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NATURALNESS AND BIODIVERSITY: WHY NATURAL CONDITIONS SHOULD BE MAINTAINED WITHIN PROTECTED AREAS

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INTRODUCTION

There is an important controversy concerning how national parks, wilderness, and other protected areas are to be managed in the United States. Federal environmental legislation and policy require that managers seek to maintain natural conditions or "naturalness," the term used by management experts, within protected areas. The Wilderness Act of 1964, for example, defines wilderness as an area that retains its "primeval character and influence" and is "managed so as to preserve its natural conditions. . . ."[1] The Act is properly interpreted as mandating the preservation of natural conditions within wilderness areas.[2] A number of leading experts in protected area management have argued, however, that natural conditions or naturalness should be abandoned as a mandatory goal in protected area management. In the recently published book, *Beyond Naturalness*, David Cole, Laurie Yung, and other management experts claim that given widespread, human-caused environmental stresses such as acid rain, invasions of exotic species, and climate change, natural conditions are in fact no longer attainable in these areas.[3] According to these experts, naturalness is vague and offers little guidance in management.[4] They strongly recommend changes in protected area law and policy to

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[1] Wilderness Act of 1964, 16 U.S.C. § 1131 (2006).

[2] *See* Jerry F. Franklin & Gregory H. Aplet, *Wilderness Ecosystems*, *in* WILDERNESS MANAGEMENT: STEWARDSHIP AND PROTECTION OF RESOURCES AND VALUES 263, 269–70 (John C. Hendee & Chad P. Dawson eds., 3d ed. 2002).

[3] *See* BEYOND NATURALNESS: RETHINKING PARK AND WILDERNESS STEWARDSHIP IN AN ERA OF RAPID CHANGE 50–51, 57–58 (David N. Cole & Laurie Yung eds., 2010) [hereinafter BEYOND NATURALNESS]. Contributing authors include, among others, Peter Landres, Eric Higgs, David Graber, Gregory Aplet, and Constance Millar. The book has been highly praised by management experts. *Id.* at back cover.

[4] *Id.* at 77–78, 253–56.

allow alternative goals.[5] According to these experts, managers must regularly intervene in protected areas to conserve "what we value" in these areas, including biodiversity, without the limitation of natural conditions.[6]

In this Article, I will argue that naturalness (natural conditions) should be maintained as a mandatory goal in the management of protected areas. It will be important to describe in detail what naturalness as a management goal consists of. Within *Beyond Naturalness*, Cole, Yung, and other authors misrepresent the naturalness mandated within protected area law and policy. I wish to defend the claim that naturalness, properly understood, is necessary for the preservation of native biodiversity. I will describe an interesting case study in which managers have intervened in wilderness to conserve "what we value" without respect for natural conditions, and native amphibians have been threatened as a result. Indeed, examples of management intervention in protected areas that supposedly show, according to Cole and others, the need to go beyond naturalness actually demonstrate the necessity of maintaining natural conditions. Naturalness should be considered an essential, broad goal under which managers can manage most effectively in the face of acid rain, exotic species, climate change, and other human-caused stresses. According to National Park Service and other federal agency policies, flexibility is allowed in special circumstances. Naturalness is not imposed in an inflexible fashion. But naturalness should remain a mandatory goal in protected area management for very good ecological and, this Article argues, social reasons.

I. NATURALNESS IN AGENCY POLICIES

Management experts have characterized naturalness in several different ways. There is no generally accepted interpretation. In *Beyond Naturalness*, Cole and other management experts frequently characterize "naturalness" in this extreme way: a lack of human influence and freedom from intentional human control and manipulation.[7] They write, for example, "naturalness implies both a lack of human impact and a lack of human control."[8] "Natural areas should be pristine," they write, "uninfluenced by humans, or at least modern technological humans."[9] Naturalness

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[5] As will be discussed, recommended alternative goals include enhancing ecosystem resilience and maintaining ecological integrity. *See id.* at 85–87, 259–62, 267.
[6] *Id.* at 7.
[7] *Id.* at 86, 89.
[8] *Id.* at 8.
[9] BEYOND NATURALNESS, *supra* note 3, at 13.

implies, according to these experts, "freedom from intentional human control, intervention, and manipulation."[10] This characterization is too strong. Surely an area can retain its natural conditions even though it has been affected to some extent by humans—even modern technological humans. An area need not be pristine, entirely free of human influence, to be natural. Cole and other experts correctly point out that there is no area on the planet that has not been influenced to some extent by contemporary humans.[11] Examples of widespread human influence include acid rain, the spread of exotic species, and global climate change.[12] By the above characterization, no area on the planet, even a remote wilderness area, can be considered to retain its natural conditions, which seems counterintuitive. In an earlier article, Peter Landres and others define "naturalness" in this way: "unaffected by contemporary . . . [human] influences."[13] This definition is also too strong. Again, an area need not be pristine to be natural.

Within *Beyond Naturalness*, naturalness is also characterized in a more moderate and accurate way. At one point, naturalness is described as minimal human influence, rather than a lack of human influence, and minimal control over nature.[14] But the reader must look closely for such descriptions. Throughout the book, the authors emphasize the extreme characterization of naturalness, and especially this aspect of it: freedom from intentional human control and manipulation.[15] In the final chapter, for example, naturalness is characterized in part as "freedom from intentional human control . . . the absence of human manipulation of ecosystems."[16] Cole and others correctly point out that federal legislation and policy governing protected areas mandate the preservation of naturalness within these areas.[17] Yet they strongly imply in places, and sometimes outright assert, that such legislation and policy mandate complete

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[10] *Id.* at 89. Naturalness "focuses on freedom from intentional human control." *Id.* at 86.
[11] Cole and others write, "[e]ven the most remote places on Earth are affected by human activities. Every acre of every park and wilderness has been and will continue to be affected, to some degree, by the activities of modern technological humans." *Id.* at 23.
[12] *See id.* at 1.
[13] *See* Peter B. Landres et al., *Naturalness and Natural Variability: Definitions, Concepts, and Strategies for Wilderness Management*, *in* WILDERNESS AND NATURAL AREAS IN EASTERN NORTH AMERICA: RESEARCH, MANAGEMENT AND PLANNING 41, 44 (David L. Kulhavy & Michael H. Legg eds., 1998).
[14] *See* BEYOND NATURALNESS, *supra* note 3, at 17.
[15] *Id.* at 86, 89.
[16] *Id.* at 253–54.
[17] *See id.* at 12–13, 31, 50, 253.

freedom from human control and manipulation.[18] At one point, for example, these experts claim that within protected area law and policy naturalness provides the foundation for the management of these areas, and they immediately add that the meaning of "naturalness" includes "freedom from intentional human control."[19] They describe the Wilderness Act of 1964 as requiring the preservation of designated wilderness areas in their "untrammeled" condition, adding that "untrammeled" is interpreted as "freedom from human control."[20] Cole and others recommend revisions of protected area law and policy to remove naturalness as a mandatory management goal.[21] Indeed, this is a major theme of the book.[22] Yet the naturalness mandated within such law and policy is not extreme naturalness. As discussed below, protected area law and policy clearly require managers to intervene in these areas in appropriate circumstances.[23] Through carelessness, perhaps, or a desire to be as persuasive as possible, authors of *Beyond Naturalness* have misrepresented the naturalness mandated within protected area legislation and policy.[24]

Beyond Naturalness, and an earlier article authored by these same experts, *Naturalness and Beyond: Protected Area Stewardship in an Era of Global Environmental Change*,[25] are written such that the reader may be easily misled into believing that the controversy in protected area management is much simpler than it really is. The reader may easily come away after reading the book or the earlier article believing that protected area legislation and policy are far too restrictive and unreasonable, mandating a total absence of human control and manipulation in these areas. The reader may believe that the controversy is over whether or not managers should be allowed to intervene in these areas. Indeed, on the first page of the book, Cole and others write, "[w]e cannot preserve parks and wilderness by drawing a line around them and leaving them alone,"[26] as

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[18] *See id.* at 8, 12–13, 17, 253–54.
[19] *Id.* at 13.
[20] BEYOND NATURALNESS, *supra* note 3, at 17. In an earlier article written by these same authors, "untrammeled" is characterized as "not . . . intentionally controlled or manipulated for any purpose, even the conservation of biodiversity." David N. Cole et al., *Naturalness and Beyond: Protected Area Stewardship in an Era of Global Environmental Change*, 25 GEORGE WRIGHT FORUM 36, 42 (2008).
[21] *Id.* at 26, 259–62, 267.
[22] *See id.*
[23] *See infra* notes 28–49 and accompanying text.
[24] They also express concern with the National Park Service Organic Act of 1916. BEYOND NATURALNESS, *supra* note 3, at 12.
[25] *See generally* Cole et al., *supra* note 20.
[26] BEYOND NATURALNESS, *supra* note 3, at 1.

though this is a major point of contention.[27] National Park Service, Forest Service, and other federal agency policies do not require that managers "draw a line around" protected areas and "leave them alone."[28] These agencies do not practice "hands-off management and the absence of human manipulations of ecosystems."[29] That managers should intervene in these areas in appropriate circumstances is not a controversial issue.

Let us first consider the National Park Service's *Management Policies*, which governs the management of national parks and monuments.[30] Within these policies, "natural condition" is characterized as "the condition of resources that would occur in the absence of human dominance over the landscape."[31] Presumably, however, in speaking of natural conditions, one is not limited to referring to a landscape. To speak of the natural conditions of an ecosystem, a wetland for example, one is surely speaking of the condition of resources that would occur in the absence of human dominance over that ecosystem rather than the entire landscape.[32] The area referred to shifts depending on the area of concern.[33] Simply expressed, "natural condition" is understood within these policies as the absence of human dominance over the area. As conceived here, an area need not be pristine to be natural. An area may have been influenced by humans to some extent, managers may exert some degree of control, yet the area is natural—retains its natural conditions—as long as human influence does not dominate the area. Intuitively, this makes much sense. Alternatively, naturalness is conceived within these policies as an area generally free of human influence.[34]

Park Service policies clearly mandate interventions in park ecosystems in special circumstances. In cases of human-caused disturbance,

> The Service will reestablish natural functions and processes in parks. . . . The Service will seek to return such

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[27] *See id.* at 1.
[28] *Id.*
[29] *Id.* at 253–54.
[30] *See generally* NAT'L PARK SERV., U.S. DEP'T OF THE INTERIOR, MANAGEMENT POLICIES (2006), *available at* http://www.nps.gov/policy/mp2006.pdf.
[31] *Id.* at 36.
[32] *See, e.g.*, *id.* at 51–52.
[33] *See id.* at 36.
[34] As this Article discusses later, other agencies have adopted this interpretation. In a later article, Peter Landres suggests this helpful characterization of naturalness: "substantially free from the effects of modern civilization." Peter Landres, *Developing Indicators to Monitor the "Outstanding Opportunities" Quality of Wilderness Character*, INT'L J. WILDERNESS, Dec. 2004, at 8, 10.

> disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated.[35]
>
> Biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural condition when a truly natural system is no longer attainable.[36]

Concerning the management of park plants and animals, the policies state,

> The National Park Service will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems.[37]
>
> The Service will successfully maintain native plants and animals by preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur.[38]

Managers are also directed to "restor[e] native plant and animal populations in parks where they have been extirpated by past human-caused actions."[39] Also, according to these policies,

> The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. . . . The Service will . . . undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats; control detrimental nonnative species; manage detrimental visitor access; and reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend.[40]

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[35] NAT'L PARK SERV., *supra* note 30, at 39.
[36] *Id.* at 37.
[37] *Id.* at 42.
[38] *Id.*
[39] *Id.*
[40] *Id.* at 45.

According to Park Service policies, if damaged by human activities, managers must preserve or restore natural park ecosystems along with all native plants and animals in their natural abundances, dynamics, distributions, and habitats.[41] This is hardly a "hands off" approach. Managers are required to "seek to return" a disturbed area to the "natural conditions and processes" characteristic of the appropriate ecological zone.[42] Physical and biological processes disturbed by humans "may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural condition. . . ."[43] These policies go on to provide as examples the use of prescribed, management-ignited fire and the artificial control of ungulates in the absence of predators.[44] Managers are required to use these and other measures to mimic as closely as possible essential natural processes that have been damaged by humans and cannot recover naturally.[45] According to these policies, managers must "protect, and strive to recover" all species listed under the federal Endangered Species Act as well as their habitats.[46] Managers are required to restore damaged habitats and reintroduce these species if necessary.[47] Exotic species that threaten park resources and can feasibly be controlled must be controlled "up to and including eradication."[48] Managers are required to prepare and implement a fire management plan that specifies measures for reducing hazardous accumulations of fuels, possibly including the use of prescribed fire.[49]

The naturalness mandated within Park Service policies allows for such interventions, yet management interventions must be as minimal and infrequent as possible.[50] These policies state, "[t]he Service will not intervene in natural biological or physical processes, except . . . ," for example, "to restore natural ecosystem functioning that has been disrupted by . . . human activities."[51] The policies add, "[a]ny such intervention will be kept to the minimum necessary to achieve the stated management

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[41] NAT'L PARK SERV., *supra* note 30, at 42.
[42] *Id.* at 39.
[43] *Id.* at 37.
[44] *Id.*
[45] Note the wording: "[b]iological or physical processes *may need* to be actively managed. . . ." *Id.* at 37 (emphasis added).
[46] *Id.* at 45.
[47] NAT'L PARK SERV., *supra* note 30, at 39.
[48] *Id.* at 48.
[49] *Id.* at 49–50.
[50] *Id.* at 37.
[51] *Id.*

objectives."[52] These policies also require that managers "minimiz[e] human impacts on native plants, animals, . . . ecosystems, and the processes that sustain them."[53] Interventions are to be as minimal and infrequent as possible, but interventions in appropriate circumstances, such as human-caused damage, are clearly required.[54]

According to the U.S. Forest Service's policy document, the *Forest Service Manual*, the Wilderness Act of 1964 mandates that the agency "preserve natural ecological conditions" in designated wilderness areas.[55] The *Forest Service Manual* announces management objectives including: "[m]aintain[ing] wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces."[56] This statement is misleading. As the *Forest Service Manual* points out, the Wilderness Act allows mining on valid claims within wilderness areas, as well as livestock grazing, fire control, disease and insect control, and visitor use.[57] The *Forest Service Manual* notes that wilderness areas must be managed within these and other legal constraints.[58] The *Forest Service Manual* explains that "the [primary] goal of wilderness management is to . . . close the gap" between current conditions in a wilderness area and the level of purity or pristineness that is attainable in that area given the legal constraints.[59] In accordance with this goal, the *Forest Service Manual* presents this fundamental mandate: "manage wilderness toward attaining the highest level of purity within wilderness within legal constraints."[60] This is the mandate upon which all management objectives and policies rest. Requirements, discussed below,[61] such as restoring watersheds damaged by human activities and protecting threatened and endangered species, are intended as specific ways through which managers are to fulfill this fundamental mandate. The *Forest Service Manual* explicitly states that the Wilderness Act does not mandate the preservation of "absolute wilderness"—wilderness

