

# Ecological Nexus as a Basis for Environmental Standing: Environmental Science and the Law After *Lujan v. Defenders of Wildlife*

by J. Stacey Sullivan

## I. Introduction

*Lujan v. Defenders of Wildlife*<sup>1</sup> has been one of the more written-about and discussed Supreme Court decisions of recent times.<sup>2</sup> Much of this material has focused on aspects of Justice Scalia's opinion concerning the nature of the injury-in-fact required to achieve Article III standing,<sup>3</sup> redressability,<sup>4</sup> and the ability of Congress to create causes of action enforceable by citizen suit provisions in statutes.<sup>5</sup>

One of the elements in the injury-in-fact discussion in Scalia's majority decision, and in the concurring and dissenting opinions as well, that has not received much scrutiny has been the nature and potential future viability of the "ecosystem nexus" argument which the Defenders of Wildlife used in their attempt to establish injury in fact.<sup>6</sup> It is the contention of this paper that Justice Scalia's opinion on this issue is not only mistaken but not the final word on the issue by any means. His opinion concerning the validity of the ecosystem nexus argument was not supported by a majority of the justices at the time, and very well may not be now.

While many of the other aspects of *Defenders of Wildlife* could have potentially devastating effects on the enforcement of environmental law, the ecosystem nexus argument holds the potential of reversing the current trend of limiting access to the federal courts for environmental plaintiffs. However, it also leads to larger questions concerning the relationship between science and the law, which could prove as problematic in their own way for environmental advocates of the ecosystem nexus argument as the recalcitrance of Justice Scalia and his ilk. These are the two primary points of discussion this paper hopes to address.

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This paper will attempt to explore the ecosystem nexus argument by first outlining the basic requirements of standing and then tracing the evolution of standing in environmental cases leading up to the *Defenders of Wildlife* decision. Part III consists of an examination of Justice Scalia's opinion, the two concurrences, and the dissent in *Defenders of Wildlife* as they pertain to the ecosystem nexus. Part IV is a discussion of current trends in environmental science regarding the concept of an ecosystem and how these trends might affect an attempt to employ the ecosystem nexus argument. The paper concludes with an attempt to construct a possible future for the ecosystem nexus argument, including an examination of the likely influence of Justices Breyer and Ginsburg in this area.

## II. The Evolution of Environmental Standing

### A. Fundamental Principles of Standing

Standing is a doctrine of federal justiciability rooted in Article III of the Constitution.<sup>7</sup> At its most basic, the "case or controversy" requirement is intended to determine whether a federal court is empowered by the Constitution to resolve a disputed issue. The constitutional requirement is met by the plaintiffs through a three-part test: (1) the existence of an "injury in fact"<sup>8</sup> (2) which can "'fairly be traced to the challenged action'"<sup>9</sup> and (3) that "'is likely to be redressed by a favorable decision.'"<sup>10</sup>

The part of the "case or controversy" test which the ecosystem nexus argument was offered to establish in *Defenders of Wildlife* was "injury in fact." The precise meaning of the phrase "injury in fact" has been the object of much debate and discussion, and remains without clear definition. Recent Supreme Court jurisprudence has focused on the cognizability of the injury suffered by the plaintiff and the concrete and immediate quality of the harm complained of.<sup>11</sup>

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Cognizability refers to whether some factor common to all plaintiffs defines or limits an injury.<sup>12</sup> The concrete and immediate harm requirement is the means by which the Court determines that injury to the plaintiff has occurred or is imminently probable at the hands of the named defendants.<sup>13</sup>

Besides the constitutional requirements, the Court also looks to certain "prudential" elements in determining standing.<sup>14</sup> As is the case with the constitutional requirements, these prudential concerns break down into three categories. The first is that the plaintiffs' complaint fall within the "zone of interests" covered by the statute or regulation at issue.<sup>15</sup> The second is that the plaintiffs' complaint must not be so general that it would be more appropriately dealt with by the legislative branch.<sup>16</sup> The third is that the issues presented in the suit must be those of the plaintiffs, not third parties.<sup>17</sup>

### B. Environmental Standing Decisions

#### 1. *Sierra Club v. Morton*

The U.S. Forest Service published a prospectus in 1965, inviting bids from private developers to create a ski resort/summer vacation area in the Mineral King Valley, adjacent to Sequoia National Park in the Sierra Nevada. The proposal from Walt Disney Enterprises, Inc., was selected, and in 1969 the final Disney plan was approved by the Forest Service.<sup>18</sup>

The Sierra Club, which ironically had made Walt Disney an honorary life member in 1959 for his wildlife films, filed suit in federal court, seeking declaratory judgment that the plan violated various federal statutes and regulations concerning the preservation of national parks, forests, and game refuges, and also seeking temporary and permanent injunctions against the granting of approval or permits for any part of the project, citing §10 of the Administrative Procedure Act (APA).<sup>19</sup> The Sierra Club at no time stated that its members ever used or planned to use Mineral King as a basis for establishing injury in fact.<sup>20</sup>

The Supreme Court affirmed the decision of the Ninth Circuit, which had held that the Sierra Club had not established standing to sue.<sup>21</sup> Writing for the majority, Justice Stewart stated that it was essential that the party seeking review of an administrative action be among those injured by the action.<sup>22</sup> He cited both *Data Processing Service v. Camp*<sup>23</sup> and *Barlow v. Collins*<sup>24</sup> as establishing that standing to sue under §10 of the APA existed only when there was injury in fact and when the alleged wrong fell within the zone of interests the statute or regulation was intended to address.<sup>25</sup>

Despite the fact that Justice Stewart denied the Sierra Club standing based on the injury in fact standard, he also held that aesthetic and environmental interests, even if shared by large numbers of people, were just as valid as bases for standing as were the more traditional economic interests.<sup>26</sup> He implied that the Sierra Club could achieve standing by amending its complaint to allege that its members' personal use and enjoyment of Mineral King would be adversely affected by Disney's project.<sup>27</sup>

It is worth noting that the Wilderness Society and other environmental organizations filed an *amicus* brief that specifically referred to the use individual members of the Sierra Club made of Mineral King.<sup>28</sup> The Sierra Club refused to use this argument, apparently choosing to try to get the Court to expand standing to include organizations which had a specific interest in the issue of conservation but no direct injury to their members. This the Court refused to do.

*Morton* is also noteworthy for its dissents, particularly that of Justice Douglas. He based his dissent on what has become one of the most significant law review articles in the field of environmental standing, Christopher Stone's "Should Trees Have Standing? Toward Legal Rights for Natural Objects."<sup>29</sup> In effect, Douglas argued, the environment itself should have the right to sue for its own protection through the medium of a legal guardian, much as children, the disabled, and others do.<sup>30</sup> While this argument has led to much theoretical discussion both in and out of the legal field, it has never been successfully advanced before a federal court.

