224. *See* Thomas J. Miller, *Curriculum Vitae*, CHESAPEAKE BIOLOGICAL LAB., http://hjort.cbl.umces.edu/people/Miller_2page_cv.pdf (last visited Feb. 27, 2015).

has published in many peer-reviewed journals, including contributions to highly respected titles.[225]

It is reasonable to presume that Dr. Miller could have offered relevant insight to explain the decreasing abundance of blue crabs, specifically as it related to decreasing salinities. Despite the extensive publication record, Dr. Miller's testimony did not persuade the court to reconsider its opinion that increased salinities, resulting from lack of freshwater inflow, were the sole reason for the declining blue crab population within the bay.[226]

Aligned with the aforementioned difficulties described by Professor Lazarus, multiple forces may have influenced the decreasing blue crab abundance.[227] For instance, the court did not consider the effect of diminished local rainfall on the increasing salinities in the estuary. Whereas temperature, predation, and dissolved oxygen contribute to the distribution of blue crabs throughout the estuary, many additional factors may affect blue crab abundance.[228] In his testimony, Dr. Miller explained that scientists expect to see high inter-annual variability in blue crab abundance, "[s]ome years physical factors and random factors coincide in such a way that [blue crab] reproductive success is considerably higher in one year than it is in the other year."[229]

Dr. Miller suggested that declines in blue crab abundance along the Atlantic Coast may be similar to those observed along the Texas Gulf Coast, primarily as a result of overexploitation by the commercial fishing industry.[230] In addition, because blue

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225. These peer-reviewed journals include well-respected titles such as *Science* and *Fisheries*. *See id.*

226. *See Aransas Project I*, 930 F. Supp. 2d at 753-54.

227. *See generally* Lazarus, *supra* notes 149, at 745-48 (highlighting various difficulties relating to the protection of the blue crab's environment).

228. *See* Transcript of Testimony of Defendant's Expert Witness, Thomas James Miller, Ph.D., *supra* note 223, at 243-45.

229. *Id.* at 244.

230. *See id.* at 246-47. The Texas Parks & Wildlife also acknowledges that blue crab populations in Texas have declined for several decades. This decline is likely the result of many factors, including overfishing or overcapitalization, shrimp trawl bycatch, habitat loss or degradation, and reduced freshwater inflow. *See* Glen Sutton & Tom Wagner, *Stock Assessment of Blue Crab* (Callinectes sapidus) *in Texas Coastal Waters*, MANAGEMENT DATA SERIES No.

crabs depend on low salinities in the estuary, the severe lack of local rainfall may have been a primary factor influencing the low salinities, not just the freshwater inflow.[231] In fact, the court noted significant declines in blue crab abundance over the entire Texas coast from 1980 to 2009.[232]

When ESA liability is at stake, the magnitude of these random variables demonstrates the need for proximate causation as a threshold when proving the cause of a "take." Though the court discounted Dr. Miller's testimony, this at least suggests that healthy debate exists within the scientific community regarding the reason for the blue crab decline. This aspect of the case demonstrates the reason to include principles of proximate cause when examining complex ecological data.

3. Contradictory Approach to *Daubert*'s "Scientific Knowledge" Framework

The court repeatedly mentioned Dr. Ronald Sass and his Nobel Peace Prize to bolster his credibility as a biogeochemical and statistical expert, seemingly in an effort to symbolize the overall reliability of TAP's expert scientific witnesses.[233] Although Dr. Sass certainly deserves recognition for being an excellent scientist, it is interesting to consider the relationship—or lack thereof—between the Nobel Prize-winning research and precise chain of causation at issue in *Aransas Project*.

Dr. Sass received the 2007 award for his contributions to global warming research for the Intergovernmental Panel on Climate Change (IPCC).[234] In particular, he studied methane

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249, at 1-4 (2007), *available at* https://tpwd.texas.gov/publications/pwdpubs/media/pwd_rp_v3400_1440.pdf.

231. *See Aransas Project II*, 756 F.3d 801, 822 (5th Cir. 2014).

232. *Aransas Project I*, 930 F. Supp. 2d at 753.