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[52] *Id.*
[53] NAT'L PARK SERV., *supra* note 30, at 42.
[54] *Id.* at 37.
[55] U.S. FOREST SERV., U.S. DEP'T OF AGRICULTURE, FOREST SERVICE MANUAL, CHAPTER 2320—WILDERNESS MANAGEMENT 6 (2007), *available at* http://www.fs.fed.us/im/directives/fsm/2300/2320.doc.
[56] *Id.* at 7.
[57] *Id.* at 11.
[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] *See infra* notes 65–76 and accompanying text.

in which there is a complete lack of human influence.[62] Yet, according to the *Forest Service Manual*, the Act mandates the preservation of "natural ecological conditions."[63] "Natural conditions" is understood within these policies, then, not as pristine, but, simply expressed, as generally free of human influence.[64]

Forest Service policies clearly require interventions to restore natural conditions in designated wilderness areas in cases of human-caused damage.[65] An objective announced within these policies is to "[m]anage forest cover to retain the primeval character of the environment and to allow natural ecological processes to operate freely."[66] This is a mandate to restore the natural appearance—primeval character—of forest cover damaged by human activities.[67] An example would be damage as a result of timber cutting. Managers are required to "remove or disguise the evidence of cutting."[68] According to the *Forest Service Manual*, active reforestation is allowed only if there is no reasonable expectation of natural recovery.[69] The *Forest Service Manual* also presents this mandate: "[u]se watershed improvements to restore watersheds where deteriorated soil or hydrologic conditions caused by humans or their influences create a serious threat or loss of wilderness values."[70] Managers must restore watersheds in cases of human-caused damage to soil or hydrological conditions that result in loss of wilderness values.[71] An example would presumably be damage to riparian areas caused by grazing livestock. In their efforts to restore watersheds, managers must "[u]se indigenous or appropriate naturalized species to reestablish vegetation. . . ."[72]

Concerning the management of native fish and wildlife, the *Forest Service Manual* states a policy to "[m]anage wilderness to protect known populations of federally listed threatened or endangered species where

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[62] U.S. FOREST SERV., *supra* note 55, at 11–12.
[63] *Id.* at 6.
[64] *Id.* at 11–12.
[65] *Id.* at 30.
[66] *Id.* at 38. Within the *Forest Service Manual*, the "objectives" provide general management mandates. The "policies," listed beneath the objectives, state more specific requirements that are to be met as managers satisfy the objectives. *Id.* All these statements are directives or mandates. *See id.*
[67] *Id.*
[68] This is explicitly required in cases of management cutting of timber. *See* U.S. FOREST SERV., *supra* note 55, at 38.
[69] *Id.* at 39.
[70] *Id.* at 35.
[71] *Id.*
[72] *Id.*

necessary for their perpetuation and aid in their recovery in areas of previous habitation."[73] This is a mandate to improve habitat, with use of appropriate structures, where necessary for the continued existence of known populations of threatened or endangered species.[74] Managers are required to reintroduce these species if necessary for the recovery of populations in areas of previous habitation.[75] According to the *Forest Service Manual*, habitat improvement projects are allowed only in cases of "abnormal human influence," and the project must be necessary to protect a federally listed threatened or endangered species or to "sustain a primary value of a given wilderness."[76] "Reintroduce wildlife species," the *Forest Service Manual* states, "only if the species was once indigenous to an area and was extirpated by human induced events."[77] The *Forest Service Manual* also presents this directive: "protect wildlife and fish indigenous to the area from human caused conditions that could lead to Federal listing as threatened or endangered."[78] Managers must improve habitat for native fish and wildlife, with the use of appropriate structures, where necessary to alleviate the impacts of human-caused conditions that could lead to federal listing.[79] This is also a mandate to reintroduce native species where

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[73] *Id.* at 30.

[74] The *Forest Service Manual* directs managers to apply a supplemental policy and guidelines document concerning the management of fish and wildlife in wilderness areas. U.S. FOREST SERV., *supra* note 55, at 30. According to this document, "[a]ctions necessary to conserve or recover threatened or endangered species, including habitat manipulation . . . will be considered and may be authorized by the Federal administering agency." ASS'N OF FISH & WILDLIFE AGENCIES, BUREAU OF LAND MGMT., U.S. DEP'T OF AGRICULTURE, FOREST SERV., POLICIES AND GUIDELINES FOR FISH AND WILDLIFE MANAGEMENT IN NATIONAL FOREST AND BUREAU OF LAND MANAGEMENT WILDERNESS 9 (2006) [hereinafter ASS'N OF FISH & WILDLIFE AGENCIES], *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2007.Par.31564.File.dat/im2007-052attach1.pdf. The Forest Service recognizes that habitat improvements, with use of structures or facilities, may be necessary to conserve or protect known populations of threatened or endangered species: "[f]acility development and habitat alteration may be necessary to alleviate adverse impacts caused by human activities on fish and wildlife." *Id.* at 7.

[75] ASS'N OF FISH & WILDLIFE AGENCIES, *supra* note 74, at 9 (stating that "[t]hreatened and endangered species may be transplanted into previously occupied habitat within wilderness."). *See also id.* at 13 (stating that "[t]ransplants (removal, reintroduction, or supplemental introduction) of terrestrial wildlife species in wilderness may be permitted if necessary: (a) to perpetuate or recover a threatened or endangered species.").

[76] U.S. FOREST SERV., *supra* note 55, at 33.

[77] *Id.* at 31.

[78] *Id.* at 30.

[79] ASS'N OF FISH & WILDLIFE AGENCIES, *supra* note 74, at 8.

necessary.[80] As these examples illustrate, according to Forest Service policies managers are required to play an active role in wilderness areas, with interventions required in cases of human-caused damage.

Managers are required to allow nature to heal itself if possible. The *Forest Service Manual* directs managers to restore watersheds in cases of human-caused damage to soil or hydrological conditions with loss of wilderness values, but the policies go on to require managers to "[p]romote natural healing . . . where natural vegetation would return in a reasonable time."[81] In the management of forest cover disturbed by human activities, managers are required to "allow, whenever possible, the natural process of healing."[82] Managers are to intervene in disturbed forests "only as a last resort."[83] Clearly, interventions in wilderness areas are to be as minimal and infrequent as possible. "Manage the wilderness resource to ensure its character and values are dominant and enduring," the *Forest Service Manual* states in advising managers of their role.[84] One announced objective is to "[p]rovide an environment where the forces of natural selection and survival rather than human actions determine which and what numbers of wildlife species will exist."[85] Furthermore, in another document the agency has adopted this general policy statement: "[m]anagement activities will be guided by the principle of doing only the minimum necessary to conserve and, if necessary, to enhance fish and wildlife resources, and to manage the area as wilderness."[86]

It should be mentioned that although the Wilderness Act mandates the preservation of designated wilderness areas in their "untrammeled" condition, the primary author of the Act, Howard Zahniser, explained that "untrammeled" means "not subject to human controls and manipulations that hamper the free play of natural forces."[87] The Wilderness Act was written to allow minor manipulations of wilderness as long as they do not

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[80] *Id.* at 11 (stating that "[t]ransplants . . . of terrestrial wildlife species . . . may be permitted if necessary . . . (b) to restore the population of an indigenous species.").
[81] U.S. FOREST SERV., *supra* note 55, at 35.
[82] *Id.* at 38.
[83] *Id.*
[84] *Id.* at 6.
[85] *Id.* at 30.
[86] ASS'N OF FISH & WILDLIFE AGENCIES, *supra* note 74, at 5.
[87] 16 U.S.C. § 1131 (2006); U.S. DEP'T OF AGRIC., FOREST SERV., MISCELLANEOUS PUBL'N NO. 1365, WILDERNESS MGMT. (1978). The Wilderness Act defines wilderness, in part, as untrammeled, and the Act is properly interpreted as mandating that wilderness areas remain untrammeled. *See* Franklin & Aplet, *supra* note 2, at 269–70. For the meaning of "untrammeled," *see* MARK HARVEY, WILDERNESS FOREVER: HOWARD ZAHNISER AND THE PATH TO THE WILDERNESS ACT 203 (2005).

hinder natural processes, or "hamper the free play of natural forces."[88] Examples include the placement of directional signs for visitor safety. The Wilderness Act also mandates that wilderness areas be managed to preserve their natural conditions,[89] but this also allows minor manipulations. In accordance with Forest Service and other federal agency policies, to be natural an area must remain generally free of human influence rather than pristine.[90] The Wilderness Act allows substantial manipulations of wilderness in special circumstances, including the construction of temporary roads, use of motorized equipment and mechanical transport, and the placement of structures or installations.[91] The Act generally prohibits such uses within wilderness areas,[92] but it includes an important exception clause that allows for such uses when they are, as interpreted by the Forest Service, "necessary for protection and administration of the wilderness."[93] Cole and other management experts claim that the Wilderness Act was intended to "protect nature by keeping our hands off."[94] This is too extreme and is not accurate. To be sure, the Wilderness Act is highly restrictive, but it is not as restrictive as Cole and others claim.

According to the Bureau of Land Management's ("BLM") policy document, the *BLM Manual*, the Wilderness Act mandates that "wilderness areas be managed to provide for their protection, [and] the preservation of their natural conditions. . . ."[95] The *BLM Manual* presents this directive: "[t]he BLM will keep watersheds, water bodies, water quality, and soils in a natural condition and will allow associated ecological processes previously altered by human influence to return to their natural condition."[96] This is a mandate to restore watersheds damaged by human activities.[97] According to these policies, watershed restoration is allowed only in cases of human-caused damage to soil or hydrological conditions with loss of wilderness values.[98] An example would be damage to riparian areas caused

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[88] HARVEY, *supra* note 87, at 203.
[89] 16 U.S.C. § 1131 (2006). *See* Franklin & Aplet, *supra* note 2, at 269–70.
[90] *See* U.S. FOREST SERV., *supra* note 55, at 6.
[91] *Id.* at 6, 28, 44.
[92] 16 U.S.C. § 1133(c) (2006).
[93] U.S. FOREST SERV., *supra* note 55, at 53. This will be further discussed below.
[94] BEYOND NATURALNESS, *supra* note 3, at 17.
[95] BUREAU OF LAND MGMT., U.S. DEP'T OF INTERIOR, BLM MANUAL 8560—MANAGEMENT OF DESIGNATED WILDERNESS AREAS .08(A)(1) (1983), *available at* http://www.wilderness.net/NWPS/documents/BLM/BLM_Manual_Wilderness.pdf [hereinafter BLM].
[96] *Id.* at .11(3).
[97] *See id.*
[98] *Id.* at .36(A)(1). Watershed restoration is also allowed in cases in which the damage to soil or hydrological conditions, though naturally caused, poses a danger to life or property. *Id.*

by grazing livestock. Concerning the management of plants and animals, these policies state,

> BLM must foster a natural distribution of native species of wildlife, fish, and plants by ensuring that natural ecosystems and ecological processes continue to function naturally. The BLM minimizes human influence on wildlife populations and works to prevent the extinction by human causes of plants and animals found in the areas.[99]

Managers are required to maintain ecosystems in their natural conditions with natural distributions of all native plant and animal species.[100] This is a mandate to restore forests damaged by human activities.[101] Active reforestation—planting trees—is allowed, according to these policies, only if there is significant loss of wilderness values and a lack of natural revegetation.[102] Only native species and primitive methods, such as hand planting, may be used.[103]

Concerning the management of fish and wildlife specifically, the *BLM Manual* presents this directive: "[m]anagement seeks a natural distribution, number, and interaction of indigenous species of fish and wildlife. Natural processes are allowed to occur in wilderness ecosystems . . . as far as possible without human influences. Management protects the conditions that allow natural processes a maximum degree of freedom."[104] The BLM "seeks" natural distributions and abundances of native fish and wildlife.[105] This is a mandate to improve habitat, with use of appropriate structures, and to reintroduce native fish and wildlife where necessary to maintain natural distributions and abundances.[106] According to the *BLM Manual*, habitat improvement projects are allowed in wilderness

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[99] *Id.* at .11(1).
[100] *Id.*
[101] BLM, *supra* note 95, at .33(D).
[102] *Id.*
[103] *Id.*
[104] *Id.* at .34. This and other parts of section .34 provide mandates that apply to specific activities: fish and wildlife management, forest management, and fire management, etc. They are intended as applications of the general policies announced in .01 and .02, and also reflect other applicable laws and regulations. *See id.* at .01–.02.
[105] *Id.* at .34.
[106] There are situations in which the construction of structures or facilities "may be necessary for the continued existence or welfare of wildlife or fish living in wilderness." BLM, *supra* note 95, at .34(C)(6); *see also* ASS'N OF FISH & WILDLIFE AGENCIES, *supra* note 74, at 8, 11–12.

only to protect federally listed threatened or endangered species or to "correct unnatural conditions resulting from human influence."[107] Fish and wildlife may be reintroduced only if a species is native and has been lost as a result of human activities.[108]

Nature must be allowed to heal itself if possible. According to the *BLM Manual*, active revegetation of watersheds is not allowed if "natural vegetation may be expected to return in a reasonable time."[109] Reforestation is allowed only "in the absence of natural revegetation."[110] Habitat improvements for fish or wildlife are allowed only if natural processes have been unsuccessful.[111] There are several indications that, according to BLM policies, management interventions in wilderness areas must be as minimal and infrequent as possible. According to the *BLM Manual*, wilderness areas "must be managed so as to be affected primarily by the forces of nature."[112] Natural processes must be allowed to occur "as far as possible without human influences."[113] Along with the Forest Service, the BLM has adopted this statement of general policy: "[m]anagement activities will be guided by the principle of doing only the minimum necessary to conserve and, if necessary, to enhance fish and wildlife resources, and to manage the area as wilderness."[114]

As mentioned, Cole and other authors of *Beyond Naturalness* recommend changes in protected area law and policy to remove the current emphasis on naturalness. "[N]ew concepts are needed to guide management," they write.[115] In contrast to claims made within the book, however, federal agency policies do not mandate "hands off" management—complete freedom from intentional human control and manipulation—within protected areas.[116] Agency policies clearly require interventions to restore natural conditions in cases of human-caused damage.[117] The naturalness

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[107] BLM, *supra* note 95, at .34(C)(3).
[108] *Id.* at .21(D)(1).
[109] *Id.* at .36(A)(1), .36(A)(2).
[110] *Id.* at .33(D).
[111] *Id.* at .21(C)(5).
[112] *Id.* at .11.
[113] BLM, *supra* note 95, at .34.
[114] ASS'N OF FISH & WILDLIFE AGENCIES, *supra* note 74, at 5.
[115] BEYOND NATURALNESS, *supra* note 3, at 26.
[116] *See id.* at 8, 12–13, 253–54.
[117] At one point, Cole and others briefly acknowledge that National Park Service policies mandate interventions. *Id.* at 77. They do not indicate the extent of the required interventions. U.S. Fish and Wildlife Service policies will not be discussed in detail. But these policies clearly require interventions to maintain natural conditions within wilderness areas in the agency's refuge system. According to the agency's *Service Manual*, managers

mandated within agency policies allows for management interventions as long as an area remains generally free of human influence or, following agency language, human influence does not dominate the area.[118] As mentioned, Park Service, Forest Service, and other federal agency policies allow substantial manipulations of wilderness areas, with deviations from naturalness generally prohibited by the Wilderness Act—construction of temporary roads, use of motorized equipment and mechanical transport, placement of structures, etc.—if "necessary for protection and administration of the wilderness" or similar language.[119] According to agency policies, management interventions in protected areas must be as minimal and infrequent as possible, but in actual practice, interventions can be quite extensive and ongoing.[120] Cole and others effectively criticize the view that humans should *never* intervene in protected areas, but no agency practices such an extreme approach.[121]

In *Beyond Naturalness*, Cole and others claim that associated with naturalness is the antiquated ecological view that nature is largely predictable and static.[122] According to this view, associated with Frederic Clements, each ecosystem is at, or is developing towards, an equilibrium point called a "climax community."[123] An ecosystem at this point is relatively unchanging.[124] Upon disturbance, an ecosystem gradually proceeds back towards the climax community, but disturbances are considered rare.[125] The currently accepted view is that nature is dynamic; an ecosystem is

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are required to "[s]ecure 'an enduring resource of wilderness' by maintaining and, where appropriate, restoring, a wilderness area's biological integrity, diversity, environmental health, and wilderness character." U.S. FISH & WILDLIFE SERV., SERVICE MANUAL 610 FW 2, GENERAL OVERVIEW OF WILDERNESS STEWARDSHIP POLICY 1.14(B) (2008), *available at* http://www.fws.gov/policy/610fw1.html. Also, "[w]e conserve fish, wildlife, and plant resources and their habitats . . . in wilderness." *Id.* at 2.16(A). "We minimize actions for administration of wilderness areas." *Id.* at 1.14(D).