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Justice Blackmun's dissent approved of the Sierra Club's argument that it should be able to bring suit on behalf of the environment based on its "provable, sincere, dedicated and established status."<sup>31</sup>

*Morton* is significant for two reasons. The first is its recognition of the validity of non-economic "user interest" in aesthetic and environmental values as a basis for standing. This has become the basis for the vast majority of court challenges to federal actions affecting the environment.<sup>32</sup> The second reason for *Morton's* importance is its clear expression of the importance of establishing injury in fact. Standing to challenge government actions had been evolving from its earlier "legal wrong" basis, in which the government was to be treated as a private party that would be potentially liable to the plaintiff under a private cause of action.<sup>33</sup> As the regulatory state expanded, the Court began to recognize that Congress had given particular parties expanded rights to standing under specific statutory language. The Administrative Procedure Act of 1946 referred specifically to parties being "adversely affected or aggrieved by agency action within the meaning of a relevant statute."<sup>34</sup> *Morton* took this evolution a step further by recognizing a general right of citizens to challenge government actions affecting the environment as long as they had sustained injury in fact and raised claims within the zone of interest the statute was meant to affect.<sup>35</sup> However, while the access of citizens to federal courts thus expanded, injury in fact was an irreducible minimum that had to be established as a threshold issue. The Sierra Club's effort to bypass it failed utterly.

## 2. *United States v. Students Challenging Regulatory Agency Procedures (SCRAP)*<sup>36</sup>

The *SCRAP* decision came down in the Court term following the *Morton* decision, and stands as the high water mark of liberalized standing for environmental plaintiffs.<sup>37</sup> The Interstate Trade Commission proposed a 2.5% surcharge on railroad freight rates in response to requests from rail companies.<sup>38</sup> Five law students challenged this proposal, claiming that the ICC had failed to prepare an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA).<sup>39</sup>

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<p>The students based their claim of injury on the argument that the higher rates would discourage the use of recycled materials due to increased shipping costs,<sup>40</sup> result in higher prices for finished goods and thus lead to the destruction of more natural resources,<sup>41</sup> and lead to increased litter in the parks and streams of the Washington, D.C. area which would adversely affect their use of these natural resources.<sup>42</sup></p>	<p><i>By allowing an attenuated chain of causation and making the injury in fact requirement minimal, SCRAP threw the doors of federal courts open as wide as they would ever be to environmental plaintiffs.</i></p>
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Justice Stewart once again wrote the majority opinion.<sup>43</sup> While he found the plaintiffs' arguments to establish standing at best an "attenuated line of causation,"<sup>44</sup> he held that harm to recreational, aesthetic, and economic interests sufficiently established injury in fact, even if only an "identifiable trifle" was cited to do so.<sup>45</sup>

The decision reiterates many of the issues first raised in *Morton*: the validity of non-economic environmental and aesthetic bases for standing,<sup>46</sup> the availability of standing when an injury is suffered by a large number of people,<sup>47</sup> and the importance of the plaintiff demonstrating that she is herself among those injured by the action.<sup>48</sup> Justice Stewart makes it clear that the pleadings to establish standing be more than an "ingenious academic exercise in the conceivable."<sup>49</sup> However, once a plaintiff has established a perceptible injury to herself as a result of agency action, then the degree of that injury is immaterial: the plaintiff has established injury in fact.<sup>50</sup> By allowing an attenuated chain of causation and making the injury in fact requirement minimal, *SCRAP* threw the doors of federal courts open as wide as they would ever be to environmental plaintiffs.

### 3. Retreat from *SCRAP*: *EKWRO* and *Allen v. Wright*

Almost as soon as the Court extended standing in *SCRAP*, it started to pull it back. *SCRAP* has never been explicitly overruled; however, several subsequent decisions, made in cases not dealing specifically with environmental issues, have used arguments based in the other constitutional elements of standing - causation and redressability - to effectively restrict *SCRAP*'s impact.<sup>51</sup> One particular line of cases has been the primary source of this restriction. The recurring pattern in these cases is that the plaintiff's injury is not due directly to agency action but rather mediated by the action of third parties.<sup>52</sup> The first of these cases was *Simon v. Eastern Kentucky Welfare Rights Org. (EKWRO)*.<sup>53</sup>

In *EKWRO*, the Court refused to grant standing to a welfare rights organization challenging an IRS rule allowing hospitals to retain tax-exempt status regardless of their level of treatment of indigent patients. The decision to treat patients was made by the hospital board of directors, not the IRS. The Court held that the plaintiff had not established that a change in tax policy would necessarily lead to increased care for indigent persons.<sup>54</sup>

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The other significant case in this progression was *Allen v. Wright*.<sup>55</sup> The Court once again refused to grant standing to the plaintiffs, this time basing its reasoning in the causation element. The plaintiffs challenged tax-exempt treatment of discriminatory private schools, and claimed their injury resulted from the interference with school desegregation caused by the alleged government assistance to "white flight." The Court held that "[t]he links in the chain of causation between the challenged Government conduct and the asserted injury are far too weak for the chain as a whole to sustain respondents' standing."<sup>56</sup>

The cumulative effect of these cases and others was to nibble away at the real value of the precedents established by *Morton* and *SCRAP* while not addressing the issue of injury in fact head on. That would come with the two *Lujan* decisions.

#### 4. *Japan Whaling Assn. v. American Cetacean Society*:<sup>57</sup> Beginning of the Nexus Argument?

Before moving on to an examination of the *Lujan* decisions, it is worthwhile to examine an element of a 1986 Supreme Court decision that would be cited in Justice Scalia's decision, Justice Kennedy's concurrence, and Justice Blackmun's dissent in *Lujan v. Defenders of Wildlife*. *Japan Whaling Society v. American Cetacean Society* was primarily focused on issues concerning the political question doctrine and the extent of congressional power over the Secretary of Commerce in the latter's carrying out of amendments pertaining to international whaling.<sup>58</sup>

In his majority opinion, Justice White addressed the issue of standing in a footnote.<sup>59</sup> After establishing that the Secretary of Commerce's actions constituted agency action, and were final agency action, Justice White went on to cite *Morton* and *SCRAP* in finding that the plaintiffs were sufficiently "aggrieved" by the agency action.<sup>60</sup> He then addresses injury in fact by stating that the plaintiffs' whale watching and other studies will be adversely affected by continued whale harvesting, and that such an interest falls within the zone of interests established by the congressional amendments.<sup>61</sup>

The significance of this statement of Justice White's lies in its geographical and ecological range of application. No specific ocean or other body of water is mentioned. The effect of whale harvesting *anywhere* will lead to injury in fact to the plaintiffs. By establishing a zone of interests that extends throughout the world's waters, Congress effectively stated that whaling anywhere in that zone creates a private cause of action for an individual or organization with a recreational or educational interest in whales. By recognizing this as a valid exercise of congressional power and upholding the plaintiffs' standing to sue, the Court arguably laid the groundwork for the ecological nexus argument that would be articulated by the plaintiffs in *Lujan v. Defenders of Wildlife*.