233. *Id.* at 744, 755-56. An additional reference to Dr. Sass's Nobel Prize was made in Judge Prado's dissenting opinion to the Fifth Circuit's denial of TAP's petition to rehear the matter. *See* Aransas Project v. Shaw (*Aransas III*), 774 F.3d 324, 327 (5th Cir. 2014) (Prado, J., dissenting).

234. Mike Williams, *Rice's Sass Honored for His Role in Nobel Prize-Winning Research on Global Warming*, RICE UNIV. NEWS & MEDIA (May 29, 2008), http://news.rice.edu/2008/05/29/rices-sass-honored-for-his-role-in-nobel-prize-winning-research-on-global-warming/. In 2007, the Nobel Peace Prize was awarded to Dr. Sass, former Vice President Al Gore, and an additional 2500

emissions from the bacterial decomposition of organic matter. This research took place while coordinating the efforts of scientists in many foreign locations, such as Thailand, Indonesia, and Germany.[235] Although impressive, the Court repeatedly mentioned the accolade to strengthen the credibility of TAP's expert witnesses, despite not indicating a connection between the Nobel research and South Texas whooping cranes.[236]

The continued reference to the award is perplexing, especially because the climate change research lacked any specific relationship with whooping cranes, the Guadalupe estuary, or even Texas. In contrast, the Court did not find TCEQ expert Dr. Miller's testimony to be relevant, despite his extensive knowledge of blue crabs, the main prey item of whooping cranes and essential link in the chain of causation.[237]

Although Dr. Miller's research involved blue crabs throughout the Atlantic coast, the court concluded that his testimony lacked credibility because it was not specific to blue crab populations in Texas.[238] If expertise regarding methane emissions in Thailand is related to crane mortality and freshwater inflows in Texas, then it is inconceivable to suggest that expertise regarding Atlantic coast blue crabs is unrelated to testimony regarding blue crabs in Texas.

In a similar approach, the court noted Dr. Sass's publication record as a basis for his credibility, specifically referencing that his 165 peer-reviewed papers included one article on whooping cranes.[239] Alarmingly, the court criticized the credibility of TCEQ expert Dr. Slack for his "insignificant knowledge on whooping cranes in particular," despite his extensive publication

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IPCC scientists from over 130 nations for their research involving the link between human activities and climate change. *Id.*

235. *Id.*

236. *See Aransas Project I,* 930 F. Supp. 2d at 744, 755-56.

237. *See id.* at 753-54. The court found Dr. Miller's lack of evidence on several key points relevant to their its opinion. *Id.*

238. *See id.* at 754. *See generally* Transcript of Testimony of Defendant's Expert Witness, Thomas James Miller, Ph.D., *supra* note 223, at 240, 249-51 (showcasing Dr. Miller's relevant testimony on his blue crab research).

239. *Aransas Project I*, 930 F. Supp. 2d at 754.

record on the precise topic of whooping cranes in Texas coastal ecosystems.[240]

Because the court chose to focus on the respective accolades of expert witnesses, ecological testimony seemingly diverted the attention away from establishing each link in the chain of causation.

B. *Fifth Circuit's Reversal on Proximate Causation Grounds*

On appeal, the Fifth Circuit reversed the district court's finding of ESA liability because the lower court did not consider proximate causation in the holding.[241] The Fifth Circuit's focus on proximate causation further underscores not only the dichotomy between these two opinions, but also a broader issue that pervades ESA liability and the "take" prohibition. Although TAP attempted to establish that licensing resulted in whooping crane deaths, the number of contingencies manipulating the chain of causation demonstrates the lack of foreseeability.[242] In contrast with the lower court's opinion, the Fifth Circuit described the alleged chain of causation as a "fortuitous confluence of adverse factors," which resulted in the unexpected

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240. *Id.* at 744, 768. Much of the ridicule directed at Dr. Slack stemmed from a brief misunderstanding, at the end of cross-examination, on whether whooping cranes possess supraorbital salt glands. Although this false impression may be relevant from a scientific perspective, it is not an essential factor in proving causation. Even so, the court mentioned it on multiple occasions. *See id.* at 744, 767-68.

