November 25, 2011

BLM, Phoenix District Office
ATTN: LS-SDNM RMP
21605 North 7th Avenue
Phoenix, Arizona 85027

Sent via U.S. Mail and email

Re: Draft Resource Management Plan and Environmental Impact Statement for the Lower Sonoran Field Office and the Sonoran Desert National Monument

Dear Ms. Garber and Mr. Hanson,

We appreciate the opportunity to comment on the Draft Resource Management Plan and Environmental Impact Statement (Draft RMP/EIS) for the BLM's Lower Sonoran Field Office and Sonoran Desert National Monument. The planning area and the natural, cultural, wilderness, and other resources and values this landscape contains are of utmost importance to the undersigned groups and our collective members and supporters. We provide the following comments and recommendations for the protection of these resources over the next twenty years in a region that stands to transform dramatically over this time period. We appreciate BLM's full consideration of these comments and recommendations and look forward to further participation in the public process. The following provides statements of interest for each of the undersigned groups.

The Wilderness Society (TWS) works to deliver to future generations an unspoiled legacy of wild places, with all the precious values they hold: biological diversity; clean air and water; towering forests, rushing rivers, and sage-sweet, silent deserts. Our mission is to protect wilderness and inspire Americans to care for our wild places. The Wilderness Society represents more than one half million members and supporters nationwide, including almost 12,000 in Arizona. TWS members and staff use the lands within the planning area for recreation and for an escape to natural places.

The Sierra Club is one of the oldest grassroots environmental organizations in the country. The Sierra Club's mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." The Grand Canyon Chapter has long been committed to protection of Arizona's lands, wildlife, water, and communities and has been significantly involved in activities related to the Lower Sonoran Field Office and Sonoran Desert National Monument. Our members recreate in and have been involved in numerous service projects in the planning area, including those focused on clean ups and buffel grass removal.

The Arizona Wilderness Coalition (AWC) is a state-based not-for-profit organization whose mission is to permanently protect and restore wildlands and waters in Arizona for the enjoyment of all citizens while ensuring that Arizona's native plants and animals have a lasting home in

wild nature. Formed in 1979, AWC has helped facilitate the designation of more than 3.5 million acres of wilderness in Arizona. In Ironwood Forest National Monument, our organization completed and submitted a detailed wilderness characteristics inventory during the RMP planning process, as well as providing substantive comment on other natural resource issues found there.

The *Center for Biological Diversity* ("Center") uses science, policy and law to advocate for the conservation and recovery of species on the brink of extinction and the habitats they need to survive. The Center represents more than 37,000 members nationwide, including over 2,500 in Arizona. Center staff and members use the lands within the planning area for quiet recreation, scientific research, aesthetic pursuits, and spiritual renewal.

The *Friends of Saddle Mountain* include approximately 50 volunteers that have assisted BLM in natural and cultural resource inventories and monitoring in the Saddle Mountain region covering nearly 58,000 acres. *Friends* have identified and continue to monitor hundreds of archaeological sites and resources in the area and have a strong interest in the long-term preservation of the spectacular resources of the Saddle Mountain region.

Contents

I. APPLICABLE LEGAL STANDARDS

The following is a brief synopsis of the legal standards which apply to the comments and recommendations on the Draft RMP. Detailed comments and recommendations follow and will refer to and/or rely upon the information set out below.

A. National Environmental Policy Act

The National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq*., requires, among other things, agencies to conduct environmental analysis of the direct, indirect, and cumulative impacts of proposed actions, as well as mitigation measures, consider a range of reasonable alternatives (including an alternative that minimizes environmental impacts), and solicit and respond to public comments.

1. Reasonable Range of Alternatives Must Be Considered

The range of alternatives is "the heart of the environmental impact statement." 40 C.F.R. § 1502.14. NEPA requires BLM to "rigorously explore and objectively evaluate" a range of alternatives to proposed federal actions. *See* 40 C.F.R. §§ 1502.14(a), 1508.25(c). "An agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action." *Nw. Envtl. Defense Center v. Bonneville Power Admin*., 117 F.3d 1520, 1538 (9th Cir. 1997). An agency violates NEPA by failing to "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action. *City of Tenakee Springs v. Clough*, 915 F.2d 1308, 1310 (9th Cir. 1990) (quoting 40 C.F.R. § 1502.14). This evaluation extends to considering more environmentally protective alternatives and mitigation measures. *See, e.g., Kootenai Tribe of Idaho v. Veneman*, 313 F.3d 1094, 1122–23 (9th Cir. 2002) (and cases cited therein). For this PRMP, the consideration of more environmentally protective alternatives is also consistent with the Federal Land Policy and Management Act's (FLPMA) requirement that BLM "minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved." 43 U.S.C. §1732(d)(2)(a).