### III. *Lujan v. Defenders of Wildlife*

If *SCRAP* marked the zenith of environmental standing, then *Defenders of Wildlife* marks the nadir, at least so far. It stands as the current final point in an assault on environmental statutory law in general, and environmental standing in particular, that began with the decision in *Lujan v. National Wildlife Federation*.<sup>62</sup> In place of the indirect limitations placed on *SCRAP* by decisions such as *EKWRO* and *Allen v. Wright*, the *Lujan* decisions stand as direct attacks on the standing jurisprudence that began with *Data Processing* and *Morton*. While this assault has come on several fronts, this paper now narrows its focus to the treatment of injury in fact requirements as it pertains to nexus-based complaints.

While *Defenders of Wildlife* is in many ways an environmental disaster, it also marks the introduction of the ecological nexus argument into the injury-in-fact controversy. Any discussion

of *Defenders of Wildlife* must begin with a look at Justice Scalia's decision in *National Wildlife Federation*, for it was in that decision that the groundwork was laid for his later ill-considered rejection of the environmental nexus argument.

### A. *Lujan v. National Wildlife Federation*

*National Wildlife Federation* was an attempt by the National Wildlife Federation (NWF) to force the Bureau of Land Management (BLM) to comply with the procedural provisions of the Federal Land Policy and Management Act (FLPMA) and NEPA regarding review of land withdrawal revocations.<sup>63</sup> In order to establish injury in fact, NWF claimed that its members used particular regions affected by the proposed land withdrawal revocation for recreational and aesthetic purposes.<sup>64</sup> NWF claimed that the proposed mining and oil and gas drilling on the formerly withdrawn lands would adversely impact its members' use of the land.<sup>65</sup>

The Supreme Court reversed the D.C. Circuit's decision.<sup>66</sup> Justice Scalia based his ruling on several factors: a lack of ripeness, since there had been no final agency action within the meaning of the APA;<sup>67</sup> the inappropriateness of the judiciary as an avenue for recourse for a programmatic and constantly changing policy;<sup>68</sup> and the failure of NWF to reduce the controversy to judicially manageable proportions or to show actual or imminent harm.<sup>69</sup> Most significantly, he upheld the District Court's finding that NWF had failed to state a sufficiently specific injury in fact to establish standing.<sup>70</sup>

According to Justice Scalia, while there is some room for debate about how "specific" the facts must be in order to show a party has been adversely affected or aggrieved by government action, the affidavits filed by NWF members, which averred use of federal lands in the vicinity of the potentially affected tracts, were clearly and indisputably too general to satisfy the basic requirements of injury in fact.<sup>71</sup> Facts missing from the affidavits which would establish the requisite specificity of injury would not be presumed by the Court.<sup>72</sup> The district court was correct in ruling that merely using land "in the vicinity" of an area affected by government action did not constitute injury in fact.<sup>73</sup>

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The attempt by NWF to establish injury in fact by stating its members used land in the vicinity of affected areas has been referred to as the "geographical nexus" argument.<sup>74</sup> NWF did not use the actual term "nexus" in its affidavits, but the implication is clear that the argument was premised on the existence of a nexus, based on geographical proximity, between the area used by the complainant and the area affected by the government's action. While Scalia's reasoning has been attacked as "misappl[ying] procedural rules to reach the desired result of preventing NWF from having a trial on the merits,"<sup>75</sup> the fact remains that, once a user of one area is out of sight of another area, the geographical nexus argument becomes problematic. When one takes into account the fact that the area referred to in the NWF affidavits extended

for some 4500 acres, it is hard to escape the conclusion that the geographical nexus argument, without more, makes a somewhat flimsy basis for a claim of injury in fact. There is, however, a very big difference between a geographical nexus and an ecological nexus. Justice Scalia's failure to recognize this vital distinction lies at the center of the following critique of his decision in *Defenders of Wildlife*.

## B. *Lujan v. Defenders of Wildlife*

### 1. The Argument

The environmental organization Defenders of Wildlife (Defenders) challenged an amendment to a regulation promulgated under the Endangered Species Act (ESA)<sup>76</sup> by the Secretary of the Interior, which declared that agencies funding overseas projects were not required to consult the Secretary concerning the potential impact such projects would have on endangered species.<sup>77</sup> Defenders brought suit under the section of the ESA that explicitly authorizes "any person" to obtain judicial review of agency action thought to violate the statute.<sup>78</sup> Defenders based their standing argument on affidavits from two members of the organization alleging injuries suffered as a result of the change in the regulation.<sup>79</sup>

### 2. The "Majority" Opinion<sup>80</sup>

Justice Scalia denied standing to Defenders based on six lines of reasoning: (1) Insufficient proof of imminent injury in fact;<sup>81</sup> (2) the unconstitutionality of the citizen suit provision of the ESA;<sup>82</sup> (3) the invalidity of the ecosystem, animal, and vocational nexus arguments raised by Defenders to establish standing;<sup>83</sup> (4) the inability of judicial action to redress the harm;<sup>84</sup> (5) the insufficiency of procedural injury as a basis for standing;<sup>85</sup> and (6) the violation of the "take care" clause regarding executive authority and other elements of separation of powers.<sup>86</sup> While all of these lines of reasoning have been subject to intense criticism,<sup>87</sup> and only two of them commanded the votes of all six justices who signed on to at least part of the decision,<sup>88</sup> the remainder of this analysis will focus on (3): the nexus arguments, specifically the ecosystem nexus.

Justice Scalia's treatment of the nexus arguments is perhaps the most scornful part of a typically acerbic decision. He refers to the "inelegantly styled" ecosystem nexus<sup>89</sup>, and sees fit to interject an "alas" in describing the animal and vocational nexus.<sup>90</sup> He dismisses them more or less out of hand.

"Ecosystem nexus" for purposes of standing in ESA cases is defined by Defenders as "the injury suffered by its members who use and enjoy any part of a contiguous ecosystem affected by federal action for purposes of studying or observing endangered species located in that ecosystem, even if the federal agency action which is damaging those interests is located some distance away from the tracts used by Defenders' members."<sup>91</sup>

Justice Scalia finds that the ecosystem nexus argument is inconsistent with the decision in *National Wildlife Federation*, which held that the allegedly injured party must use the area affected by the challenged activity and not an area roughly "in the vicinity" of it.<sup>92</sup>



Scalia continues, "[t]o say that the [Endangered Species] Act protects ecosystems is not to say that the Act creates (if it were possible) rights of action in persons who have not been injured in fact, that is, persons who use portions of an ecosystem not perceptibly affected by the unlawful action in question."<sup>93</sup> That is the extent of his analysis of the ecosystem nexus argument.