241. *See Aransas Project II*, 756 F.3d 801, 816-24 (5th Cir. 2014). The reversing opinion elicited a deep appreciation for proximate cause as an important limit on liability, providing a detailed history of the Supreme Court's adherence to proximate causation principles. *See id.* at 817-821. The Fifth Circuit quoted Prosser and Keeton to augment the importance of proximate cause as a limit to prevent assigning liability based on attenuated circumstances, "the consequences of an act go forward to eternity, and the causes of an event go back to the dawn of human events, and beyond." *Id.* at 818 (citing W. KEETON ET. AL, PROSSER AND KEETON ON THE LAW OF TORTS 264 (5th ed. 1984)). The Fifth Circuit also referenced the Supreme Court's reasoning in *Exxon Co.* to establish that proximate causation is a "necessary limitation on liability," because, in regards to attenuated circumstances, "somewhere a point will be reached when courts will agree that the link has become too tenuous—that what is claimed to be consequence is only fortuity." *See id.* (citing Exxon Co., USA v. Sofec, Inc., 517 U.S. 830, 838 (1996)).

242. *See id.* at 822.

crane die-off.[243] The Fifth Circuit reversed because the attenuated circumstances in the chain of causation lacked a direct connection, such that "the contingencies [were] all outside of the state's control and often outside human control."[244] In fact, the whooping crane population had increased both before and after the winter of 2008-09.[245]

Accordingly, the district court failed to articulate "why the remote connection between water licensing, decisions to withdraw river water by hundreds of users, whooping crane habitat, and crane deaths during a year of extraordinary drought compels ESA liability."[246] As a matter of attenuation, the Fifth Circuit rejected TAP's salinity argument because an array of natural conditions potentially affects salinity levels in the Guadalupe estuary.[247] The salinity levels are subject to "unpredictable and uncontrollable. . .forces of nature," such as drought, decreased local rainfall, tides, and temperature.[248] The district court's only mention of foreseeability was in the context of a report that described the effect of TCEQ's water permitting on freshwater inflows.[249] The report did not satisfy TAP's burden to establish foreseeability because it was non-specific, instead predicting the potential for declining freshwater inflows over the long-term.[250]

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243. *Id.* at 823. Suggesting that the unexpected crane die-off was the "essence of unforeseeability," the Fifth Circuit drew an analogy to Judge Henry Friendly's hypothetical in which "a vessel colliding with a bridge should not be held liable for the death of a patient whose doctor arrived late because of the bridge closing." *Id.* (citing *Exxon Co.*, 517 U.S. at 838-39).

244. *Id.* at 822.

245. *Id.* at 820.

246. *Id.* at 818. Accordingly, the Fifth Circuit noted that even if the district court proved proximate cause, the injunction issued was still an abuse of discretion. *Id.* at 806.

247. *See id.* at 820-22.

248. *Id.* at 822. Proximate cause serves as a limit on ESA liability in regards to the multiple forces affecting ecosystems: "That these natural conditions can change quickly is a truism, and that the seriousness or duration of a drought cannot be foreseen in advance is equally trite. Texas is prone to cyclical drought conditions, but the winter of 2008-09 was an outlier among those." *Id.*

249. *Id.* at 821 (citing *Aransas Project I*, 930 F. Supp. 2d 716, 747 (S.D. Tex. 2013)).

250. *Id.*

The Fifth Circuit focused primarily on whether TCEQ's permitting decisions to use river water for human, manufacturing, and agricultural consumption foreseeably and proximately caused the whooping crane deaths.[251] The "multiple, natural, independent, unpredictable, and interrelated forces affecting the cranes estuary environment" prevented the Fifth Circuit from finding that TCEQ's licensing was the proximate cause of the crane deaths.[252] Proximate cause functions to limit ESA liability, particularly in the context of complex ecological testimony, because liability should not be based "on the 'butterfly effect' nor on remote actors in a vast and complex ecosystem."[253]

The district court assigned liability based on remote, attenuated, and fortuitous events.[254] The Fifth Circuit noted that, in doing so, the lower court either misinterpreted the relevant liability test or misconstrued the proximate cause analysis.[255] The proximate cause requirement is significant in the context of ESA liability because it "preclude[s] liability when the causal link between conduct and result is so attenuated that the consequence is more aptly described as a mere fortuity."[256] For example, TCEQ's overarching authority lies in its ability to merely issue the permits that allow municipalities or individuals to withdraw water. Thus, TCEQ does not compel or require water withdrawal, even when they issue a permit. Further complicating the causal link is the fact that some water uses are not even required to obtain permits, such as withdrawals for domestic and livestock purposes.[257] The chain of causation becomes more attenuated when factoring in the independent

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251. *See id.* at 816-17.