[118] *See* NAT'L PARK SERV., *supra* note 30, at 36. U.S. Fish and Wildlife Service policies describe wilderness as "a place where human uses . . . do not dominate." U.S. FISH & WILDLIFE SERV., *supra* note 117, at 1.13(D). According to Forest Service policies, wilderness "character and values" must remain "dominant and enduring." U.S. FOREST SERV., *supra* note 55, at 6.

[119] U.S. FOREST SERV., *supra* note 55, at 54. This will be further discussed below.

[120] *See* BEYOND NATURALNESS, *supra* note 3, at 77.

[121] *See id.* at 18.

[122] *See id.* at 42–43.

[123] *See id.* at 15, 35, 42–43, 46. According to the older view, the climax community is not individual or specific to a given ecosystem, but exists in common in ecosystems of the same type in the same region. BEYOND NATURALNESS, *supra* note 3, at 15.

[124] *Id.* at 35, 42–43, 46.

[125] *Id.*

constantly changing with no equilibrium point.[126] This view is used by experts as a basis for criticizing naturalness as well as protected area law and policy. According to Cole and others, the notion of naturalness "has been undermined by advances in ecological knowledge regarding the dynamism of ecosystems. . . ."[127] They write, "[t]he laws that guide protected area management . . . are also in many ways outdated. Environmental policy in the United States is founded on the equilibrium paradigm, the assumption that ecosystems are relatively stable and static. . . ."[128]

But naturalness is not essentially tied to the older, discredited ecological view. National Park Service policies clearly recognize that nature is always changing and emphasize the importance of maintaining natural processes and disturbance regimes.[129] The agency's *Management Policies* simply asserts, "natural change will . . . be recognized as an integral part of the functioning of natural systems."[130] These policies also state, "Natural resources will be managed to preserve fundamental physical and biological processes."[131] Managers are directed to use strategies intended to maintain the "dynamics of . . . plant and animal populations."[132] According to these policies, "Native pests will be allowed to function unimpeded," with certain exceptions indicated.[133] Each park is required to prepare a fire management plan that describes the areas and circumstances in which lightning-ignited fires will be left to burn naturally.[134] Indeed, at one point Cole and others acknowledge that Park Service policies reflect the view that ecosystems are dynamic.[135] Park Service policies mandate the maintenance of natural conditions, understood as the absence of human dominance,[136] without assuming that an ecosystem reaches a unique climax community that constitutes its "natural conditions."

Other federal agency policies clearly require the maintenance of natural processes and, to the extent possible, disturbance regimes in wilderness areas. There is no indication that within these policies nature is conceived as largely predictable and static. The *Forest Service Manual*

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[126] *See id.* at 34–35, 37–46.
[127] *Id.* at 254.
[128] *Id.* at 259.
[129] *See* NAT'L PARK SERV., *supra* note 30, at 36.
[130] *Id.*
[131] *Id.*
[132] *Id.* at 43.
[133] *Id.* at 48.
[134] *See id.* at 49–50.
[135] *See* BEYOND NATURALNESS, *supra* note 3, at 77.
[136] NAT'L PARK SERV., *supra* note 30, at 36.

directs: "[m]anage wilderness to ensure that human influence does not impede the free play of natural forces."[137] The *Forest Service Manual* goes on to direct, "in wilderness natural processes shall dominate"[138] and "[p]ermit ecological processes to operate naturally."[139] Within these policies, the agency recognizes the critical role of fire, outbreaks of insects and diseases, and other natural disturbances. The *Forest Service Manual* announces this objective: "[p]ermit lightning caused fires to play, as nearly as possible, their natural ecological role within wilderness."[140] The *Forest Service Manual* then directs managers to specify, in the forest plan or other appropriate document, the areas and circumstances in which lightning-ignited fires will be allowed to burn naturally.[141] The *Forest Service Manual* also presents this mandate: "[d]o not control insect or plant disease outbreaks," with exceptions indicated, including preventing unacceptable losses due to exotic pests.[142]

BLM policies are quite similar. According to the *BLM Manual*, managers must "ensur[e] that natural ecosystems and ecological processes continue to function naturally."[143] This document also states, "[n]atural processes are allowed to occur in wilderness ecosystems . . . as far as possible without human influences."[144] The *BLM Manual* directs managers to "allow[] fire, insects, and diseases to play a natural role in the wilderness ecosystem, except where these activities threaten human life, [or] property. . . ."[145] "Natural fire is normally a part of the ecology of the wilderness," the document states.[146] According to these policies, managers may allow lightning-ignited fires to burn naturally, but only in accordance with an approved fire management plan.[147] The document also states that "[i]nsect and disease outbreaks must not be artificially controlled," with certain exceptions indicated.[148]

To be sure, the policies of each agency include certain terminology that suggests the older view of ecosystem stability. Within the policies

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[137] U.S. FOREST SERV., *supra* note 55, at 6.
[138] *Id.* at 35.
[139] *Id.* at 38.
[140] *Id.* at 46.
[141] *Id.* "Fire ignited by lightning may be permitted to burn if prescribed in an approved plan." *Id.*
[142] U.S. FOREST SERV., *supra* note 55, at 45.
[143] BLM, *supra* note 95, at .11(1).
[144] *Id.* at .34.
[145] *Id.* at .11(A)(2)
[146] *Id.* at .35(A)(2).
[147] *Id.*
[148] *Id.* at .35(B)(1).

governing forest management, for example, the *Forest Service Manual* requires managers to "[r]ecognize both climax and successional biotic communities as natural and desirable."[149] This statement should not be interpreted, however, as a reference to "climax" as traditionally understood. After all, these policies were issued in 2007.[150] According to ecologists today, old-growth forests and other communities traditionally labeled "climax" are merely apparent climax.[151] They appear to be permanent and relatively unchanging from a human perspective, yet each "climax" community is in fact slowly changing into a new and different type of community.[152] According to modern thinking, no biological community is at, or is developing towards, a true equilibrium point.[153] The above policy statement directs managers to recognize that forests traditionally considered "climax" are no more natural and desirable than those communities representing earlier successional stages.[154] Managers are not to favor one over the other.[155] At one point the *BLM Manual* states, "The natural processes of ecological succession are the preferred method of site-restoration" rather than active reforestation.[156] References to succession, here and in Forest Service policies, should not be interpreted in terms of the older view that through succession a community inevitably reaches climax, an equilibrium point. Succession is understood today as simply the change in community structure and species composition through time.[157] Within BLM and

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[149] U.S. FOREST SERV., *supra* note 55, at 38.
[150] *Id.* at 1.
[151] *See* ROBERT L. SMITH, ECOLOGY AND FIELD BIOLOGY 664–68 (5th ed. 1996); *see also* Douglas J. Spieles, *A Thing Is Right*, *in* PROTECTED LAND: DISTURBANCE, STRESS, AND AMERICAN ECOSYSTEM MANAGEMENT 37, 38, 42–44 (Springer ed., 2010).
[152] Smith writes, "What appears permanent to the observer is slowly transitory." SMITH, *supra* note 151, at 667. Smith goes on to say, "Perhaps the most outstanding characteristic of natural communities is their dynamic nature. They are constantly changing through time. . . . Even those communities that are seemingly the most stable . . . slowly change through time." *Id.* at 686. Spieles claims that an ecosystem may have a "stable state," but he adds "[s]tability is a human construct, like the ecosystem itself, and as such it occurs only in the eye of the beholder." Spieles, *supra* note 151, at 44; *see also id.* at 42–44. It is now thought that each "climax" community is specific to an individual ecosystem, the result of its particular mix of biotic and abiotic factors, and will not be repeated. SMITH, *supra* note 151, at 672.
[153] *Id.* at 668.
[154] U.S. FOREST SERV., *supra* note 55, at 38.
[155] *See id.*
[156] BLM, *supra* note 95, at .33(D).
[157] *See* Steward T.A. Pickett et al., *Domain and Propositions of Succession Theory*, *in* THE THEORY OF ECOLOGY 185, 243 (Samuel M. Scheiner & Michael R. Willig eds., 2011); *see also* Smith, *supra* note 151, at 666–68, 684–86.

Forest Service policies, only the very occasional use of certain terms suggests the older view.[158] Generally, there is no good indication within either Forest Service or BLM policies that nature is conceived as largely predictable and static, and that managers are required to maintain an ecosystem's climax community or equilibrium point—its "natural conditions."[159]

BLM, Forest Service, and other federal agency policies reflect well the Wilderness Act. The Act was written, in part, to protect natural ecological processes and disturbance regimes. Again, according to the Wilderness Act, wilderness areas are to remain "untrammeled," or free of intentional human control or manipulation that would, in Zahniser's words, "hamper the free play of natural forces."[160] Within the Wilderness Act there is no mandate to maintain climax communities; there is no reference to climax or to stable states.[161] In short, it is highly problematic to assert, as Cole and others do, that protected area law and policy rests on the older and discredited view that ecosystems are largely predictable and static.[162]

The real controversy in protected area management is not, as one might believe after reading *Beyond Naturalness* and the earlier article, over whether or not managers should intervene in natural ecosystems. Again, agency policies require interventions in appropriate circumstances, as in cases of human-caused damage.[163] Cole and others devote many pages to their discussion of the dynamism of ecosystems,[164] but this also is not a controversial issue. These experts fault agency policies for being vague and directionless,[165] but many protected area policies are fairly precise in their meanings and the directions they give. The real controversy, discussed below, is more subtle than this.

II. CONSERVING "WHAT WE VALUE" IN PROTECTED AREAS

The authors of *Beyond Naturalness* recommend a pluralistic approach in the management of protected areas. They emphasize the need to select from a diversity of management goals.[166] The exact goal that is

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[158] *See* U.S. FOREST SERV., *supra* note 55, at 6, 38; *see also* BLM, *supra* note 95, at .05, .33(D).
[159] *See generally id.*
[160] *See* Harvey, *supra* note 87, at 203.
[161] *See generally* 16 U.S.C. §§ 1131–1133 (2006).
[162] *See* BEYOND NATURALNESS, *supra* note 3, at 15, 26, 31–32, 34–35, 253–54, 259.
[163] *See* U.S. FOREST SERV., *supra* note 55, at 6, 11, 29, 31, 33, 35, 39; *see also* BLM, *supra* note 95, at .34(C)(2)–(3), .34(C)(6), .34(D)(1), .35(A)(1), .36(A)(1).
[164] *See id.* at 20, 34–46, 259.
[165] *See id.* at 77–78, 259.
[166] BEYOND NATURALNESS, *supra* note 3, at 2, 9–10, 138–39, 159–60, 256.

applied in any one area should reflect the circumstances.[167] They also emphasize the need for "flexibility in adjusting goals and management actions."[168] "[P]lanning must become more flexible and adaptive," they write.[169] According to these experts, naturalness should not be entirely abandoned.[170] In its extreme form, naturalness has been maintained as one possible management goal: respecting nature's autonomy by "not taking action" that controls or manipulates an ecosystem.[171] This is known as the "let it be" or "hands off" approach.[172] These experts do not consider this approach appropriate in most situations, however.[173] Under this approach, they claim, protected areas would gradually become less and less natural as a result of acid rain, invasions of exotic species, global climate change, and other human-caused stresses.[174] Cole and others encourage active management in most situations, intervening in nature with the broad purpose of conserving "what we value."[175] "The key challenge to park and wilderness stewardship," they write, "is to decide where, when, and how to intervene in physical and biological processes to conserve what we value in these places."[176] Managers are to have much discretion as they determine "what we value."[177]

Managers may elect to preserve or restore natural conditions that held in the past. This is to manage for "historical fidelity."[178] According to Cole and others, extensive interventions may be required to preserve or restore past conditions.[179] An example of such an intervention is the extensive planning and effort involved in creating gaps in a forest that mimic natural, fire-created gaps.[180] These experts acknowledge that, according

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[167] *Id.* at 139, 159–60, 256.
[168] *Id.* at 257.
[169] *Id.*
[170] *Id.* at 254–55.
[171] *Id.* at 91.
[172] BEYOND NATURALNESS, *supra* note 3, at 91.
[173] *Id.* at 1, 7–8, 121, 149, 166, 253–54. In a contributed chapter Landres takes a different view, suggesting that the "let it be" or "hands off" approach is the most appropriate strategy in the management of certain designated wilderness areas. *See* Peter Landres, *Let It Be: A Hands-Off Approach to Preserving Wildness in Protected Areas*, *in* BEYOND NATURALNESS, 88, at 92 (David N. Cole and Laurie Yung eds., 2010). Landres's view will be discussed later in this article.
[174] BEYOND NATURALNESS, *supra* note 3, at 1, 7–8, 121, 149, 166, 253–54.
[175] *Id.* at 7.
[176] *Id.*
[177] *Id.*
[178] *Id.* at 127.
[179] *Id.* at 137–38.
[180] BEYOND NATURALNESS, *supra* note 3, at 137–38.

to many published studies, maintaining historically natural conditions aids in the preservation of native biodiversity.[181] This goal is not considered appropriate in many situations, however. One reason is that with invasions of exotic species, climate change, and other human-caused stresses, attempting to maintain past conditions in many situations would involve actions that are increasingly invasive, "akin to paddling upstream," they write.[182] Also, past conditions may leave an ecosystem increasingly vulnerable to the effects of climate change and other human-caused stresses.[183] According to Cole and others "interventions that seek a high degree of historical fidelity should be more the exception than the rule in parks and wilderness."[184]