Scalia was joined in his opinion by Chief Justice Rehnquist and Justices White and Thomas. Justice Kennedy wrote a concurrence in which Justice Souter joined, and Justice Stevens wrote a separate concurrence. Justice Blackmun dissented, joined by Justice O'Connor. When one turns to these concurrences and dissents, a very different picture of the Court's opinion of the ecosystem nexus emerges than the one rather hastily and crudely sketched by Justice Scalia, one which, at least at the time, arguably reached the magic number of five votes.

### 3. Kennedy's Concurrence

Justice Kennedy agreed with Justice Scalia that Defenders failed to demonstrate that they are themselves among "the injured."<sup>94</sup> According to Kennedy, the injury in fact "is not satisfied unless '[p]laintiffs ... demonstrate a "personal stake in the outcome." ... Abstract injury is not enough.'<sup>95</sup> Based on the record before him, he did not find the nexus arguments adequate to establish sufficiently concrete injury to Defenders for standing to be granted.<sup>96</sup>

Kennedy then broke with Scalia: "I am not willing to foreclose the possibility, however, that in different circumstances a nexus theory similar to those proffered here might support a claim to standing."<sup>97</sup> He then referred to *Japan Whaling Assn.*, in which Justice White stated that whaling anywhere in the world constituted injury in fact to those who wished to view and study whales.<sup>98</sup> The implication here is that Justice White, in so many words, created the basis for an ecological nexus argument in environmental cases with that note. It is somewhat ironic that the author of this opinion voted with Justice Scalia on every aspect of *Defenders of Wildlife*.

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In his discussion of the citizen suit aspect of the case, Justice Kennedy implies that the way to resolve the constitutional issue raised by Justice Scalia is for Congress to identify a general public interest or benefit derived from the preservation of endangered species and demonstrate how a negative impact to those interests and benefits constitutes an actual or imminent injury to individual citizens.<sup>99</sup> It is at least arguable that this would be the sort of "different circumstance" in which the ecosystem nexus would be a valid basis for standing.

#### 4. Stevens' Concurrence

Justice Stevens did not find that the ecosystem nexus might be a valid basis for standing in other circumstances. He found it to be valid in the case before him.<sup>100</sup> Stevens attacked Scalia's conclusion that Defenders had not suffered injury in fact because they had not proven the injury was imminent. He held that "an injury to an individual's interest in studying or enjoying a species *and its natural habitat* occurs when someone...takes action that harms that species and habitat." (emphasis added.)<sup>101</sup> Imminence of such an injury should be determined by the timing and likelihood of the threatened injury rather than the time that might elapse between the injury taking place and the visit of the injured party to the area.<sup>102</sup> The emphasis, Stevens held, should be on the imminence of the injury to the species and its habitat. - "[the] injury will occur as soon as the animals are destroyed."<sup>103</sup>

Stevens concurred in the judgment because he felt that the Government was correct in its substantive assertion that the ESA did not apply to government-funded activities outside the United States.<sup>104</sup> He explicitly stated that in his opinion Defenders had standing to sue.<sup>105</sup> By including habitat in his definition of imminent harm, and by citing *Japan Whaling Ass'n.* as precedent for granting standing,<sup>106</sup> Stevens implicitly but clearly endorsed the ecosystem nexus as a valid basis for establishing injury in fact.

#### 5. The Dissent

Justice Blackmun, with whom Justice O'Connor joined, found the ecosystem nexus to be valid as a means of establishing standing in *Defenders of Wildlife*.<sup>107</sup> Blackmun's

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writing on the issue is clear, blunt, and, in my view, absolutely correct. He began by pointing out the central, glaring flaw in Scalia's reasoning - the reliance on *National Wildlife Federation* as authority for rejecting the ecosystem nexus.<sup>108</sup> In that case, NWF's bid for standing was predicated on a *geographical* nexus argument - harm to the injured party's

visual enjoyment of an area. As Blackmun pointed out, such an injury necessarily presumes physical proximity.<sup>109</sup> It is worth noting that Defenders made a separate and clearly distinct argument for a geographical nexus in their brief to the Court.<sup>110</sup> An *ecosystem* nexus is a fundamentally different thing. As Blackmun put it, "[m]any environmental injuries...cause harm distant from the area immediately affected by the challenged action."<sup>111</sup>

There is much more to an ecosystem than being in the same neighborhood. Areas close to one another as the crow flies might be on different sides of a ridgeline or in vastly different climatic regions. Conversely, a clearcut at the headwaters of a river can have a direct and devastating impact on salmon runs hundreds of miles away. Justice Scalia

conflated Defenders' geographic and ecosystem nexus arguments and then either ignored, or was ignorant of, the basic concept of what an ecosystem is. Justice Blackmun summed things up by saying, "[i]t cannot seriously be contended that a litigant's failure to use the precise or exact site where animals are slaughtered or where toxic waste is dumped into a river means he or she cannot show injury."<sup>112</sup> Justice Scalia had no snappy comeback for this particular observation of the dissent.

## 6. Summary

Justice Scalia's rationale for rejecting Defenders' ecosystem nexus argument is uncharacteristically sloppy in its logic and use of precedent. It can legitimately be asked if, in his determination to reach a desired result, he failed to think through his reasoning before committing it to paper. In a very real sense, Scalia did not address the issue of ecosystem nexus at all. By ignoring or failing to realize the immense difference between geographical vicinity and a contiguous ecosystem, he set himself up for the lesson in elementary ecology administered by Justice Blackmun in his dissent.

Justices have been less than precise logically before, however, even in majority decisions. Nonetheless, those decisions stand as binding precedent until a later Court, or the Congress, reverse them. The reason that the ecological nexus is more than an historical footnote is that five justices endorsed it, implicitly or explicitly. The holding in *Defenders of Wildlife* is largely limited to the facts, at least as regards ecosystem nexus. One looks at Justice Kennedy's words: "[I]n different circumstances a nexus theory similar to those proffered here might support a claim to standing,"<sup>113</sup> then realizes that his vote was necessary to create the majority, and comes to the conclusion that the door is, as Justice Kennedy hoped, still open to the ecosystem nexus.

## IV. The Science of Ecosystems and the Law

We have now arrived at the present day. The ecosystem nexus theory is dormant, not dead. Before attempting to devise a means by which it may be revived, it is essential to ask a very basic question: While Justice Blackmun and others, including the entire science of ecology, have made it clear that an ecosystem is *not* merely a synonym for geographical proximity, can we say with any certainty what an ecosystem *is*? This question seemed to have a very clear answer in the glory days of environmental statute-making in the early 1970s; the answer is much less clear today. However, it must be answered in order for the ecosystem nexus to mean anything at all.