252. *Id.* at 823.

253. *Id.* at 818. The Fifth Circuit described the 'butterfly effect' as a theory of remote causation, defined as a situation where present conditions are the result of a string of events set off by a seemingly inconsequential act. *Id.* at 818, n.10.

254. *Id.* at 817.

255. *Id.*

256. *Id.* at 818 (citing Paroline v. United States, 134 S.Ct. 1710, 1719 (2014)).

257. *See id.* at 822. Water uses for domestic and livestock purposes are not required to obtain permits. *See supra* notes 18-28 and accompanying text.

decisions made by individual water users, which influences the amount of water diverted from Texas rivers.

The failure to apply the proximate cause analysis was apparent in the lower court's review of expert scientific testimony.[258] The Fifth Circuit's sound criticism of the lower court's opinion illuminates the inherent challenges associated with using ecological testimony to establish causation: "Every link of this chain [of causation] depends on modeling and estimation. At best, the court found but-for causation. Proximate cause, however, requires the causal factors and the result to be reasonably foreseeable."[259] Because TAP's allegations were void of the required close connection, finding proximate cause based on this chain of causation would impose ESA liability for an activity that is far outside the realm of current ESA jurisprudence.[260]

Proximate cause is an important tool when proving the cause of ecological injuries. By adhering to established legal principles, the Fifth Circuit's opinion demonstrates the practicality of proximate cause as a limit on using scientific testimony to prove causation within complex natural environments. Although science is absolutely vital to the conservation of the whooping cranes, the complex forces of nature in any given ecosystem should limit scientific testimony from being the sole basis for assigning ESA liability when an actor is alleged to have violated the "take" prohibition.

C. *Fifth Circuit's Denial of TAP's Petition for Rehearing & TAP's Petition to the Supreme Court of the United States*

On December 15, 2014, by an 11-4 vote, the Fifth Circuit issued its opinion denying TAP's petition for rehearing.[261] In the dissenting opinion, Circuit Judge Edward C. Prado, offered insight regarding the utility of scientific testimony to prove

258. *See Aransas Project II*, 756 F.3d at 820.

259. *Id.*

260. *See id.* at 819 (explaining that the district court's factual findings are not binding at the appellate level the appellate level when the district court has used the improper proximate causation test).

261. *Aransas Project III*, 774 F.3d 324, 325 (5th Cir. 2014).

causation.[262] Judge Prado argued that the Fifth Circuit's review was inappropriate because the appellate court engaged in a de novo reweighing of facts that was "particularly egregious."[263] Likely suggesting that TAP continue its appeal, Judge Prado wrote that "the Supreme Court has reversed this Court before for improperly reweighing the factual findings of district courts."[264]

Judge Prado's reasoning was rooted in his opinion of the validity of certain expert scientific witnesses.[265] He referenced the accolades of TAP's witnesses, including their publication records and the unrelated Nobel Prize.[266] Similar to the district court's opinion, Judge Prado further disparaged the work of TCEQ's expert witnesses, referencing their supposed "limited experience and insignificant expertise" despite the fact that TCEQ's witnesses, at a minimum, offered testimony that was relevant to the specific task at hand.[267]

Based on the sentiment expressed in Judge Prado's dissent, TAP submitted a petition for a writ of certiorari to the Supreme Court of the United States.[268] In particular, TAP sought the Court's review to determine "[w]hether ordinary standards of proximate cause are satisfied by a foreseeable chain of events, even if it involves intervening actors and forces of nature."[269] On June 22, 2015, the Supreme Court of the United States denied TAP's petition for writ of certiorari to review the Fifth Circuit's decision.[270]

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262. *Id.* at 326-331 (Prado, J., dissenting).