A recommended goal in many situations is to enhance the resilience of ecosystems to climate change and other human-caused stresses. This is to manage for "ecosystem resilience," described as the capacity of an ecosystem to persist in the long term while continuing to provide selected functions or processes.[185] As Cole and others recognize, protected areas have been set aside for the purpose, in part, of preserving native biodiversity.[186] Under the goal of resilience, however, the emphasis is on maintaining selected functions or processes, rather than maintaining an exact species composition in a given area.[187] Cole and others argue that managers should be allowed to focus their efforts on maintaining "regional biodiversity" as well as selected ecosystem functions or processes, rather than maintaining a definite species composition in a given area.[188] As an example of this approach, in response to the changing climate, managers may shift their goal for a particular forest from preserving giant sequoias, *Sequoiadenron giganteum*, to maintaining vegetative cover sufficient to provide habitat for native wildlife.[189] The species composition would be allowed to shift with the changing climate as long as this key function is maintained. Under this goal, managers are encouraged to play an active role in ensuring that selected ecosystem functions or processes are

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[181] *Id.* at 130–31, 138.
[182] *Id.* at 136–37; *see also id.* at 58, 63; Constance I. Millar et al., *Climate Change and Forests of the Future: Managing in the Face of Uncertainty*, 17 ECOLOGICAL APPLICATIONS 2145, 2146–47 (2007).
[183] *See* BEYOND NATURALNESS, *supra* note 3, at 23–24, 50, 58, 63; Cole et al., *supra* note 20, at 44.
[184] BEYOND NATURALNESS, *supra* note 3, at 138.
[185] *Id.* at 147–48.
[186] *Id.* at xi, 26, 36, 70, 110.
[187] "Resilience emphasizes *functioning*." *Id.* at 148 (emphasis added); *see also id.* at 63, 192.
[188] *Id.* at 63, 192; Cole et al., *supra* note 20, at 41–42.
[189] BEYOND NATURALNESS, *supra* note 3, at 145.

maintained through time, through the use of for example, management-ignited fire, herbicides, or livestock grazing.[190] "A critical consideration," some experts write, "is whether protected areas will be able to weather unprecedented rates and types of change."[191] They add that "[m]anaging for truly long-term resilience might call for letting go of the way landscapes look today."[192]

According to Cole and others, to more effectively deal with climate change, managers should consider actively increasing genetic diversity through plantings and animal introductions, possibly emphasizing genetic types from warmer locations.[193] They may need to consider replacing vulnerable native species with species that are not native to the area or, presumably, even the region, but are considered better suited to the changing climate and able to provide the desired functions.[194] Such measures are described as "realigning" an ecosystem to current and future conditions.[195] At some point, these experts write, managers may need to consider the extreme option of actively transforming an ecosystem to a new type of system considered more resilient in the changing conditions.[196] Under resilience, managers may intervene to preserve a single species considered vulnerable and of special value, such as giant sequoias or Joshua trees, *Yucca brevifolia*.[197] The selected function, in such a case, would be the provision of habitat suitable for the continued existence of the desired species.[198] These experts frequently recommend that managers consider "assisted migration," actively assisting species to move into new areas considered more suitable for their survival.[199]

Another recommended goal in many situations is to maintain "ecological integrity."[200] Within *Beyond Naturalness*, an ecosystem is considered to have "ecological integrity" when it is "whole, complete, intact, sound, and unimpaired."[201] An ecosystem can be described as having

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[190] *See id.* at 146, 148–49; *see also id.* at 63, 192, 258.
[191] *Id.* at 142.
[192] *Id.* at 145.
[193] *Id.* at 185, 193.
[194] *Id.* at 185, 193; Cole et al., *supra* note 20, at 52.
[195] BEYOND NATURALNESS, *supra* note 3, at 184–85, 193; Cole et al., *supra* note 20, at 52.
[196] BEYOND NATURALNESS, *supra* note 3, at 154–55, 156, 258; Cole et al., *supra* note 20, at 41, 47–48, 52.
[197] BEYOND NATURALNESS, *supra* note 3, at 148, 150–51, 154.
[198] *Id.* at 150–51.
[199] *Id.* at 7–8, 154, 186, 193, 229–30, 263.
[200] *See generally id.* at 106–22.
[201] *Id.* at 121.

ecological integrity when it is "intact, sound, [and] functioning."[202] Under this goal, managers should do their best to "ensure that ecological systems are not missing important parts and that they are functioning well."[203] These descriptions are highly vague. Managers are left with much discretion in deciding what constitutes a whole, complete, intact, sound, unimpaired, and well-functioning system. As they make their decisions, managers are required to consider preferences within society concerning how a protected area should be used. Ecological integrity "forces the use of ecosystem science, in combination with societal wishes."[204] Under ecological integrity, according to *Beyond Naturalness*, the focus shifts from natural conditions to "desirable attributes of protected area ecosystems."[205] Managers are no longer concerned with whether a given alteration of an ecosystem is human-caused. Rather, managers are concerned with whether or not an alteration is desired.[206] According to Cole and others, preserving biodiversity is an important aspect of managing for ecological integrity, but they are considering only regional biodiversity.[207] Under this goal, managers seek to maintain a "whole, complete, intact, sound . . . well-functioning system," however this is defined for each ecosystem. Managers are given much discretion to reconstruct ecosystems, shifting species distributions and abundances to satisfy societal preferences, perhaps for enhanced recreational opportunities.[208]

Cole and other experts favor the goals of enhancing resilience or maintaining ecological integrity for most management situations.[209] The general approach adopted within *Beyond Naturalness* is, of course, highly interventionist. Indeed, according to these experts, a major difficulty with naturalness is that it "requires that humans restrain their activities."[210]

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[202] *Id.* at 107.
[203] BEYOND NATURALNESS, *supra* note 3, at 108.
[204] *Id.* at 122.
[205] *Id.* at 107.
[206] Ecological integrity "shifts attention from cause to effect, from a focus on whether humans caused a particular ecological condition to a concern with desired attributes of future ecological conditions." *Id.* at 113.
[207] *See* Cole et al., *supra* note 20, at 41, 45; BEYOND NATURALNESS, *supra* note 3, at 110, 113, 121.
[208] *See* Cole et al., *supra* note 20, at 41, 45; BEYOND NATURALNESS, *supra* note 3, at 107, 113, 122.
[209] *See* BEYOND NATURALNESS, *supra* note 3, at 63. This book emphasizes "a need for bold action" rather than the "let it be" approach. *See id.* at 258. Again, historical fidelity is considered to be of limited usefulness. *Id.* at 138.
[210] *Id.* at 253.

Cole and others recommend that protected areas be managed with a "light touch."[211] "Less intervention is better than more," they write.[212] Under their approach, however, the expectation is that interventions in protected areas will typically be extensive and ongoing.[213] Cole and others write, "Management intervention is likely to become increasingly pervasive."[214] "Substantial human influence is inevitable," they also write, "even in our most valued parks and wilderness areas."[215] These experts recognize that the reconstructions they envision under resilience and ecological integrity represent significant infusions of human designs into nature.[216] Nature is to be shaped in accordance with human designs to satisfy human preferences. Even under the goal of enhanced resilience, according to experts, managers must ask "what functions or processes one really wants to retain in the face of change. . . ."[217] Under this approach, nature is transformed into a human construction, an artifact.

To better understand federal protected area policies, we should ask: how does the approach mandated within these policies compare with the management goals discussed within *Beyond Naturalness*? As discussed above, National Park Service, Forest Service, and other federal agency policies do not mandate a strict "let it be" or "hands off" approach.[218] Is it fair to say that these policies require that protected areas be managed for historical fidelity, that is, to mimic past conditions? Such a claim would be problematic. Park Service policies allow that, in restorations, managers may select species that are "historically appropriate for the period or event commemorated."[219] But, in general, managers are to restore the conditions and processes "characteristic of the ecological zone in which the damaged resources are situated."[220] This is not a mandate to restore past conditions. As discussed, Park Service policies recognize that nature is dynamic and that ecosystems constantly change through time. Again,

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[211] *See* Cole et al., *supra* note 20, at 43, 47.
[212] BEYOND NATURALNESS, *supra* note 3, at 241.
[213] *See* Cole et al., *supra* note 20, at 40–41.
[214] BEYOND NATURALNESS, *supra* note 3, at 252; *see also id.* at 249.
[215] *Id.* at 63. "[I]ntentional manipulations of ecosystem processes will be needed to maintain integrity in many protected areas. . . . Unlike the concept of naturalness, ecological integrity assumes that people were, and can be, integral parts of many ecosystems." *Id.* at 107.
[216] "[W]e should acknowledge that [as we intervene in nature] we interject human intention into wild ecosystems, designing them." *Id.* at 161; *see also id.* at 235, 246, 250.
[217] *Id.* at 145; *see also id.* at 87.
[218] NAT'L PARK SERV., *supra* note 30, at 10.
[219] *Id.* at 46.
[220] *Id.* at 39.

these policies state, "natural change will also be recognized as an integral part of the functioning of natural systems."[221] Additionally, "[t]he Service recognizes that natural processes and species are evolving, and the Service will allow this evolution to continue—minimally influenced by human actions."[222] Managers are required to maintain conditions that are natural, generally free of human influence, and characteristic of a given type of ecosystem, rather than conditions that existed in the past.[223] As discussed, Forest Service and BLM wilderness policies emphasize the importance of preserving natural processes.[224] Forest Service policies require that managers "ensure that human influence does not impede the free play of natural forces."[225] Forest Service policies also state, "in wilderness natural processes shall dominate."[226] BLM policies direct managers to ensure that, in wilderness, "natural ecosystems and ecological processes continue to function naturally."[227] Within federal agency policies, there is no mandate to restore past conditions in protected areas.[228] Cole and others write, insightfully, "if we are to allow for the free play of natural processes, including evolutionary change, we cannot expect future park landscapes to look like they did in the past."[229]

Put simply, the controversy in protected area management concerns whether or not managers should be required to maintain natural conditions and processes in these areas, including natural species distributions and abundances, keeping human influence as minimal as possible. This is the approach generally mandated within federal agency policies. Authors of *Beyond Naturalness* recommend that, in revised law and policy, managers should be given much discretion to conserve "what we value" in these areas with no requirement to maintain natural conditions and limit human influence. They recommend that managers reconstruct ecosystems for the sake of enhanced resilience in certain situations, selecting the functions that will be maintained through time.[230] The book emphasizes

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[221] *Id.* at 36.
[222] *Id.*
[223] *Id.*
[224] *See* U.S. FOREST SERV., *supra* note 55, at 7.
[225] *Id.* at 6.
[226] *Id.* at 35.
[227] BLM, *supra* note 95, at .11(1).
[228] *See* BUREAU OF LAND MGMT., U.S. DEP'T OF INTERIOR, BLM MANUAL 6340—MANAGEMENT OF DESIGNATED WILDERNESS AREAS (PUBLIC) 1–9 (2012), *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.22269.File.dat/M6340_WildernessMgt_Final%20071312.pdf.
[229] Cole et al., *supra* note 20, at 39.
[230] BEYOND NATURALNESS, *supra* note 3, at 146, 148–50.

the need to preserve beloved, charismatic species such as Joshua trees and giant sequoias.[231] They also recommend that in certain situations managers reconstruct ecosystems, possibly shifting species distributions and abundances, to ensure that an ecosystem is whole, complete, intact, sound, unimpaired, and well-functioning, however this is defined for each ecosystem.[232] Reconstructions may be merely for the purpose of satisfying societal preferences, perhaps for enhanced recreational opportunities. This general approach is highly interventionist. Nature becomes an artifact.

A major difficulty with abandoning natural conditions in our dealings with protected areas, however, is that we run the risk of losing amphibians, rare and endemic plants, and other native species that are highly sensitive to habitat alterations.

III. NATURALNESS IN THE PRESERVATION OF BIODIVERSITY

In the Bob Marshall Wilderness Area in Montana, the state wildlife agency has embarked on a controversial fish removal and restocking project.[233] In cooperation with the Bonneville Power Administration and the U.S. Forest Service, the Montana Fish, Wildlife, and Parks Department has begun the process of poisoning hybrid trout in twenty-one high wilderness lakes and restocking the lakes with genetically pure westslope cutthroat trout, *Oncorhynchus clarkii lewisi*.[234] The purpose of the project is to preserve the genetic purity of westslope cutthroat trout within the South Fork Flathead watershed.[235] This subspecies is rare; it is listed as "imperiled" by the state of Montana.[236] It has been designated the state fish.[237] This watershed is considered critical habitat.[238] The state wildlife

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[231] *Id.* at 7, 128–29, 150–51, 180, 184.
[232] *Id.* at 7–8.
[233] BONNEVILLE POWER ADMIN., SOUTH FORK FLATHEAD WATERSHED WESTSLOPE CUTTHROAT TROUT CONSERVATION PROGRAM, FINAL ENVIRONMENTAL IMPACT STATEMENT 347, 358, 364 (July 2005) [hereinafter BONNEVILLE FEIS].
[234] BONNEVILLE POWER ADMIN., SOUTH FORK FLATHEAD WATERSHED WESTSLOPE CUTTHROAT TROUT CONSERVATION PROGRAM, DRAFT ENVIRONMENTAL IMPACT STATEMENT S-3, C-6, C-12, C-15, C-19, C-31, C-35, C-37, C-51, C-57, 2-3 (June 2004) [hereinafter BONNEVILLE DEIS]. The Bonneville Power Administration is funding the project and is the lead federal agency. *Id.* at I-13. The Montana Fish, Wildlife, and Parks Department, and the U.S. Forest Service are cooperating agencies. *Id.*
[235] *Id.* at S-1.
[236] MONT. FISH, WILDLIFE & PARKS DEPT., SOUTH FORK FLATHEAD WATERSHED WESTSLOPE CUTTHROAT TROUT CONSERVATION PROGRAM, RECORD OF DECISION 2 (2006).
[237] *Id.* at 1.
[238] *Id.*; *see also* BONNEVILLE DEIS, *supra* note 234, at S-1.

agency is concerned that hybrid trout living in the lakes will be washed downstream during storms and will interbreed with the westslope cutthroats living downstream and in the lower lakes.[239] The project is controversial in part because it involves the use of many thousands of pounds of poisons, rotenone and antimycin, within this wilderness area.[240] The project is also controversial because it involves the use of airplanes and helicopters to deliver the poisons to the less accessible lakes.[241] Motorboats will be used to disperse the poisons in all lakes.[242] The noise of aircraft and motorboats disrupts the wilderness experiences of visitors, and the Wilderness Act generally prohibits their use within wilderness areas.[243]

This project is also controversial because westslope cutthroat trout are not native to these lakes.[244] Historically, these lakes were fishless.[245] These trout are native to the watershed, the streams and the lower lakes, but historically their range did not extend up into these high lakes.[246] Waterfalls and other obstructions prevented fish from entering these lakes.[247] Since the 1920s, these lakes were stocked with non-native rainbow trout, *Oncorhynchus mykiss*, and Yellowstone cutthroat trout, *Oncorhynchus clarkii bouvieri*, which have hybridized with the westslope cutthroats that have more recently been introduced.[248] The project essentially involves eliminating non-native fish for the sake of stocking the lakes with another non-native, but more highly valued, fish.