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## A. The Equilibrium Paradigm

The Webster's New Collegiate Dictionary defines "ecosystem" as "the complex of a community and its environment functioning as an ecological unit in nature."<sup>114</sup> The root of the word, and of all "eco-words," derives from the Greek "oikos," meaning "house."<sup>115</sup> The word "ecosystem" was first defined by the British biologist A.G. Tansley in 1935, who wrote, "[i]n an ecosystem the organisms and inorganic factors alike are *components* which are in relatively stable dynamic equilibrium."<sup>116</sup>

The dominant understanding of the word "ecosystem" up until the early 1980s was rooted in the "equilibrium paradigm." Another, more popular way to describe this paradigm was the "balance of nature."<sup>117</sup> The concept of "balanced nature" had its origins in the Christian and Enlightenment World views,<sup>118</sup> where natural creation was seen as a perfect act of God disrupted and perverted by sinful humanity. This essentially theological concept was translated into scientific terms by Tansley and his associates, and given its first and still perhaps most powerful popular articulation by Aldo Leopold, who summarized his ecological land ethic as follows: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."<sup>119</sup> The idea of nature as a balanced, integrated, largely static ecosystem that has been radically disturbed by human activity was central to Rachel Carson's epochal book *Silent Spring*.<sup>120</sup>

The two definitions of an ecosystem, from the dictionary and Tansley, respectively, cited above are excellent examples of the presumptions that lay at the root of the equilibrium paradigm. The dictionary definition refers to an ecosystem as a "unit," a closed, discrete object. Tansley uses the words "stable" and "equilibrium." Ecologists spoke of stable, self-perpetuating "climax communities," in which a given ecosystem had achieved homeostasis.<sup>121</sup> This was a manifestation of a larger paradigm which viewed ideal systems as stable, and saw nature as striving to achieve that ideal.<sup>122</sup> In retrospect, one can see the equilibrium paradigm as one of the last gasps of nineteenth century deterministic science.<sup>123</sup> It remains the overwhelmingly accepted popular idea of what an ecosystem is.

The equilibrium paradigm was enthusiastically adopted by the theoreticians and

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drafters of the major environmental statutes of the '60s and '70s. It was attractive because it seemed to present a neutral, universal organizing principle for the management and use of all natural resources.<sup>124</sup> The equilibrium paradigm is at the conceptual center of the Wilderness Act,<sup>125</sup> NEPA,<sup>126</sup> the ESA,<sup>127</sup> and parts of the Clean Water Act, including §404 concerning wetlands.<sup>128</sup> Among

other things, this means that the definition of "contiguous ecosystem" in the initial expression of the ecosystem nexus theory in *Defenders of Wildlife* was rooted in the equilibrium paradigm.

## B. A Digression: Science and the Law

One of the paradoxes of environmental law, and in fact any area where law is predicated on science, is that science and law are not only dissimilar but contradictory in method and purpose. Law in both its statutory and judge-made forms is concerned with creating objective standards which can be changed only incrementally and with some effort, in order to create a firm, unvarying legal basis for society and its members to refer to and base actions upon. Science is almost exactly the opposite. The purpose of scientific research is to constantly challenge existing assumptions. While certain basic rules obtain in most scientific fields, and mathematical constants underlie everything, these should not be analogized to statutory law. They more closely resemble fundamental rules of syntax and grammar.

The two fields and their methodologies can be characterized as follows: Law's closest scientific parallel might be the physical law of inertia, in which objects maintain a constant direction and velocity unless acted upon by an outside force. Science is more of a steadily changing curve - mutation is constant.<sup>129</sup> Consequently, any attempt of law to embrace science is the equivalent of taking a snapshot of a moving and changing object - the law may reflect the status of the science at the moment the statute is enacted, but it is inevitable that the science by its very nature will mutate much more quickly than the law which claims to reflect it. One can state this as a simplified, and perhaps simplistic, variation on the Heisenberg Uncertainty Principle - a statute may be able to indicate a scientific principle's location at the moment of enactment, but it cannot also indicate the principle's direction or velocity of change.

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*...any attempt of law to embrace science is the equivalent of taking a snapshot of a moving and changing object...*

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## C. The Nonequilibrium Paradigm

This incongruous dynamic has manifested itself in the relationship between the current scientific understanding of the term "ecosystem" and that reflected in environmental statutes. Ecological science has discarded the equilibrium paradigm and replaced it with a "nonequilibrium" or "disequilibrium" paradigm.<sup>130</sup> In the place of a relatively simple, stable model one now finds a complex, stochastic one. This shift has led to the development of a entire new area of environmental science: conservation biology.<sup>131</sup>

Even before this paradigmatic shift took place, numerous inconsistencies had been appearing in the empirical data in several fields of ecology. Natural communities were found to have numerous persistent states rather than a single climax, with multiple successional pathways leading to them. Natural communities were subject to a wide range of disturbances that altered succession and diversity. Data from the field of paleoecology created more

problems for the equilibrium paradigm.<sup>132</sup> Conventional ecosystem science began to resemble Ptolemaic astronomy just before Copernicus and Kepler - more and more baroque modifications had to be made to the received wisdom in order to make the anomalies fit.

Eventually the weight of these anomalies caused the equilibrium paradigm to collapse. Daniel Botkin, in a revolutionary book, "deconstructed" the old paradigm as an effort to reconcile modern science with theological and philosophical concepts of a perfect universe.<sup>133</sup> Bill McKibben's book *The End of Nature* articulated the new ecology for the popular reader much as *Sand County Almanac* had done for the old.<sup>134</sup> Even the primary spokesman for the equilibrium paradigm in the 1960s, Eugene Odum, has recently written that the first and most important great ecological idea for the 1990s is that "an ecosystem is a thermodynamically open, far from equilibrium system."<sup>135</sup>

The basic principles of the nonequilibrium paradigm are that ecosystems are open, that disturbances are a natural and necessary part of ecosystems, that systems can be influenced or controlled by events occurring in neighboring or distant ecosystems, and that the state of the system at present depends on what happened yesterday as well as what happened long ago.<sup>136</sup> The concept underpinning the paradigm is that an ecosystem is a *process*, not a *state*, of nature. As Judy L. Meyer puts it, the focus of nonequilibrium is "on the trajectory of change rather than on the final endpoint."<sup>137</sup>

Environmental law has hardly begun to address this fundamental shift in one of its fundamental concepts. As A. Dan Tarlock puts it, "[t]his paradigm shift affects the fundamental justifications for environmental law, the strategies we have used to promote

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*The concept underpinning the (equilibrium) paradigm is that an ecosystem is a process, not a state, of nature.*

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environmental values, the relationship between law and scientific research, and the rules that govern environmental decision making."<sup>138</sup> In attempting to draft and implement environmental statutes, lawyers, legislators, and administrators were confronted with what environmental scientists had long known: environmental decisions are most often made under very

uncertain conditions.<sup>139</sup> The nonequilibrium paradigm and its scientific manifestation, conservation biology, have the potential to compound this problem immensely.