263. *Id.* at 327.

264. *Id.* at 325-26.

265. *Aransas Project III*, 774 F.3d at 326-28 (Prado, J., dissenting).

266. *See id.* at 327, 331.

267. *Id.* at 327.

268. *See* David Sikes, *Whooper Appeal to Supreme Court Underway,* CORPUS CHRISTI CALLER TIMES (Jan. 22, 2015, 9:43 AM), http://www.caller.com/sports/outdoors/whooper-appeal-to-supreme-court-underway-ep-891000556-314340061.html.

269. Petition for Writ of Certiorari, The Aransas Project v. Shaw, 2015 WL 1250863, at *ii (U.S., Mar. 16, 2015) (No. 14-1138).

270. *See* The Aransas Project v. Shaw, 135 S. Ct. 2859 (Mem.) (June 22, 2015).

VI.
FUTURE IMPLICATIONS & WHY THE FIFTH CIRCUIT MADE THE CORRECT DECISION

A. *Proximate Cause Alleviates the Potential for Treacherous Precedent*

Assigning liability for the "take" of a listed species can erode the fabric of industry and progress. Lawyers, scientists, and policymakers must recognize the differences in scientific disciplines and how these distinctions relate to the admissibility of expert testimony. To harmonize this tension, scientists must understand that judges are experts in legal issues like proximate causation, but judges must also realize the value in utilizing scientific knowledge. Reconciling the gaps between science and the law is vital, especially if ESA litigation continues to increase in the future. Politicians express additional concern that despite billions of dollars in federal funding, "the way the [ESA] was written, there is more of an effort to list (species as endangered or threatened) than to delist."[271]

Rather than reevaluating the importance of *Daubert* in the context of ecological testimony, the established legal principle of proximate causation may serve as a more reliable foundation. The Fifth Circuit's reversal in *Aransas Project* was correct because the trial court failed to adequately consider proximate cause in the face of ecological testimony. The decision represents the outer bounds of liability under the *Sweet Home* proximate causation doctrine, "providing additional protection to private parties and government agencies that issue licenses and permits."[272] *Aransas Project* may set important precedent in the context of ESA liability, particularly in the Courts of Appeals that have maintained reluctance to adopt the proximate causation requirement set forth in *Sweet Home*.[273]

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271. *GOP to Propose Changing Endangered Species Act*, CBS NEWS (Feb. 4, 2014, 7:21 AM), http://www.cbsnews.com/news/gop-to-propose-changing-endangered-species-act/.

272. Richardson et al., *supra* note 92.

273. *See id.*

Established legal principles are an important foundation, particularly as environmental advocates champion the listing of insects as threatened or endangered. In fact, the ESA recently recognized thirty-one insect species as candidates for ESA protection.[274] Many scholars support this recent trend, as commentators suggest that insects are traditionally under-represented as listed species.[275] Insects are forage for many species, often serving as the primary diet for fish, birds, and salamanders. Although the increase in listed insect species may lead to litigation, the Fifth Circuit's adherence to proximate causation maintains a framework for courts to reach an equitable result.

Recently, the Ninth Circuit found the proximate causation standard in *Aransas Project* to be persuasive when it denied an injunction sought by an environmental plaintiff.[276] In *California River Watch v. County of Sonoma*, the environmental non-profit group alleged that the county violated the ESA by taking the endangered California tiger salamander.[277] Seeking a blanket order to enjoin Sonoma County from issuing land-use permits within a vast geographic area, the environmental group argued for a similar injunction to the one granted by the district court in *Aransas Project*.[278] In *California River Watch*, the Ninth Circuit not only denied the injunction, but further elaborated on the proximate causation standard relied upon by the Fifth Circuit.[279]

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274. *See* Review of Endangered and Threatened Wildlife and Plants, 79 Fed. Reg. 72,450 (proposed Dec. 5, 2014) (to be codified at 50 C.F.R. pt. 17) (reviewing native species that are candidates for listing as endangered or threatened).