In their earlier article, Cole and other management experts give a positive assessment of this project.[249] This is a good example of "assisted migration," they claim—assisting a species to move into a new area considered more suitable for its survival.[250] This project supposedly demonstrates the benefits to be gained by abandoning naturalness as a mandatory goal in protected area management.[251] These experts also claim that this project

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[239] BONNEVILLE DEIS, *supra* note 234, at 1-2.
[240] *See id.* at app. C, 1, 3, 6, 8–9, 11–12, 14–16, 18, 20–21, 23–26, 59–60.
[241] *Id.* at 2-3.
[242] *Id.* at S-4, 2-3, 2-19, 2-20, 2-22.
[243] 16 U.S.C. § 1133(c) (2006).
[244] BONNEVILLE DEIS, *supra* note 234, at S-1.
[245] *Id.*
[246] *Id.* at C-4, C-10, C-11, C-18, C-22, C-26; BONNEVILLE POWER ADMIN., COEUR D'ALENE TRIBE FISH AND WILDLIFE PROGRAM HABITAT PROTECTION PLAN: IMPLEMENTATION OF FISHERIES ENHANCEMENT OPPORTUNITIES ON THE COEUR D'ALENE RESERVATION 9 (2012).
[247] BONNEVILLE DEIS, *supra* note 234, at 3-2.
[248] *Id.* at S-1, 3-4.
[249] *See* Cole et al., *supra* note 20, at 42.
[250] *Id.*
[251] *Id.* at 36, 42.

will enhance regional biodiversity.[252] This rare subspecies of trout will be protected from hybridization. Yet these lakes are not being restored to their natural fishless condition. The article proclaims "biodiversity conservation trumps naturalness."[253] The agencies plan to stock these lakes on a "frequent or annual basis" into the foreseeable future.[254]

A major problem with this project, however, is that it will not enhance native or regional biodiversity since nothing is being done to improve amphibian habitat at these lakes.[255] At best, the project will enhance only selected biodiversity—this subspecies of trout specifically.

According to the Environmental Impact Statement ("EIS") for the project, in surveys of the seventy-five lakes within the project area, amphibian species were found in strikingly low numbers.[256] Northern leopard frogs, *Rana pipiens*, believed to exist in the project area, were not found at all.[257] Most of the lakes in the project area have been stocked with trout for decades, beginning in the 1920s.[258] Yet the EIS does not adequately discuss the impacts of introduced trout on amphibians.[259] Many studies have shown significant negative impacts. David Pilliod and Charles Peterson, for example, conducted a survey of amphibians in high wilderness lakes in Idaho.[260] They concluded that introduced trout, which are known to prey on amphibians, are slowly eliminating amphibians in these lakes.[261] Based on surveys of high wilderness lakes in the Sierra Nevada Mountains, Roland Knapp and Kathleen Matthews concluded that introduced trout is a primary cause of decline in mountain yellow-legged frogs, *Rana*

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[252] *Id.* at 41.
[253] *Id.* at 42.
[254] BONNEVILLE DEIS, *supra* note 234, at 2-4.
[255] T. Gardner, *Declining Amphibian Populations: A Global Phenomenon in Conservation Biology*, 24.2 ANIMAL BIODIVERSITY AND CONSERVATION 25, 26 (2001).
[256] *See* BONNEVILLE FEIS, *supra* note 233, at S-27. Pacific chorus frogs (*Pseudacris regilla*) were found at three percent of the lakes surveyed. *Id.* A total of only two chorus frogs were found at all sites. *Id.* Rocky Mountain tailed frogs (*Ascaphus montanus*) were found at thirteen percent of the lakes surveyed. *Id.* A total of nineteen tailed frogs were found at all sites. *Id.* Columbia spotted frogs (*Rana luteiventris*), the most numerous amphibians found in the survey, were found at fifty-three percent of the lakes surveyed. *Id.*
[257] BONNEVILLE FEIS, *supra* note 233, at 207; *see also* BONNEVILLE DEIS, *supra* note 234, at 3-18.
[258] BONNEVILLE DEIS, *supra* note 234, at 1-7, 3-4.
[259] *See id.* at 3-18; *see also* BONNEVILLE FEIS, *supra* note 233, at S-27, tbl.1–2 (discussing agency responses to comments).
[260] David S. Pilliod & Charles R, Peterson, *Local and Landscape Effects of Introduced Trout on Amphibians in Historically Fishless Watersheds*, 4 ECOSYSTEMS 322, 322 (2001).
[261] *Id.* at 322, 330–31.

muscosa, in this mountain range.[262] The frogs have been pushed into marginal and isolated habitats, they write, in which they are "slowly going extinct."[263] In a report on the management of amphibians in Montana, Bryce Maxell discusses the negative impacts of introduced trout and other predaceous fish on amphibians in the state.[264] He reports that only two populations of northern leopard frogs are believed to exist in western Montana.[265] He recommends that the Forest Service and the State of Montana restore fishless lakes and generally enhance habitat for the remaining populations.[266] The EIS for the Bob Marshall Wilderness trout restocking project does not discuss the findings of Pilliod and Peterson, or Knapp and Matthews.[267] According to the EIS, northern leopard frogs are believed to exist in the project area, in western Montana, but the EIS does not discuss habitat needs for these frogs or Maxell's recommendation to enhance habitat for the remaining populations.[268]

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[262] Roland A. Knapp & Kathleen R. Matthews, *Non-Native Fish Introductions and the Decline of the Mountain Yellow-Legged Frog From Within Protected Areas*, 14 CONSERVATION BIOLOGY 428, 435 (2000).
[263] *Id.* at 437.
[264] *See* BRYCE A. MAXELL, MANAGEMENT OF MONTANA'S AMPHIBIANS 19 (U.S. Forest Serv., 2000).
[265] *Id.* at 144.
[266] *Id.* at 22, 146. According to Smith & Keinath, introduced predaceous fish is a major cause of the severe declines in northern leopard frogs across the United States. *See* BRIAN E. SMITH & DOUGLAS A. KEINATH, NORTHERN LEOPARD FROG (*RANA PIPIENS*): TECHNICAL CONSERVATION ASSESSMENT 3, 4, 25, 30, 36–37, 38–39 (U.S. Forest Serv., 2007). "Northern leopard frogs have no defense against introduced predaceous fish, and frog populations can decline and go extinct in the presence of such fish." *Id.* at 4.
[267] *See* BONNEVILLE DEIS, *supra* note 234, at 3-18; BONNEVILLE FEIS, *supra* note 233, at S-27, S-28.
[268] BONNEVILLE DEIS, *supra* note 234, at 3-18. The EIS includes misleading statements concerning the ability of trout and amphibians to coexist, such as: "[i]n streams and lakes throughout the South Fork Flathead, native westslope cutthroat trout and native amphibians co-exist much as they do naturally in these streams." *Id.* This statement makes it appear that predaceous fish in the lakes scheduled for treatment and restocking have no significant impact on amphibians at these lakes. *Id.* The agencies also write, "[t]he full extent of impacts of introduced fish on amphibians may never be fully documented because any possible impacts would have occurred beginning in 1926 when the first fish were stocked in the project area." BONNEVILLE FEIS, *supra* note 233, at 435–36. According to the above studies, however, introduced trout may be continually suppressing numbers of amphibians at these lakes. *See* Pilliod & Peterson, *supra* note 260, at 322; Knapp & Matthews, *supra* note 262, at 435–36. According to the EIS, there are approximately four to eight fishless lakes in the project area, but there is no discussion of whether this number and distribution of fishless lakes will meet the needs of amphibians. BONNEVILLE FEIS, *supra* note 233, at 317. The agencies declare that this is the appropriate number of fishless lakes to meet visitor demand for this type of recreational opportunity. *Id.* at 309.

In letters commenting on the project, several local and national environmental organizations requested that the lakes be left fishless to restore natural conditions.[269] The Environmental Protection Agency suggested that some of the lakes be left fishless in order to compare the future development of lakes with fish to that of fishless lakes.[270] In reply, the Bonneville Power Administration and other agencies state that creating fishless lakes is not a goal of the project.[271] The agencies were concerned with problems of illegal, non-native fish introductions if the lakes were left fishless, and they were concerned with negative impacts on the local economy.[272] The agencies state in the EIS, "There are established social and economic practices [such as angling and outfitting] that may be impacted if the lakes were rendered fishless."[273] An important consideration, however, is that some of the more remote lakes scheduled for treatment and restocking have no trail access and are only lightly used by anglers.[274] An apparently reasonable alternative would have been managing at least some of the lakes for preservation of northern leopard frogs and other amphibians after eliminating the hybrid trout.[275] This alternative would have helped ensure the genetic purity of westslope cutthroat trout in the streams and lower lakes, and thus would have met the need for the project.[276] This alternative would have enhanced native biodiversity of the fish *and* amphibians, yet it was not evaluated.

Cole and other management experts praise this fish-restocking project, claiming that it will enhance regional biodiversity.[277] They write,

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[269] *See id.* cmts. at 1-65, 1-70, 1-78.

[270] *Id.* at 1-19.

[271] BONNEVILLE POWER ADMIN., SOUTH FORK FLATHEAD WATERSHED WESTSLOPE CUTTHROAT TROUT CONSERVATION PROGRAM, RECORD OF DECISION 7–8 (2006).

[272] *See* BONNEVILLE FEIS, *supra* note 233, at 1-198, 1-271 to 1-272, 1-328 to 1-329.

[273] *See id.* at 1-272. The agencies also state, "[t]he fishery resources have helped to define the character of this area, and have driven the high social and economic value of this wilderness. Creating fishless lakes may have a negative and long term social and economic impact to the wilderness resources." *Id.* at 1-328, 1-329. In this project there are elements of both goals favored by Cole and other experts. The agencies seek to improve habitat and preserve this subspecies of trout to enhance resilience. Yet another goal is to maintain desired angling opportunities and protect the local economy, presumably to maintain ecological integrity.

[274] MONT. FISH, WILDLIFE, & PARKS DEP'T ET AL., SOUTH FORK FLATHEAD WATERSHED WESTSLOPE CUTTHROAT TROUT CONSERVATION PROGRAM: Q&A FACT SHEET 3–4 (June 8, 2004), *available at* http://www.efw.bpa.gov/environmental_services/Document_Library/South_Fork_Flathead/QADEIS060804.pdf. *See also* BONNEVILLE DEIS, *supra* note 234, at app. C (describing lakes and angler use data).

[275] BONNEVILLE DEIS, *supra* note 234, at 3-13.

[276] *Id.* at abstract.

[277] Cole et al., *supra* note 20, at 41–42.

"Biodiversity conservation trumps naturalness."[278] But these experts do not consider the habitat needs of amphibians.[279] This project represents extensive, ongoing management interventions in wilderness to conserve "what we value"—this subspecies of trout as well as angling opportunities—but at the cost of native and regional biodiversity.[280] Presumably, the population of northern leopard frogs in this area will continue to decline. Brian Smith and Douglas Keinath write, "We predict that the abundance of northern leopard frogs [in North America] will continue to trend down."[281] As managers select the functions and species to maintain in protected areas and the societal values to impose, the tendency is to conserve charismatic species such as westslope cutthroat trout while less charismatic species, such as various species of amphibians, are either not protected or are not protected with the same intensity of effort. Within our society amphibians have typically been ignored in our dealings with nature,[282] yet they are adapted to highly specific environmental conditions and are extremely sensitive to habitat alteration.[283] According to Raymond Semlitsch, "most biologists believe that habitat alteration is the primary cause of

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[278] *See id.* at 42.
[279] *See id.* at 41–42.
[280] *Id.* at 49.
[281] SMITH & KEINATH, *supra* note 266, at 29.
[282] *See* Deni Porej & Thomas E. Hetherington, *Designing Wetlands for Amphibians: The Importance of Predatory Fish and Shallow Littoral Zones in Structuring of Amphibian Communities*, 13 WETLANDS ECOLOGY & MGMT. 445, 446 (2005) (explaining that, concerning required mitigation for loss of wetlands under the Section 404 permitting process, "replacement or creation of quality amphibian habitat is usually not one of the goals of wetland replacement.").
[283] *See* MAXELL, *supra* note 264, at 9 (describing that amphibians require specific habitat types corresponding to the different stages of their life cycles, including shallow ponds or other bodies of water for breeding and growth of larvae, and, for some species, deep lakes or ponds for overwintering. Required habitat types must be connected by suitable migratory corridors.); SMITH & KEINATH, *supra* note 266, at 17–18 (explaining that ponds suitable for breeding must have shallow slopes, natural hydrological cycles, including pond drying, and sufficient emergent vegetation.); Raymond D. Semlitsch, *Critical Elements for Biologically Based Recovery Plans of Aquatic-Breeding Amphibians*, 16 CONSERVATION BIOLOGY 619, 622–23 (2002); J.J. MACK & M. MICACCHION, AN ECOLOGICAL ASSESSMENT OF OHIO MITIGATION BANKS: VEGETATION, AMPHIBIANS, HYDROLOGY, AND SOILS 19–21 (Ohio Envtl. Protection Agency, Div. of Surface Water, Wetland Ecology Group 2006). Concerning the restoration and creation of wetlands for amphibian conservation, Porej and Hetherington write that "fish-free wetlands with extensive shallow littoral zones should be the preferred design." Porej & Hetherington, *supra* note 282, at 452. Semlitsch emphasizes the need to preserve and restore small isolated ponds (less than four hectares), naturally distributed across a landscape, which allow the dispersal of juveniles and the recolonization of areas in which local populations have become extinct. Semlitch, *supra* note 283, at 623.

amphibian declines."[284] It is known that many types of deviations from natural conditions—such as eliminating wetlands, altering hydrological cycles, introducing predaceous fish, introducing poisons, altering upland areas surrounding wetlands by eliminating canopy cover, and placing roads and other obstructions across dispersal corridors—threaten amphibian biodiversity.[285] Concerning northern leopard frogs in a five state region, Smith and Keinath write, "Any kind of habitat fragmentation in any locality . . . can result in loss of important habitat."[286]

Naturalness is necessary for the preservation of native biodiversity for this reason. Through evolution, each organism is adapted to more-or-less specific environmental conditions. As Thomas Smith and Robert Smith write in a popular text, "[t]he characteristics that an organism exhibits, its physiology, morphology, behavior . . . development and reproduction . . . reflect adaptations to its particular environment."[287] In some cases this is quite extreme. Amphibians, rare and endemic plants, and other organisms are adapted to highly specific environmental conditions and are not able to tolerate substantial human alterations of their habitats. For example, amphibians cannot tolerate draining wetlands, altering hydrological cycles, and introducing predatory fish. Natural conditions—generally free of human influence—are necessary for the preservation of amphibians and other sensitive species and, therefore, the preservation of native biodiversity.[288] Natural conditions provide a template, or pattern, within nature that, if maintained, helps ensure the preservation of all native species, whether charismatic or not.

There are other examples in which protected areas have been altered by agency managers without respect for natural conditions, and native biodiversity is threatened as a result. Non-native Rocky Mountain

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[284] Semlitsch, *supra* note 283, at 627; *see also id.* at 619; MAXELL, *supra* note 264, at 5, 10; SMITH & KEINATH, *supra* note 266, at 3–4.