Standard risk-assessment analysis, already the source of ranges of options sometimes so wide as to be meaningless, becomes that much more problematic when applied to a dynamic, stochastic ecosystem.<sup>140</sup> The use of scientific data to support management decisions also becomes much more troublesome. The requirement of a causal link between human behavior and environmental damage is much harder to meet when a basic premise of conservation biology is that disruptions are a natural and necessary part of an ecosystem.<sup>141</sup>

Tarlock suggests that the Supreme Court's recent "junk science" decision in *Daubert v. Merrill Dow Securities*<sup>142</sup> could mean that conservation biology might not be accepted as the basis for a decision in an environmental case,<sup>143</sup> particularly because of the Court's suggested guideline that scientific evidence's reliability be tested by the "falsifiability" of the hypothesis upon which the evidence is based.<sup>144</sup> The difficulties posed by this are obvious for a science based on process rather than fixed states.

Despite all these potential problems, the nonequilibrium paradigm and conservation biology do not undermine biodiversity protection. They accept the basic lesson of ecology: without regulation, humans harm ecosystems due to the nature and the magnitude of their disruption of them.<sup>145</sup> In many cases, it can be argued that conservation biology actually strengthens the scientific case for biodiversity protection.<sup>146</sup> The element of nonequilibrium and the difficulty in predicting the effect of disruptions lends strength to arguments for conservatism in resource use decisions.<sup>147</sup> However, there is no question but that the nonequilibrium paradigm complicates the politics and law of environmental protection.

## V. The Future of the Ecosystem Nexus Argument: Some Possibilities

### A. Conservation Biology, Law, and Policy

As was shown in the previous section, the biggest problem facing advocates of the ecosystem nexus argument may not be legal but scientific. Defining what a contiguous ecosystem is has become a much more complex and amorphous proposition with the advent of the nonequilibrium paradigm. Nonetheless, the changed scientific basis must be met head on by anyone attempting to promote or defend ecosystem-based environmental policies.

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*...the biggest problem facing advocates of the ecosystem nexus argument may not be legal but scientific.*

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Ecosystem management premised on conservation biology must operate on the assumption that all management is an ongoing experiment.<sup>148</sup> This assumption comes into direct conflict with an underlying principle of our legal system: finality.<sup>149</sup> This is a microcosm of the fundamental conflict between the aims of science and law.<sup>150</sup> The obvious need is for management policies that exist in a middle ground between these two poles, where the law is made more flexible and the science more responsive to the constitutional requirements of substantive and procedural due process.<sup>151</sup>

Tarlock cites two examples where adaptive management is being tried in the context of federal environmental law: the Natural Community Conservation Plan in Southern California and the Glen Canyon Dam flow modifications on the Colorado River.<sup>152</sup> Both of these programs were inaugurated with much optimism and expectation; the accomplishments so far have been kept minimal by resistance from established interests.

How much of this relative failure can be attributed to adaptive management and how much to the general anti-environmental mood of government and powerful interest groups (*not*, if polls are to be believed at all, the American people) is impossible to determine.

## **B. A Three-Part Test for Contiguous Ecosystems**

How might this new, ongoing attempt to reconcile conservation biology and the law apply to a future attempt to employ the ecosystem nexus as a means to achieve standing? As a starting point, this paper proposes the development of a three-part test which could be used as a guide by both plaintiffs and judges in determining the existence and scope of the contiguous ecosystem affected by government action.

### **1. Objective Scientific Data for the Existence and Scope of an Ecosystem Process.**

The first part of the test would rely on objective scientific data to establish the existence and dynamic of an ecosystem process in the affected area. While this is more difficult with the new principles of conservation biology, it is not impossible and is already done in ecology field work on a regular basis.<sup>153</sup> The function of this evidence would be to demonstrate the relationships and processes within the ecosystem, not merely define its geographical boundaries.

The primary difficulty may not be with the science per se but with the lack of clean, easily definable lines and boundaries a non-scientist judge can easily grasp. It is here that the "process" orientation of conservation biology encounters the specter of the *Daubert* decision and the issue of "falsifiability."<sup>154</sup> It is too early to tell what the outcome of a challenge to conservation biology scientific evidence might be. A possible solution would be the development of an "enhanced preponderance" standard, which would allow evidence with a high degree of probability but less than absolute certainty to establish the existence of an ecosystem.

### **2. Limiting the Scope of the Ecosystem through Causality Analysis.**

One of the basic principles of conservation biology is the recognition that ecosystem processes are affected by events in other ecosystems.<sup>155</sup> The argument has been made by proponents of James Lovelock's Gaia theory that the entire planet is one complex ecosystem, or more specifically, a single organism.<sup>156</sup> How can the scope of a contiguous ecosystem be limited to a judicially acceptable size?

That is the function of the second part of the test. This would consist of a basic causality analysis: an excessively attenuated causal chain or the presence of an excessive number of possible causes of injurious impact other than the challenged government action would cause the argument to fail. This would be a necessary compromise of science to legal requirements. An attempt to extend the contiguous ecosystem to its scientifically possible limits would be a useless and counterproductive enterprise in a legal setting.



### 3. The Nature and Extent of Disruption of the Ecosystem Due to Government Action.

The third part of the test would be a determination of the extent and degree of the potential disruptive impact of the government action on the ecosystem. Once again, this is something that can not be absolutely determined but only estimated based on modelling and field work. Again, an "enhanced preponderance" standard would be the means by which the courts could ask for a degree of likelihood well above 51% while still recognizing the reality of conservation biology: nothing is certain.

Needless to say, this three-part test is only a first step towards devising a means by which plaintiffs and judges might adapt to and adopt the reality of the nonequilibrium paradigm while preserving essential requirements of proof, justiciability, and causation. There are many areas where conflicts will arise. Nonetheless, the issue must be addressed in one way or another by advocates of the ecosystem nexus. Justice Scalia demonstrated that he was either ignorant or uninterested in what an ecosystem was in his decision in *Defenders of Wildlife*.<sup>157</sup> It is imperative that anyone basing an argument for standing based on an ecosystem nexus be able to tell a court exactly what one is, where it is, and what it does.

## VI. Conclusion

The ecosystem nexus is a logical step in the doctrine of environmental standing as it has evolved from *Morton* through *Japan Whaling Ass'n*. Justice Scalia's ill-conceived rejection of the idea in *Defenders of Wildlife* is neither logically consistent with his own prior ruling in *National Wildlife Federation* nor binding as precedent - five justices approved of the ecosystem nexus in one way or another in the former case.

It is difficult to predict how the current Court would rule on the issue. Two of the justices who heard *Defenders of Wildlife* - White (who voted with Scalia) and Blackmun (who wrote the dissent) are gone. Justices Ginsburg and Breyer have yet to rule on any significant environmental cases, though they are currently considering arguments in the potentially epochal *Babbitt v. Sweet Home* case involving the ESA.<sup>158</sup> At least one writer has analyzed Justice Ginsburg's appellate court decisions involving issues of standing, and states that all indications are that she would have granted standing in *Defenders of Wildlife*.<sup>159</sup>

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There appears to be no equivalent analysis of Justice Breyer. While he is known for his strong advocacy of streamlining government regulation of business,<sup>160</sup> he has also been extraordinarily open about his pro-environmentalist position in the *Sweet Home* case.<sup>161</sup>

The tentative conclusion one draws is that the five votes in favor of the ecosystem nexus are still present on the Court - Ginsburg appears likely to be as staunch in her support for it as Blackmun was - and could very likely be joined by a sixth in Breyer. What is essential is that whatever case is employed as the standard bearer not have the weaknesses that *Defenders of Wildlife* had in other areas.