275. *See generally* Ezequiel Lugo, *Insect Conservation under the Endangered Species Act*, 25 UCLA J. ENVTL. L & POL'Y 97 (2007) (describing a primary cause of insect under-representation as "a lack of qualified biologists to file and review listing petitions.").

276. *See* Cal. River Watch v. Cnty. Of Sonoma, 55 F. Supp. 3d 1204 (N.D. Cal. 2014) (relying on *Aransas Project II* to hold that the plaintiff did not establish causation because its claim that development would threaten salamanders lacked specificity, instead relying on modeling and approximation).

277. *Id.* at 1206.

278. *Id.* at 1211-12.

279. *Id.* at 1212. The Fifth Circuit in *Aransas Project II* specifically stated that it was not a "take" where the "causal chain was 'so attenuated that the consequence [was] more aptly described as mere fortuity.'" *Id.* (quoting *Aransas Project II*, 756 F.3d 801, 818, 823-24 (5th Cir. 2014)).

In the context of future ESA cases, this suggests that the Ninth Circuit may consider proximate causation when evaluating causal chains.

B. *Future Tension Between State Water Rights and Endangered Species Act Protection*

Recent ESA decisions at the appellate level imply the possibility of a meaningful Supreme Court opinion on the horizon, with far-reaching ramifications for water users and landowners.[280] Significant legal implications arise with regard to whether the federal ESA preempts state-created water rights and state-authorized water management decisions.[281] ESA controversies will likely escalate as the effect of drought in certain regions decreases the availability of water for protected species. As conflicts between the ESA and state water law intensify, scholars predict that there is "no simple resolution in sight."[282]

Courts have generally been disinclined to affirmatively rule on the preemptive relationship between the federal ESA and state water law at this point in ESA jurisprudence.[283] As *Aransas Project* depicts, "the exercise of state water rights. . .directly pits a state law property right against a federal law prohibition."[284] Although ultimately decided on the basis of proximate causation, the district court's opinion would have set legal precedent that the ESA preempts state water law.[285] The court focused on the actual conflict between the TCEQ's authority to issue water rights and the whooping cranes' need for essential habitat and resources. Indicative of future litigation, federal conflict preemption determined the outcome of the *Aransas Project* case

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280. *See generally* Richardson et al., *supra* note 92 (highlighting the recent Fifth Circuit *Aransas Project II* decision as well as a recent Ninth Circuit decision creating a circuit split).

281. *See* Robin Kundis Craig, *Does the Endangered Species Act Preempt State Water Law?*, 62 KAN. L. REV. 851, 851 (2014).

282. *Id.* at 851-852.

283. *Id.* at 876.

284. *Id.* at 877.

285. *See id.* at 888.

at the district court level, foreshadowing potential lawsuits that allege the taking of vested property rights without compensation.[286] Proximate causation rightfully decided the legal outcome of *Aransas Project*; however, in the case of less attenuated circumstances, the controversial issue of federal preemption will assuredly maintain a prominent role in future ESA decisions.

VII.
CONCLUSION

Established legal principles are an important safeguard, specifically in regards to assigning ESA liability in the context of nature's attenuated and complex circumstances. Proximate causation offers a practical threshold for courts as uncertainties prevalent in the environment present challenges for reconciling ecological testimony within the scope of causation. Although science is essential to the conservation of whooping cranes, the complicated processes in nature should limit scientific testimony from being the sole basis for assigning ESA liability when an actor alleges to have violated the "take" prohibition. The Fifth Circuit's reversal in *Aransas Project* illustrates this conundrum, because the lower court based its finding of ESA liability on a remote and unconnected chain of causation.

Although the court's focus on established legal principles may limit opportunities for environmental groups to litigate and expand the theory of ESA liability, proximate causation offers a means to interject consistency into an already robust regulation. Within the context of ESA liability for violations of the "take" prohibition, proximate causation maintains an avenue of reason, particularly in comparison to scientific testimony. Nature is wicked, uncertain, and influenced by a mosaic of dynamic forces; proximate causation thus represents a platform of stability for a regulatory scheme that is essential to the conservation of many protected species.

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286. *Id.* at 889.