[285] *See supra* notes 283–84 and accompanying text.

[286] SMITH & KEINATH, *supra* note 266, at 29 (discussing the conservation of these frogs in Forest Service Region 2: Colorado, Wyoming, South Dakota, Kansas, and Nebraska); *see also id.* at 13.

[287] *See* THOMAS M. SMITH & ROBERT L. SMITH, ELEMENTS OF ECOLOGY 68 (Pearson, 8th ed. 2012). Douglas Fatuyma eloquently writes, "[a]ll species are ecologically specialized in one way or another, sometimes to an extraordinary degree." Douglas J. Fatuyma, *The Evolution and Importance of Species Interactions*, *in* PRINCIPLES OF CONSERVATION BIOLOGY 240, 241 (Gary K. Meffe et al. eds., 2d ed. 1997). Pianka writes, "Organisms are adapted to their environments in that, to survive and reproduce, they must meet their environment's conditions for existence." ERIC R. PIANKA, EVOLUTIONARY ECOLOGY 90 (6th ed. 2000). He adds, "Adaptation has many dimensions in that most organisms must conform simultaneously to numerous different aspects of their environments." *Id.* at 91.

[288] SMITH & KEINATH, *supra* note 266, at 3.

goats, *Oreamnos americanus*, were introduced into Olympic National Park in Washington in the 1920s by the state wildlife agency.[289] National Park Service biologists are now concerned that the goats threaten the existence of rare and endemic plants in the park.[290] According to an agency report, forty-three percent of the park's rare and endemic plants occur within mountain goats' summer range.[291] Biologists have observed that the goats harm and actually kill individual plants through grazing, trampling, and wallowing.[292] Studies have shown that the goats have altered abundances of three endemic plant species in the park.[293] No studies have shown that the goats actually threaten the existence of rare and endemic plants, but biologists remain concerned because some of the plants in the park are extremely rare.[294] The concern is that their populations will be fragmented and their numbers reduced to the point that they will not be able to survive.[295] According to the Center for Plant Conservation, "[m]ountain goats are not part of the native ecosystem in the Olympic Mountains, and, consequently, the flora of the region is not adapted to the stresses that goats put on the plants."[296] The Park Service is considering the controversial solution of eliminating all goats within the park through aerial shooting.[297]

As another example, the National Park Service hires beekeepers to bring domesticated honeybees into Capitol Reef National Park, in

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[289] *See* D.B. Houston et al., *History, Distribution, and Abundance*, *in* MOUNTAIN GOATS IN OLYMPIC NATIONAL PARK: BIOLOGY AND MANAGEMENT OF AN INTRODUCED SPECIES 4-2 (2007); *see also* Bruce B. Moorhead & Victoria Stevens, *Introduction and Dispersal of Mountain Goats in Olympic National Park*, *in* ECOLOGICAL RESEARCH IN NATIONAL PARKS OF THE PACIFIC NORTHWEST 46 (Edward E. Starkey et al. eds., 1982).

[290] E.G. Schreiner et al., *Rare Plants*, *in* MOUNTAIN GOATS IN OLYMPIC NATIONAL PARK: BIOLOGY AND MANAGEMENT OF AN INTRODUCED SPECIES 12-1 (2007).

[291] *Id.* at 12-12.

[292] *Id.*

[293] *Id.* at 12-1.

[294] E.G. Schreiner & D.B. Houston, *Synthesis of Herbivory*, *in* MOUNTAIN GOATS IN OLYMPIC NATIONAL PARK: BIOLOGY AND MANAGEMENT OF AN INTRODUCED SPECIES 12-1 (2007) (explaining that cotton's milk vetch, *Astragalus australis*, for example, exists only in the high elevations of Washington's Olympic Mountains); *see* CTR. FOR PLANT CONSERVATION, *ASTRAGALUS AUSTRALIS* VAR. *OLYMPICUS* (2010), http://www.centerforplantconservation.org/Collection/CPC_ViewProfile.asp?CPCNum=390 (explaining that this plant grows only on subalpine, south-facing talus slopes and ridges with calcareous soils with high pH and that only approximately ten populations of this plant exist).

[295] E.G. Schreiner et al., *supra* note 290, at 12-12.

[296] *See* CTR. FOR PLANT CONSERVATION, *supra* note 294.

[297] Houston et al., *supra* note 289, at 14–16.

southern Utah, for the purpose of pollinating the historic fruit orchards at the center of the park.[298] Park Service policies allow the use of exotic species in national parks in special circumstances, including to "meet the desired condition of a historic resource."[299] Restrictions include requiring that introduced exotic species be non-invasive and be prevented from becoming invasive.[300] According to a recent study of these orchards by Vincent Tepedino and other biologists, there is some risk that the domesticated bees will become invasive and establish colonies in the park, displacing the native bees.[301] These biologists are also concerned that honeybees foraging on the orchard blossoms are competing with the native bees and suppressing their numbers.[302] The authors believe that honeybees are able to usurp high density resources, such as orchards, by efficiently recruiting foragers.[303] Studies have not conclusively shown that the domesticated bees negatively affect numbers of native bees, but these biologists remain concerned that some native bee populations will be reduced to the extent that they are susceptible to extinction.[304] They recommend phasing out the use of honeybees in the park, which would, they argue, enhance native biodiversity.[305] The park is home to over 700 species of native bees, and these biologists believe that several species could adequately pollinate the orchards.[306] Here is another example of managers seeking to preserve "what we value" in a protected area without respect for natural conditions, in this case the presence of native bees, and it may be that native species are threatened as a result.

Again, natural conditions serve as a template or pattern within nature that, if maintained, helps ensure the preservation of amphibians, rare and endemic plants, native bees, and other species that are environmentally sensitive but not particularly charismatic. Managing to conserve "what we value" in protected areas, without respect for natural conditions, risks the loss of such species.

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[298] Vincent J. Tepedino et al., *Orchard Pollination in Capitol Reef National Park, Utah, USA. Honey Bees or Native Bees?*, 16 BIODIVERSITY & CONSERVATION 3083 (2007).
[299] NAT'L PARK SERV., *supra* note 30, at 47.
[300] *Id.*
[301] Tepedino et al., *supra* note 298, at 3092.
[302] *Id.*
[303] *Id.* at 3091.
[304] *Id.*
[305] *Id.*
[306] *Id.* at 3083.

IV. MANAGING FOR NATURALNESS IN A CHANGING WORLD

Within *Beyond Naturalness*, Cole and other experts emphasize the threat to protected areas presented by acid rain, invasions of exotic species, climate change, and other human-caused stresses.[307] Increased management flexibility is needed, these authors argue, to counter such stresses.[308] Again, they recommend abandoning naturalness as a mandatory goal in the management of protected areas.[309] Yet, as discussed above, amphibians, rare and endemic plants, and other organisms are adapted to highly specific environmental conditions, and are highly sensitive to habitat alteration.[310] Certain management interventions in protected areas—such as introducing predatory trout into historically fishless lakes and introducing non-native mountain goats into wilderness areas—have resulted in losses or threatened losses of such species.[311] Indeed, *all* organisms are adapted to more-or-less specific environmental conditions.[312] This suggests that there should be a proper balance within protected area policies: a mandate to maintain natural conditions in these areas, along with the flexibility to intervene as needed to maintain natural conditions and protect native biodiversity. In fact, agency policies currently provide managers much flexibility.[313] The authors of *Beyond Naturalness* praise certain agency projects for demonstrating the need to go "beyond naturalness,"[314] but in fact these projects demonstrate the need to maintain natural conditions within protected areas. These projects are required by agency policies, which provide the flexibility needed to carry them out.[315]

Authors of *Beyond Naturalness* discuss an interesting project proposed by the Park Service: a vegetation restoration project in a designated wilderness area within the Bandelier National Monument in New Mexico.[316] The authors of the book claim that this project demonstrates

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[307] BEYOND NATURALNESS, *supra* note 3, at xi, 1, 8, 23, 50, 62, 64, 179–80, 192, 252, 258.
[308] *Id.* at 64, 190, 192–93, 257–58, 260–61.
[309] *Id.* at 26, 259–62, 267.
[310] *See* MAXELL, *supra* note 264, at 9; MACK & MICACCHION, *supra* note 283, at 21; Porej & Hetherington, *supra* note 282, at 446, 452; Semlitsch, *supra* note 283, at 622–23; SMITH & KEINATH, *supra* note 266, at 17–19.
[311] Schreiner et al., *supra* note 290, at 12-12; MAXELL, *supra* note 264, at 62.
[312] SMITH & SMITH, *supra* note 287, at 68–69.
[313] *See generally* BEYOND NATURALNESS, *supra* note 3, at 8, 13.
[314] *See generally id.* at 1–4, 7–9, 12–14.
[315] *Id.* at 8, 13, 44.
[316] *Id.* at 2–4.

the need to go "beyond naturalness,"[317] yet it can be argued that this project well illustrates the need to restore natural conditions in protected areas. As described within the EIS for the project, a long history of fire suppression has resulted in increasing numbers of fire-sensitive piñion and juniper trees and the expansion of their ranges, crowding out native grasses, herbs, and forbs.[318] Additionally, livestock grazing has resulted in the loss of much of this herbaceous vegetation.[319] Grazing ended in the 1940s,[320] but the exposed soil has been subjected to high rates of erosion and much of it is washing away.[321] The monument is dedicated to the preservation of archeological sites.[322] According to the EIS, approximately seventy-five percent of the known prehistoric sites in the park lie within piñion-juniper woodlands, and approximately ninety percent of these sites have been damaged by erosion.[323] Natural processes have been unable to restore the herbaceous vegetation.[324] One problem is that, lacking such vegetation, these areas are unable to support the frequent, low-intensity fires that would naturally limit the distributions of piñions and junipers and encourage the growth of grasses and forbs.[325] Efforts to reseed these areas have reportedly been unsuccessful.[326] Managers have proposed the use of chain saws to cut down piñions and junipers in approximately 4000 acres of the wilderness area.[327] Cut branches and tree trunks will be scattered across the ground in denuded areas to stabilize the soil and allow grasses and other herbaceous vegetation to take hold. Based on experience in other areas, this is considered a "proven treatment."[328] Helicopters

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[317] *See id.* at 2, 7–8.
[318] NAT'L PARK SERV., BANDELIER NATIONAL MONUMENT ECOLOGICAL RESTORATION PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT 8 (2006) [hereinafter BANDELIER DEIS], *available at* http://parkplanning.nps.gov/document.cfm?parkID=27&projectID=10977&documentID=17655.
[319] *Id.* at vii, 8.
[320] Peter B. Landres et al., *Naturalness and Wildness: The Dilemma and Irony of Managing Wilderness*, *in* WILDERNESS SCIENCE IN A TIME OF CHANGE CONFERENCE VOLUME 5: WILDERNESS ECOSYSTEMS, THREATS, AND MANAGEMENT 377, 380 (David N. Cole et al. eds., 2000).
[321] BANDELIER DEIS, *supra* note 318, at i–ii, 9–11.
[322] *Id.* at i–ii.
[323] *Id.* at ii.
[324] *Id.*
[325] *Id.* at vii.
[326] *Id.* at vi, 61–62; *see also* NAT'L PARK SERV., BANDELIER NATIONAL MONUMENT ECOSYSTEM RESTORATION PLAN RECORD OF DECISION 4 (Sept. 2007) [hereinafter BANDELIER ROD].
[327] The park totals approximately 34,000 acres. BANDELIER DEIS, *supra* note 318, at i.
[328] BANDELIER ROD, *supra* note 326, at 2.

will be used to support the work crews in remote locations.[329] Once herbaceous vegetation has been established, the Park Service will consider use of management-ignited fire to establish a more natural fire regime and maintain more natural species distributions.[330] The agency anticipates that it will take fifteen to twenty years for successful revegetation and signs of human influence to fade.[331]

In fact, Park Service policies require this effort to protect the archeological sites.[332] The agency's *Management Policies* states, "[t]he National Park Service will employ the most effective concepts, techniques, and equipment to protect cultural resources against theft, fire, vandalism, overuse, deterioration, environmental impacts, and other threats without compromising the integrity of the resources."[333] As discussed, Park Service policies require restoration of the natural distributions of all native park species.[334] Furthermore, agency policies require restoration of essential natural processes, or the "closest approximation" if they cannot recover naturally.[335] For this project, processes requiring restoration include a natural fire regime and growth of the native herbaceous vegetation in currently denuded areas, which will provide needed soil retention.[336]

It is important to point out that Park Service managers do not claim that this project will restore natural conditions. The claim in the EIS is more modest: the project will restore the area to "a more naturally functioning state."[337] This modest claim presumably reflects uncertainty concerning the extent of successful revegetation and the degree to which a natural fire regime will be established through natural and perhaps management-ignited fires.[338] When considering any restoration project, for a number of reasons it is problematic to simply assert that natural conditions will be, or have been, restored. Surely it is highly problematic

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[329] *Id.* at 3.
[330] *Id.* at 3, 6.
[331] BANDELIER DEIS, *supra* note 318, at i, xiii.
[332] *See id.* at 2.
[333] NAT'L PARK SERV., *supra* note 30, at 65.
[334] *See id.* at 42.
[335] "Biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural condition when a truly natural system is no longer attainable." *Id.* at 37.
[336] BANDELIER DEIS, *supra* note 318, at i–ii.
[337] *Id.* at i.
[338] The agency adopted as a goal of the project the restoration of "a more natural fire cycle." *Id.* at i, iii, viii. Appropriately, managers do not boldly claim that a natural fire regime will be restored. *See* BANDELIER ROD, *supra* note 326, at 3.

to assert that natural conditions, generally free of human influence, can be restored through extensive human interventions such as cutting down trees over 4000 acres, scattering the trunks and branches, and regularly setting fires. Yet, as the Bandelier restoration project illustrates so well, it is necessary to restore, if not truly natural conditions and processes, at least close approximations of these within protected areas.[339] There must be at least a close mimicking. Considering the Bandelier National Monument, it is, after all, deviations from naturalness, such as livestock grazing and fire suppression, that caused increased erosion and damage to the archeological sites.[340]

Park Service policies provide flexibility for the required interventions. The Wilderness Act generally prohibits the use of chain saws, helicopters, and other motorized equipment and mechanical transport in wilderness areas.[341] But, based on language within the Act, Park Service and other federal agency policies allow exceptions.[342] According to Park Service policies, motorized equipment and mechanical transport may be used within a designated wilderness area when such use is determined to be "the minimum requirement needed by management to achieve the purposes of the area, including the preservation of wilderness character and values, in accordance with the Wilderness Act."[343] Managers are required to include, within an EIS or other project document, an evaluation of the impacts of such use upon a number of wilderness qualities, including natural conditions, solitude, and opportunities for primitive recreation.[344] Indeed, the agency provides such an evaluation within the EIS for the Bandelier restoration project.[345] Managers are given much discretion in determining "the purposes of the area," balancing desired goals with the preservation of wilderness qualities.[346] Park Service managers are given much discretion, then, in the use of motorized equipment and mechanical