The Court that addresses the issue of the ecosystem nexus will also be addressing a larger issue, which is the growing gap between scientific knowledge and the law. It also must

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*...if the Court refuses to adapt to...new ways of thinking, it is chillingly unlikely that the opportunity will exist for it to admit it was wrong, much less rehabilitate the planet, four hundred years from now.*

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address the dilemma of government policy based on current scientific perspectives in conflict with legal standards based on outdated ones. If the current trend of policy choices based on ecosystem and biodiversity management continues, as it has every appearance of doing, the law is at risk of finding itself irrelevant. How the courts deal with this will be a crucial element in the adaptation of the law to a technological universe. A well-researched,

well-reasoned argument for standing based on an ecosystem nexus, rooted in conservation biology-based evidence of the existence and nature of contiguous ecosystem processes, could be a significant catalyst for this change.

Three hundred and fifty-odd years ago the judges of the Vatican condemned Galileo for proposing and advocating the then-revolutionary Copernican theory of the solar system, which challenged the officially endorsed view of the Church. These judges refused to accept Galileo's observations as evidence; it was enough that the observations challenged orthodoxy. Three hundred and fifty later, the Vatican admitted it had been wrong and "rehabilitated" Galileo.

The judicial system today is being presented with a growing body of ecological scientific innovation and discovery that challenges both received scientific wisdom and the traditional mechanisms and procedures of the law. The stakes are very much higher than they were at Galileo's time: if the Court refuses to adapt to the need for new ways of thinking, it is chillingly unlikely that the opportunity will exist for it to admit it was wrong, much less rehabilitate the planet, four hundred years from now.

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## NOTES

1. 112 S. Ct. 2130 (1992), hereafter *Defenders of Wildlife*.
2. *The Index to Legal Periodicals* lists 22 articles on *Defenders of Wildlife* to date.
3. See, e.g., Cass R. Sunstein, *What's Standing After Lujan?: Of Citizen Suits, "Injuries," and Article III*, 91 MICH. L. REV. 163 (1992).
4. Heather Cox, *Standing to Protect the Global Environment: A Call for Congressional Action*, 13 J. ENERGY, NAT. RES. & ENV. L. 475 (1993).
5. see, e.g., Richard J. Pierce, Jr., *Lujan v. Defenders of Wildlife: Standing as a Judicially Imposed Limit on Legislative Power*, 42 DUKE L. REV. 1170 (1993).
6. *Defenders of Wildlife*, 112 S. Ct. at 2139.
7. U.S. CONST., Art. III, §2, cl. 1.
8. see *Association of Data Processing Serv. Orgs. v. Camp*, 397 U.S. 150, 152 (1970)
9. *Valley Forge Christian College v. Americans United for Separation of Church & State, Inc.*, 454 U.S. 464, 472 (quoting *Simon v. Eastern Kentucky Welfare Rights Org.*, 426 U.S. 26, 41 (1976))
10. *Id.* at 472 (quoting *Simon*, 426 U.S. at 38).
11. Kurt S. Kusiak, Note, *Standing to Sue: A Brief Review of Current Standing Doctrine*, 71 B.U.L. REV. 667 (1991).
12. See *Sierra Club v. Morton*, 405 U.S. 727, 734-35 (1972).
13. Kusiak, *supra* note 68, at 673.
14. *Warth v. Seldin*, 422 U.S. 490, 498 (1975).
15. *Data Processing Serv. Org.*, at 153.
16. *Allen v. Wright*, 468 U.S. 737, 751 (1984).
17. *Warth*, 422 U.S. at 499.
18. *Morton*, 405 U.S. at 729-730.
19. *Id.*
20. *Id.* at 735.
21. The district court granted the preliminary injunction, rejecting the respondents' challenge to the Sierra Club's standing to sue. The respondents appealed, and the 9th Circuit reversed, finding on the standing issue that there was "no allegation in the complaint that members of the Sierra Club would be affected by the actions [of the respondents] other than the fact that the actions are personally displeasing or distasteful to them." *Sierra Club v. Morton*, 433 F.2d 24, 30 (1970).
22. *Morton*, 405 U.S. at 735.
23. 397 U.S. 150 (1970).
24. 397 U.S. 159 (1970).
25. *Morton*, 405 U.S. at 733-735.
26. *Id.* at 734.
27. *Id.* at 735, 736.
28. ROBERT V. PERCIVAL, ALAN S. MILLER, CHRISTOPHER H. SCHROEDER, AND JAMES P. LEAPE, ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY, 723 (1992).
29. 45 S. Cal. L. Rev. 450 (1972).
30. *Morton*, 405 U.S. at 742-43, 752.
31. *Id.* at 757-58.
32. Percival, at 724.
33. *Id.*, at 725.
34. 5 U.S.C. §702.
35. PERCIVAL, at 725.
36. 412 U.S. 669 (1973).
37. PERCIVAL, at 726.
38. *SCRAP*, 412 U.S. at 674.

39. *Id.* at 679.
40. *Id.* at 685.
41. *Id.* at 678.
42. *Id.*
43. The District Court had held that SCRAP had standing to sue, since NEPA implicitly gave courts authority to enjoin any activity that violated NEPA's procedural requirement. This decision was upheld on appeal.
44. *Id.* at 688.
45. *Id.* at 686-87, 698 fn. 14.
46. *Id.* at 686.
47. *Id.* at 687.
48. *Id.*
49. *Id.* at 688.
50. *Id.* at 689.
51. *Percival*, at 726.
52. *Id.*
53. 426 U.S. 26 (1976).
54. *Id.* at 38.
55. 468 U.S. 737 (1984).
56. *Id.* at 759.
57. 478 U.S. 230 (1986).
58. *Id.*
59. *Id.* at 230, fn. 4.
60. *Id.*
61. *Id.*
62. 497 U.S. 871 (1990).
63. *Id.* at 879.
64. *Id.* at 886.
65. *Id.*
66. The District Court found that the NWF members' affidavits referred only to lands in the vicinity of the affected areas, not the areas themselves, and refused to grant standing. The D.C. Circuit reversed, holding that the affidavits, when read in context of the entire record of the case, alleged specific facts sufficient to establish injury in fact for purposes of standing.
67. *National Wildlife Federation*, 497 U.S. at 892-93.
68. *Id.* at 894.
69. *Id.* at 891.
70. *Id.* at 889.
71. *Id.* at 889.
72. *Id.*
73. *Id.* at 886-87.
74. See Matthew C. Porterfield, *Agency Action, Finality, and Geographical Nexus: Judicial Review of Agency Compliance with NEPA's Programmatic Environmental Impact Statement Requirement After Lujan v. National Wildlife Federation*, 28 U. RICH. L. REV. 619 (1994).
75. Eric I. Abraham, *Justice Ginsburg and the Injury in Fact Element of Standing*, 25 SETON HALL L. REV. 267 (1994).
76. 16 U.S.C. §1500 et seq.
77. *Defenders of Wildlife*, 112 S.Ct. at 2135; see also 50 C.F.R. 402.01 (1986)
78. 16 U.S.C. §1540(g).
79. *Defenders*, 112 S. Ct., at 2138.
80. The District Court originally granted the Secretary of the Interior's motion to dismiss for lack of standing. *Defenders of Wildlife v. Hodel*, 658 F.Supp. 43 (Minn. 1987). The Court of Appeals for the Eighth Circuit reversed. *Defenders of Wildlife v. Hodel*, 851 F.2d 1035 (1988). On remand both parties moved for summary judgment. The District Court, citing the appellate decision on the standing issue, granted *Defenders'* motion and ordered the

Secretary to promulgate new regulations. The Eighth Circuit affirmed.

81. *Defenders of Wildlife*, 112 S.Ct. at 2138.
82. *Id.* at 2143, 2145
83. *Id.* at 2139-40.
84. *Id.* at 2140.
85. *Id.* at 2142-43.
86. *Id.* at 2145.
87. see *supra* notes 2-5 for a selection of articles on *Defenders of Wildlife*.
88. Pierce, *supra* note 168, at 1174.
89. *Defenders of Wildlife*, 112 S. Ct. at 2139.
90. *Id.*
91. Brief for Respondents at 20, *Lujan v. Defenders of Wildlife*, 112 S. Ct. 2130 (1992) (No. 90-1424).
92. *Defenders of Wildlife* at 2139, citing *National Wildlife Federation*, 497 U.S. at 887-889.
93. *Defenders of Wildlife*, 112 S. Ct. at 2139.
94. *Id.* at 2146, quoting *Morton*, 405 U.S. at 735.
95. *Defenders of Wildlife*, 112 S.Ct. at 2146, quoting *Los Angeles v. Lyons*, 461 U.S. 95, 101 (1983).
96. *Defenders of Wildlife*, 112 S. Ct. at 2146.
97. *Id.*
98. *Japan Whaling Assn.*, 478 U.S. at 231, n. 4.
99. *Id.* at 2146-47.
100. *Id.* at 2147.
101. *Id.* at 2148.
102. *Id.*
103. *Id.* at 2149.
104. *Id.*
105. *Id.* at 2147, 2149.
106. *Id.* at 2148, fn. 1.
107. *Id.* at 2154.
108. *Id.* See *supra*, notes 67-75 and accompanying text.
109. *Defenders of Wildlife*, 112 S.Ct. at 2154.
110. Brief for Respondents at 20, *Defenders of Wildlife*, 112 S.Ct. 2130 (1992) (No. 90-1424).
111. *Defenders of Wildlife*, 112 S.Ct. at 2154.
112. *Id.*
113. *Id.* at 2146.
114. WEBSTER'S NEW COLLEGIATE DICTIONARY 357 (1981).
115. HENRY GEORGE LIDDELL AND ROBERT SCOTT, A SHORTER GREEK LEXICON 478 (1958).
116. A.G. Tansley, *The Use and Abuse of Vegetational Concepts and Terms*, 16 ECOLOGY 284, 306 (1935).
117. A. Dan Tarlock, *The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law*, 27 LOY.L.A. L.REV. 1121, 1122 (1994).
118. Charles J. Meyers, *An Introduction to Environmental Thought: Some Sources and Some Criticisms*, 50 IND. L.J. 426 (1975).
119. ALDO LEOPOLD, A SAND COUNTY ALMANAC, 224-25 (1949).
120. RACHEL L. CARSON, SILENT SPRING (1962).
121. Judy L. Meyer, *The Dance of Nature: New Concepts in Ecology*, 68 CHI-KENT L. REV. 875, 876 (1994).
122. *Id.*
123. Tarlock, *supra* at 1127.
124. *Id.* at 1122.
125. 16 U.S.C. §1131-1136.
126. 42 U.S.C. §§4321-4370(d).
127. 16 U.S.C. §§1531-1544.
128. 33 U.S.C. §§1251-1387.

129. Whether this curve is moving forward, backward, up, down, or nowhere in particular is a question beyond the scope of this paper.
130. Tarlock, *supra* at 1123.
131. *Id.* at 1130.
132. Meyer, *supra* at 876.
133. DANIEL B. BOTKIN, DISCORDANT HARMONIES: A NEW ECOLOGY FOR THE TWENTY-FIRST CENTURY, note 22 (1990)
134. BILL MCKIBBEN, THE END OF NATURE (1989).
135. Eugene P. Odum, *Great Ideas for Ecology for the 1990s*, 42 BIOSCIENCE 542 (1992).
136. Steward T.A. Pickett et al., *The New Paradigm in Ecology: Implications for Conservation Biology Above the Species Level*, in CONSERVATION BIOLOGY: THE THEORY AND PRACTICE OF NATURE CONSERVATION PRESERVATION AND MANAGEMENT 65 (Peggy L. Fiedler & Subodh K. Jain, eds., 1992).
137. Meyer, *supra* at 877.
138. Tarlock, *supra* at 1134.
139. *Id.* at 1135.
140. *Id.* at 1136.
141. *Id.* at 1137.
142. 113 S.Ct. 2786 (1993).
143. Tarlock, *supra* at 1138.
144. *Daubert*, 113 S.Ct. at 2796.
145. Tarlock, *supra* at 1130.
146. *Id.* See also Reed F. Noss, *Some Principles of Conservation Biology, As They Apply to Environmental Law*, 69 CHI-KENT L.REV. 893 (1994).
147. Noss, *supra* at 897.
148. Tarlock, *supra* at 1139.
149. *Id.*
150. see *supra*, III(B).
151. Tarlock, *supra* at 1140.
152. *Id.* at 1141-1143.
153. Robert B. Keiter, *Conservation Biology and the Law: Assessing the Challenges Ahead*, 69 CHI-KENT L. REV. 911, 919 (1994).
154. *Daubert*, 113 S. Ct. at 2796.
155. Meyer, *supra* at 883.
156. JAMES LOVELOCK, GAIA: A NEW LOOK AT LIFE ON EARTH (1979).
157. see *supra*, notes 88-92, 106-111 and accompanying text.
158. *Babbitt v. Sweet Home Chapter of Communities for a Greater Oregon*, No. 94-859 (1995).
159. Abraham, *supra* at 309-310.
160. see STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION (1993)
161. Linda Greenhouse, *Justices Hear Crucial Environmental Case*, N.Y. TIMES, April 18, 1995, at A12.