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[339] BANDELIER DEIS, *supra* note 318, at i–ii.
[340] *Id.* at vii.
[341] 16 U.S.C. § 1133(c) (2006).
[342] According to the Wilderness Act, motorized equipment, mechanical transport, and structures and installations are not allowed in a federally designated wilderness area except in emergencies or "as necessary to meet minimum requirements for the administration of the area for the purpose of this [Act]." *Id.* This clause is highly obscure, and has been interpreted by the agencies so as to allow much management discretion to engage in such uses.
[343] NAT'L PARK SERV., *supra* note 30, at 82. Notice that this language only roughly approximates the wording of the Act's exception clause. *See supra* note 342 and accompanying text.
[344] NAT'L PARK SERV., *supra* note 30, at 81.
[345] BANDELIER DEIS, *supra* note 318, at xiv–xv.
[346] *Id.* at 139.

transport in wilderness areas.[347] Cole and others criticize federal protected area policies for their emphasis on naturalness and lack of management flexibility.[348] "Less controversial is the urgent need to change policies and institutions to make them more flexible and adaptive," they write.[349] They praise this native plant restoration project without recognizing, apparently, that Park Service policies require the project and provide the flexibility needed to carry it out.[350] As required, the agency has attempted to minimize intrusions into the wilderness area, for example, by using chainsaws rather than hand tools, which will lower the number of years the project will take by "at least 20-fold."[351]

Cole and other experts discuss another interesting project: an effort by the U.S. Forest Service to restore aquatic ecosystems in the St. Mary's Wilderness Area in Virginia.[352] Using helicopters, the agency recently deposited limestone sand—calcium carbonate—along headwater streams in this wilderness area.[353] Cole and others claim that this project demonstrates the need to go "beyond naturalness," yet the goal of the project was to raise the pH in the river and streams to natural levels in order to counteract the effects of acid rain.[354] According to the Environmental Assessment ("EA") for the project, increased acidity in the St. Mary's River and its tributaries had caused dramatic losses of native trout and aquatic macroinvertebrates.[355] Approximately fifty percent of these species had been lost.[356] The Forest Service sought to raise the pH to natural levels, allowing these species to recover naturally.[357] Native amphibians were also expected to recover naturally.[358] According to the EA, depositing limestone sand along the headwater streams is "a management action aimed at preserving the natural stream conditions which are threatened by

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[347] *See* NAT'L PARK SERV., *supra* note 30, at 82.
[348] BEYOND NATURALNESS, *supra* note 3, at 190, 192–93, 252–55, 259–62.
[349] *Id.* at 192.
[350] *Id.* at 44.
[351] BANDELIER ROD, *supra* note 326, at 9.
[352] BEYOND NATURALNESS, *supra* note 3, at 4–5.
[353] U.S. FOREST SERV., ENVIRONMENTAL ASSESSMENT FOR PROPOSED ST. MARY'S AQUATIC RESTORATION PROJECT 1 (1998) [hereinafter ST. MARY'S EA], *available at* http://csm.jmu.edu/st.marys/Project/Planning/Environmental_Assessment/environmental_assessment.html.
[354] BEYOND NATURALNESS, *supra* note 3, at 1–2, 7–9, 13–14; ST. MARY'S EA, *supra* note 353, at 2–3.
[355] ST. MARY'S EA, *supra* note 353, at 2, 16.
[356] *Id.* at 16.
[357] *See id.* at 2, 5, 16; *see also* Cole et al., *supra* note 20, at 41.
[358] ST. MARY'S EA, *supra* note 353, at 5, 18. *See* SMITH & KEINATH, *supra* note 266, at 33–34.

human caused air pollution and acidification."[359] The agency believed that the river and streams would likely not recover without this treatment, which had been used successfully elsewhere in the forest.[360] An important consideration was that limestone does not occur naturally in this area.[361] The limestone deposits were expected to be of a different color than the surrounding rock and soil, and noticeable to visitors.[362] The deposits were expected to dissipate within five to eight years,[363] and the agency anticipated that further treatments would be needed.[364] It is fair to say that, with this project, the aquatic ecosystems are being restored to at least a close approximation of their natural conditions for the purpose of preserving native biodiversity. The agency attempted to minimize the impacts of the intrusions by scheduling the helicopter drops at times of low visitation and closing the park during the scheduled drops.[365]

Forest Service managers correctly interpreted the agency's policies as requiring this project and allowing the needed interventions. As discussed, according to the *Forest Service Manual*, managers are required to restore watersheds in cases of human-caused damage to soil or hydrological conditions, with loss of wilderness values.[366] Managers are also required to protect native wildlife and fish from human impacts that could lead to federal listing.[367] According to the *Forest Service Manual*, to be approved, a habitat improvement project must be in response to "abnormal human influence," and the project must be "necessary to sustain a primary value of a given wilderness or to perpetuate a federally listed threatened or endangered species."[368] The EA for this project emphasizes the recreational value of the native brook trout fishery.[369] Forest Service managers clearly believed they were compelled by law and agency policies to undertake this project.[370] According to the *Forest Service Manual*, motorized equipment and mechanical transport—including aircraft—are

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[359] ST. MARY'S EA, *supra* note 353, at 9.
[360] *Id.* at 2, 13.
[361] Limestone occurs naturally lower in the Shenandoah Valley, but not at higher elevations. *See* Dan Downey, Liming Information Sheet, ST. MARY'S WILDERNESS LIMING PROJECT, http://csm.jmu.edu/st.marys/Background/Liming/liming.html (last visited Nov. 8, 2012).
[362] ST. MARY'S EA, *supra* note 353, at 11.
[363] *Id.*
[364] *Id.* at 9.
[365] *Id.* at 1, 5, 11.
[366] U.S. FOREST SERV., *supra* note 55, at 35.
[367] *Id.* at 30.
[368] *Id.* at 33.
[369] ST. MARY'S EA, *supra* note 353, at 16.
[370] *See id.* at 9–11.

allowed in a wilderness area in emergencies or "to meet minimum needs for protection and administration of the area as wilderness."[371] For documentation, the *Forest Service Manual* requires that managers merely identify, in the appropriate forest management plan, "the places and circumstances" in which such uses are "necessary for protection and administration of the wilderness."[372] Agency managers are left with much discretion in determining what constitutes "protection and administration of the wilderness."[373] Although Cole and others criticize protected area policies for their emphasis on naturalness and lack of flexibility,[374] they praise this project without recognizing that agency policies require the project and allow the needed interventions.

Generally, protected area policies grant managers much flexibility in their efforts to maintain naturalness and protect native biodiversity. Interventions in protected areas may be extensive and ongoing. With respect to the use of motorized equipment and mechanical transport, including aircraft, in wilderness areas, BLM policies are similar to those of the Forest Service.[375] According to the *BLM Manual*, managers are merely required to identify, within the appropriate wilderness management plan, the "instances and places" in which such uses are "necessary to protect and administer the wilderness resource."[376] Again, Park Service managers must determine that such uses are necessary "to achieve the purposes of the area, including the preservation of wilderness character and values."[377] This is all vague language, and there is little required documentation, which allows for much management discretion.[378]

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[371] U.S. FOREST SERV., *supra* note 55, at 53.
[372] *Id.* at 54.
[373] *See id.*
[374] BEYOND NATURALNESS, *supra* note 3, at 190, 192–93, 252–55, 259–62.
[375] *Compare* BLM, *supra* note 95, at .07(F) (limiting the use of motor vehicles, motorboats, motorized equipment, or landing of aircraft), *with* U.S. FOREST SERV., *supra* note 55, at 52 (prohibiting the approval of the use of motorized equipment, mechanical transport, or flights over the wilderness unless justified).
[376] BLM, *supra* note 95, at .39(B); *see also id.* at .13, .13(A). U.S. Fish and Wildlife Service policies allow use of motorized equipment and mechanical transport when such uses are "the minimum requirement for administering the area as wilderness and are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes." U.S. FISH & WILDLIFE SERV., *supra* note 117, at 1.16B(2). Managers must document their decision to engage in such uses, and provide an estimate of the times and places, within the wilderness stewardship plan for the area. *Id.* at 1.18, 1.19A.
[377] NAT'L PARK SERV., *supra* note 30, at 82. As mentioned, Park Service managers are merely required to include within an appropriate project document an evaluation of the impacts of such uses upon a number of wilderness qualities. *See id.* at 81.
[378] *See generally id.* at 81.

It should be mentioned that Cole and other experts find little flexibility in agency policies. They are critical of agency planning, claiming that a management plan excessively limits the ability of managers to adapt to changing circumstances, often for up to ten to twenty years.[379] "[P]lanning must become more flexible and adaptive," they write.[380] Yet, according to BLM policies, wilderness management plans "should be flexible" and must be updated periodically to reflect changing circumstances.[381] Similarly, Forest Service policies require amendments or revisions of forest management plans to keep them current.[382] Park Service policies require several levels of planning, with a general management plan as well as detailed plans for specific actions.[383] These policies require revisions of a park's general management plan as conditions change, and stress the need for adaptive management.[384]

Policies governing national parks, wilderness, and other protected areas allow managers to use motorized equipment and mechanical transport in these areas if necessary, build temporary roads, place directional signs, designate campgrounds, cut trees, artificially stock fish, use management-ignited fire, control unwanted fires, remove exotic species, defend against outbreaks of insects and diseases, control predators, control ungulate populations, and install trails, bridges, fences, lookout towers, communication facilities, and administrative buildings.[385] It is important to point out the flexibility that is provided in the management of these areas.

V. GLOBAL CLIMATE CHANGE

Within *Beyond Naturalness*, Cole and other experts especially rely on the problem of climate change to convince their readers that managers should have such wide discretion in the management of protected areas.[386] They write, "Climate change is likely to be the defining issue

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[379] *See* BEYOND NATURALNESS, *supra* note 3, at 217–18, 258.
[380] *Id.* at 257; *see also id.* at 217.
[381] BLM, *supra* note 95, at .21(B).
[382] U.S. FOREST SERV., *supra* note 55, at 15.
[383] NAT'L PARK SERV., *supra* note 30, at 26–27.
[384] *Id.* at 26.
[385] *See id.* at 47–50, 124–27, 133–37; U.S. FOREST SERV., *supra* note 55, at 20, 34, 38, 45–50; BLM, *supra* note 95, at .12–.15, .31, .33, .34, .35, .37, .39, .41–.47; *see also* U.S. FISH & WILDLIFE SERV., *supra* note 117, at 1.16.
[386] *See* BEYOND NATURALNESS, *supra* note 3, at 23, 56, 179–80, 192, 258.

facing managers of parks and wilderness in the twenty-first century."[387] They emphasize that the rapid warming of Earth's climate is unprecedented.[388] These authors claim that, mainly because of climate change, it is impossible to maintain truly natural conditions within protected areas.[389] According to these experts, it may be inappropriate to attempt to maintain natural conditions, or even an approximation of these in many situations, since natural conditions may leave an area susceptible to losses of valued species and functions.[390] Managers must "adopt fundamentally new goals and management strategies," they write.[391] They emphasize the losses we face such as Joshua trees, giant sequoias, and the Everglades, as well as "a need for bold action."[392] Again, Cole and others recommend consideration of assisted migration.[393] They also recommend enhancing resilience by increasing genetic diversity, or—in more extreme situations—by replacing vulnerable species with species considered functionally equivalent.[394] Managers may need to consider the more extreme step of actively transforming ecosystems into new types of systems.[395] These experts emphasize the need to experiment in order to determine the effects of interventions, and to quickly adapt in light of new knowledge and changing circumstances.[396]

Agency policies do not specify specific actions to take in the face of climate change, beyond the Park Service's mandate to "gather and maintain baseline climatological data for reference."[397] Yet agency policies mandating natural conditions are the most effective response to climate change, given that a primary goal in protected areas is to preserve native biodiversity.

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[387] *Id.* at 192. Camille Parmesan and John Matthews agree, writing that "[t]he global scale of anthropogenic climate change threatens to exceed any other conservation problem." *See* Camille Parmesan & John Matthews, *Biological Impacts of Climate Change*, *in* PRINCIPLES OF CONSERVATION BIOLOGY 333, 355 (Martha Groom et al. eds., 3d ed. 2005).
[388] *See* BEYOND NATURALNESS, *supra* note 3, at 56–58.
[389] *Id.* at 50–51, 57–58; *see also* Cole et al., *supra* note 20, at 44.
[390] BEYOND NATURALNESS, *supra* note 3, at 50–51, 57–58, 126; Cole et al., *supra* note 20, at 44.
[391] *See* BEYOND NATURALNESS, *supra* note 3, at 63.
[392] *Id.* at 258; *see also id.* at 150, 154. "Contemporary climate change . . . places much that humans value at risk," they write. *Id.* at 180. "[T]here is a rising sense of urgency." *Id.* at 192.
[393] *Id.* at 7–8, 154, 186, 193, 229–30, 263.
[394] *See id.* at 185, 193.; *see also* Cole et al., *supra* note 20, at 52.
[395] BEYOND NATURALNESS, *supra* note 3, at 154–55, 156, 258; Cole et al., *supra* note 20, at 41, 47–48, 52.
[396] BEYOND NATURALNESS, *supra* note 3, at 8, 257–58; Cole et al., *supra* note 20, at 51.
[397] NAT'L PARK SERV., *supra* note 30, at 53.

Studies show that many species are responding to the changing climate by adjusting their spatial distributions without direct human assistance.[398] For example, in a recent study of small mammals in Yosemite National Park, Craig Moritz and other biologists documented upward shifts in the ranges of half of the twenty-eight species they surveyed.[399] These upward shifts are a response, they believe, to the changing climate.[400] "Formerly low-elevation species expanded their ranges" into higher elevations, they write, "and high-elevation species contracted theirs[.]"[401] These biologists recommend protection of large-scale elevation gradients. They write, "Our results confirm that protecting large-scale elevation gradients retains diversity by allowing species to migrate in response to climate and vegetation change."[402] Cole and others claim that with the changing climate it is problematic to speak of maintaining truly natural conditions.[403] Perhaps it is most appropriate to say that large-scale elevation gradients should be maintained in as natural a condition as possible, meaning as free of human influences, such as roads, fences, and other obstructions, as possible, allowing species to adjust on their own to climate change.

Other research has also shown shifts in spatial distributions of various species. Camille Parmesan found that two-thirds of the fifty-eight butterfly species she studied "have shifted their ranges northward by as much as 100 kilometers per decade," and she believes that only climate change can explain such dramatic shifts.[404] Rachael Hickling and other biologists studied 329 animal species in England, including mammals, birds, butterflies, reptiles, amphibians, fish, and spiders.[405] "[M]ost taxonomic groups," they write, "have shown significant distributional shifts northwards and to higher elevations" in response to climate warming.[406] Jonathan Lenoir and other biologists studied range shifts in 171 forest plant species in western European mountains, between lowlands and

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[398] Craig Moritz et al., *Impact of a Century of Climate Change on Small-Mammal Communities in Yosemite National Park, USA*, 322 SCIENCE 261, 261 (2008).
[399] *Id.*
[400] *Id.*
[401] *Id.*
[402] *Id.* at 264.
[403] BEYOND NATURALNESS, *supra* note 3, at 56–57.
[404] Parmesan & Matthews, *supra* note 387, at 348.
[405] Rachael Hickling et al., *The Distributions of a Wide Range of Taxonomic Groups Are Expanding Polewards*, 12 GLOBAL CHANGE BIOLOGY 450, 450 (2006).
[406] *Id.* at 452.

upper subalpine vegetation.[407] They concluded, "[F]orest plant species, as many vertebrate and invertebrate species, have already followed the pace of climate change by shifting their distributions to higher altitudes."[408] There is much evidence that many plant and animal species are responding to climate change by shifting their distributions to higher elevations or toward the poles.[409] Furthermore, many species are responding by shifting the timing of their life cycles by earlier emergence and reproduction in the spring.[410]

A recent study of pika, *Ochotona princeps*, populations in the Sierra Nevada and Great Basin ranges shows that these small mammals are not slowly going extinct as a result of climate change, as was previously thought, but are in fact "thriving."[411] According to Constance Millar and Robert Westfall, the pikas in these mountains "persist in a wide range of thermal environments, and show little evidence of extirpation or decline."[412] This is probably due to their preferred habitat. According to Millar and Westfall, pikas prefer to live in rocky structures such as boulder streams and rock glaciers that lie adjacent to wetlands.[413] Typically associated with such structures are northerly aspects, steep slopes, narrow and deep canyons, and other characteristics that increase cold air flow and pooling.[414] According to Millar and Westfall, such environments "tend to be cooler than means expected for their elevations" in summer months, and they are also warmer in winter months.[415] These biologists claim that such habitat is "likely to remain buffered against temperature change and lag in response to warming,"

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[407] *See* Jonathan Lenoir et al., *A Significant Upward Shift in Plant Species Optimum Elevation During the 20th Century*, 320 SCIENCE 1768, 1768 (2008); *see also* Harald Pauli et al., *High Summits of the Alps in a Changing Climate*, *in* "FINGERPRINTS" OF CLIMATE CHANGE 139 (Gian-Reto Walther et al. eds., 2001).
[408] Lenoir et al., *supra* note 407, at 1769.
[409] *See* I-Ching Chen et al., *Rapid Range Shifts Associated with High Levels of Climate Warming*, 333 SCIENCE 1024, 1024 (2011); Ragupathy Kannon & Douglas A. James, *Effects of Climate Change on Global Biodiversity: A Review of Key Literature*, 50 TROPICAL ECOLOGY 31, 34–35 (2009).
[410] *See* Chen et al., *supra* note 409, at 1024; Kannon & James, *supra* note 409, at 33–34.
[411] *See generally* Constance I. Millar & Robert D. Westfall, *Distribution and Climatic Relationships of the American Pika (Ochotona princeps) in the Sierra Nevada and Western Great Basin, USA*, 42 ARCTIC, ANTARCTIC, AND ALPINE RES. 76 (2010).
[412] *Id.* at 86.
[413] *Id.* at 84–85.
[414] *Id.* at 84.
[415] *Id.* at 84–85.

and they emphasize the importance of such habitat for the continuing survival of pikas.[416]

Cole and other management experts write, "the value of naturalness as a conceptual foundation on which to base operational management decisions has been called into question."[417] Yet the studies just discussed indicate that the survival of many species, of different taxa, depends upon the existence of natural habitats, elevation gradients, and habitat corridors that allow species to adjust to and survive the rising temperatures. Biologists emphasize the need to maintain natural conditions over extensive areas.[418] Camille Parmesan and others recommend the creation of new natural reserves, such as national parks, wilderness, and other legally protected areas, with high topographical diversity in order to accommodate species' movements upwards.[419] They also recommend that natural habitat corridors be protected, including "[c]orridors along fence lines, ditches, streams, and other minimally used land," to accommodate species movements upward and toward the poles.[420]

Reed Noss recommends the protection of old growth forests, arguing that such forests are expected to buffer the "intensity and rate of change."[421] Noss also recommends restoring natural fire regimes in certain areas through the use of management-ignited fire.[422] In a recent article, Noss recommends that we cease habitat fragmentation, maintain extensive networks of protected areas lying adjacent to each other—for example, along the length of the Cascade Mountains—and protect natural gradients including elevational and soil moisture gradients.[423] He concludes that in dealing with climate change our focus should be on

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[416] *Id.* at 86.
[417] BEYOND NATURALNESS, *supra* note 3, at 25.
[418] *See* Reed F. Noss, *Beyond Kyoto: Forest Management in a Time of Rapid Climate Change*, 15 CONSERVATION BIOLOGY 578, 582–83 (2001).
[419] Parmesan & Matthews, *supra* note 387, at 354–55; *see also* Reed F. Noss & Blair Csuti, *Habitat Fragmentation*, *in* PRINCIPLES OF CONSERVATION BIOLOGY, *supra* note 387, at 240; Noss, *supra* note 418, at 582–83. Smith and Smith write, "[g]iven the ever-growing pressures placed on lands by the human population, preservation of biological diversity depends more and more on establishing legally designated protected areas." SMITH & SMITH, *supra* note 287, at 579.
[420] *See* Parmesan & Matthews, *supra* note 387, at 354–55; Noss & Csuti, *supra* note 419, at 240; Noss, *supra* note 418, at 583–84; SMITH & SMITH, *supra* note 287, at 581–82.
[421] *See* Noss, *supra* note 418, at 583.
[422] *Id.* at 585.
[423] *See* REED NOSS, CLIMATE CHANGE AND CONSERVATION, CONSERVATION NORTHWEST (2012), *available at* http://www.conservationnw.org/what-we-do/wildlife-habitat/climate-change.

"land conservation on a vast scale," with good ecosystem management and minimal intrusions.[424]

As previously discussed, Cole and others recommend consideration of highly invasive measures—assisted migration, introducing functional substitutes for species considered vulnerable, and actively transforming ecosystems into new types of systems—but, as these experts admit, we lack knowledge of how species will respond to such interventions.[425] They caution that such interventions are risky and should be treated as experimental.[426] The danger, of course, is that native species may be lost as a direct result of the interventions. Indeed, assisted migration is not encouraged by some biologists for this reason: transporting a non-native species into a new area risks the loss of species already present in the area.[427] Some management experts are unwilling to accept the risks. Within *Beyond Naturalness*, Landres defends the strict "let it be" or "hands off" approach based on our lack of knowledge of how ecosystems will respond to global warming and our management efforts.[428] He writes, "Global climate change highlights how little managers and scientists understand about ecological systems, and respecting nature's autonomy and using a hands-off approach is even more important in such a novel world to hedge risk and not cause inadvertent problems."[429] His argument is that, in the circumstances, doing nothing is the approach that minimizes risk to native species.[430] He claims that the "let it be" or "hands off" approach is the most appropriate strategy in the management of some wilderness areas.[431] Landres warns of the increased risk of losing native species as managers intervene in nature with the intent of preserving selected species.[432]

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[424] *Id.*
[425] BEYOND NATURALNESS, *supra* note 3, at 58.
[426] *Id.* at 8, 186, 190, 192.
[427] Cole and others acknowledge that "[t]ranslocations are often unsuccessful, and unanticipated consequences can result from introducing new species into extant communities." *Id.* at 186. Douglas Futuyma writes, "[b]ecause of these complex interactions [predation, herbivory, and competition], the addition or extinction of any single species is likely to affect the persistence of at least a few other species, and in some cases can affect many." DOUGLAS J. FUTUYMA, EVOLUTIONARY BIOLOGY 82 (3d ed. 1998).
[428] Landres, *supra* note 173, at 93, 101.
[429] *Id.* at 101.
[430] *Id.* at 93.
[431] *Id.* at 92.
[432] "Another ecological benefit of the hands-off approach is that it may increase the likelihood of protecting a broad range of species that might otherwise be lost when management focuses on select species." *Id.* at 95.

As previously discussed, agency policies do not mandate the strict "let it be" approach in protected areas. Interventions are required in cases of human-caused damage to these areas and may be quite extensive. Yet the goal must always be to maintain natural conditions and processes, or close approximations, with intrusions as minimal as possible. Under agency policies, native species are allowed to adjust on their own to climate change within conditions that are natural or as close to natural as possible. This is the most effective strategy for preserving native biodiversity. Again, as studies have shown, many species are adjusting to and surviving the rising temperatures without direct human assistance.[433] It can be argued, borrowing from Landres, that given our relative ignorance of how species will respond to the rising temperatures and our management efforts, maintaining natural conditions, or conditions as natural as possible, and allowing species to adjust on their own minimizes the risk of losing native species. It is worth emphasizing that within agency policies the goal is to preserve a broad array of native species—"*all* plants and animals native to park ecosystems"—rather than a few charismatic species.[434]

CONCLUSION

The controversy in protected area management is not, as one might believe after reading *Beyond Naturalness* and the earlier article, over whether or not managers should intervene in these areas. The controversy is certainly not over whether ecosystems are dynamic rather than static. The real controversy concerns how much discretion should be granted in the management of national parks, wilderness, and other protected areas. According to Cole and other management experts, managers should be allowed, in revised law and policy, to extensively shape these areas to conserve "what we value," without the limitation of natural

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[433] According to studies, however, some species cannot effectively respond to climate change. For example, lizards appear to be particularly vulnerable to the changing temperatures for physiological reasons. Biologists predict that, by 2080, twenty percent of all lizard species worldwide will be extinct. *See* Barry Sinervo et al., *Erosion of Lizard Diversity by Climate Change and Altered Thermal Niches*, 328 SCIENCE 894, 894 (2010). In forecasting models, shifts in species ranges "only trivially offset losses." *Id.* at 899. Sinervo and others write, "[O]ur findings indicate that lizards have already crossed a threshold for extinctions." *Id.* Even if natural conditions are maintained over extensive areas, there will be some losses.

[434] *See* NAT'L PARK SERV., *supra* note 30, at 42 (emphasis added). For another especially strong statement see BLM, *supra* note 95, at .11(1).

conditions or a requirement of minimal intrusions.[435] Under this approach, managers are given much discretion to impose human preferences and designs onto nature, which puts at increased risk species such as amphibians, rare and endemic plants, and others that are highly sensitive to habitat alterations, but are not highly valued within society.

This Article has argued that maintaining natural conditions is necessary for preserving native biodiversity. Again, all organisms are adapted to more-or-less specific environmental conditions.[436] The St. Mary's Wilderness aquatic restoration project well illustrates the necessity of maintaining natural conditions, or close approximations, for the preservation of a wide array of native species—in this case amphibians, aquatic macroinvertebrates, and trout.[437]

Cole and others argue that human-caused stresses such as acid rain, exotic species, and climate change should lead us to abandon naturalness as a mandatory goal in protected areas.[438] More flexibility is needed, they claim.[439] Such arguments are not convincing. As managers concluded, restoring natural pH levels in the St. Mary's Wilderness Area was necessary for the restoration of the native aquatic ecosystem, which had been significantly affected by acid rain.[440] Considering climate change, the most effective strategy, as suggested by many studies, is to maintain natural conditions, or conditions as natural as possible, and allow native species to adjust and survive on their own. In fact, in *Beyond Naturalness* and the earlier article, Cole and others have not presented even one example of an agency project that has successfully enhanced native or regional biodiversity that did not involve bringing a given area to at least a close approximation of its natural conditions. There must be at least a close mimicking. To claim that managers have gone "beyond naturalness" because they have taken action, with extensive interventions in certain cases, to maintain biodiversity fails to recognize the essential role that natural conditions, or close approximations, play in maintaining native and regional biodiversity. Natural conditions should be considered an essential, broad goal in protected area management, beneath which managers can most effectively deal with human-caused problems such as acid rain and climate change. Protected area legislation and policy should,

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[435] BEYOND NATURALNESS, *supra* note 3, at 8, 257–58; Cole et al., *supra* note 20, at 51.
[436] *See* SMITH & SMITH, *supra* note 287, at 68–69, 571.
[437] *See supra* notes 353–65 and accompanying text.
[438] BEYOND NATURALNESS, *supra* note 3, at 8, 23, 26, 180, 192, 253–54, 259.
[439] *Id.* at 64, 190, 192–93, 257–58, 260–61.
[440] ST. MARY'S EA, *supra* note 353, at 1–5.

therefore, continue to mandate maintaining natural conditions in these areas. As discussed, agency policies allow managers much flexibility in their efforts to maintain natural conditions and native biodiversity, including the use of motorized equipment and mechanical transport, placement of structures, and use of management-ignited fire.

Finally, philosopher Mark Sagoff has written that federal environmental legislation expresses ideals within our society concerning how we should live within our "magnificent natural heritage."[441] Sagoff eloquently writes,

> Our environmental goals rest on views or beliefs that find their way, as ethical principles and intuitions, into legislation and common-law adjudication. . . . These goals represent not goods we choose but values we recognize—not what we want but who we are.[442]

Federal environmental legislation reflects what Sagoff calls the "citizen perspective," the perspective citizens adopt as they go beyond personal preferences to consider what is good for society as a whole.[443]

The mandate within federal legislation and policy to maintain natural conditions in protected areas reflects an ideal shared within our society. Americans envision national parks, wilderness, and other protected areas as places that retain their natural conditions. That people view protected areas in this way can be seen in their responses to agency proposals that call for excessive and unnecessary management interference in these areas. The agencies proposing the Bob Marshall Wilderness fish restocking project received numerous letters from citizens and organizations opposed to the project. In one particularly moving letter, citizens write,

> We feel that this plan goes against all that is held sacred in a wilderness area. Wilderness areas were established in order to hold those areas in a pristine state without interference from human beings. We believe the "Wilderness Act" should be respected and these areas should not be tampered with.[444]

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[441] MARK SAGOFF, THE ECONOMY OF THE EARTH: PHILOSOPHY, LAW, AND THE ENVIRONMENT 27 (2d ed. 2008).
[442] *Id.* at 26–27.
[443] *See id.* at 31.
[444] *Letter from Virgil and Barbara Burns*, BONNEVILLE FEIS, *supra* note 233, at 1–6.

As discussed, the Wilderness Act does not mandate that wilderness areas be managed to remain pristine, entirely free of human influence.[445] It is fair to say, however, that it is their naturalness that Americans "hold sacred" in wilderness and other protected areas, their general freedom from human influence, or, borrowing language from the Park Service, the absence of human dominance over these areas.[446] In an earlier article, Landres and other management experts express concern that citizens often oppose management manipulations of wilderness. They ask, "Is it the science they distrust or is it us?"[447] Management experts have failed to appreciate that, as expressed within protected area legislation and policy, citizens within our society value naturalness itself. Regardless of how good the science is and how well-intentioned managers may be, citizens within our society accept that national parks, wilderness, and other protected areas should remain generally free of human influence. In these areas, nature is to remain autonomous or self-governing.[448]

Naturalness within protected areas is necessary ecologically for the preservation of native biodiversity, and it is important socially. It is consistent with expectations American citizens have concerning the management of these areas.

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[445] NAT'L PARK SERV., *supra* note 30, at 36.
[446] *Id.*
[447] Landres et al., *supra* note 320, at 380.
[448] Landres, *supra* note 173, at 89.