NEPA requires that an actual "range" of alternatives is considered, such that the Act will "preclude agencies from defining the objectives of their actions in terms so unreasonably narrow that they can be accomplished by only one alternative (i.e. the applicant's proposed project)." *Col. Envtl. Coal. v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999), citing *Simmons v. U.S. Corps of Engineers*, 120 F.3d 664, 669 (7th Cir. 1997). This requirement prevents the environmental impact statement (EIS) from becoming "a foreordained formality." *City of New York v. Dep't of Transp.*, 715 F.2d 732, 743 (2nd Cir. 1983). *See also Davis v. Mineta*, 302 F.3d 1104 (10th Cir. 2002).

Further, in defining what is a "reasonable" range of alternatives, NEPA requires consideration of alternatives "that are practical or feasible" and not just "whether the proponent or applicant likes or is itself capable of carrying out a particular alternative"; in fact, "[a]n alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable." Council on Environmental Quality, *Forty Most Asked Questions Concerning*

CEQ's National Environmental Policy Act Regulations, *Questions 2A and 2B*, *available at* http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm; 40 C.F.R. §§ 1502.14, 1506.2(d).

2. Hard Look Must Be Appropriate to Proposed Action and Include Direct, Indirect, and Cumulative Impacts

NEPA dictates that BLM take a "hard look" at the environmental consequences of a proposed action and the requisite environmental analysis "must be appropriate to the action in question." *Metcalf v. Daley*, 214 F.3d 1135, 1151 (9th Cir. 2000); *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989). In order to take the "hard look" required by NEPA, BLM is required to assess impacts and effects that include: "ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, *whether direct, indirect, or cumulative*." 40 C.F.R. § 1508.8. (emphasis added). NEPA regulations define "cumulative impact" as:

> the impact on the environment which results from the *incremental impact of the action when added to other past, present, and reasonably foreseeable future actions* regardless of what agency (Federal or non-Federal) or person undertakes such other actions. *Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time*.

40 C.F.R. § 1508.7 (emphasis added).

To satisfy NEPA's hard look requirement, the cumulative impacts assessment must do two things. First, BLM must catalogue the past, present, and reasonably foreseeable projects in the area that might impact the environment. *Muckleshoot Indian Tribe v. U.S. Forest Service*, 177 F.3d 800, 809–10 (9th Cir. 1999). Second, BLM must analyze these impacts in light of the proposed action. *Id.* If BLM determines that certain actions are not relevant to the cumulative impacts analysis, it must "demonstrat[e] the scientific basis for this assertion." *Sierra Club v. Bosworth*, 199 F.Supp.2d 971, 983 (N.D. Ca. 2002). A failure to include a cumulative impact analysis of actions within a larger region will render NEPA analysis insufficient. *See, e.g., Kern v. U.S. Bureau of Land Management*, 284 F.3d 1062, 1078 (9th Cir. 2002) (analysis of root fungus on cedar timber sales was necessary for an entire area).

3. Baseline Information Must Be Sufficient to Permit Analysis of Impacts

Importantly, 40 C.F.R. § 1502.15 requires agencies to "describe the environment of the areas to be affected or created by the alternatives under consideration." Establishment of baseline conditions is a requirement of NEPA. In *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988), the Ninth Circuit states that "without establishing . . . baseline conditions . . . there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." The court further held that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process."

4. Mitigation Measures Must Be Described with Specificity and Must Include Commitments for Action

NEPA requires that BLM discuss mitigation measures in an EIS. 40 C.F.R. §§ 1502.14, 1502.16. Also, under NEPA, BLM's Finding of No Significant Impact (FONSI) is lawful only if "BLM has made a convincing case that no significant impact will result there from or that any such impact will be reduced to insignificance by the adoption of appropriate mitigation measures." *Defenders of Wildlife*, 152 IBLA 1, 6 (2000) (citations omitted). In general, in order to show that mitigation will reduce environmental impacts to an insignificant level, BLM must discuss the mitigation measures "in sufficient detail to ensure that environmental consequences have been fairly evaluated." *Communities, Inc. v. Busey*, 956 F.2d 619, 626 (6th Cir. 1992). Simply identifying mitigation measures, without analyzing the effectiveness of the measures, violates NEPA. Agencies must "analyze the mitigation measures in detail [and] explain how effective the measures would be . . . A mere listing of mitigation measures is insufficient to qualify as the reasoned discussion required by NEPA." *Nw. Indian Cemetery Protective Ass'n v. Peterson*, 764 F.2d 581, 588 (9th Cir. 1985), *rev'd on other grounds*, 485 U.S. 439 (1988). NEPA also directs that the "possibility of mitigation" should not be relied upon as a means to avoid further environmental analysis. Council on Environmental Quality, *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, *available at* http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm; *Davis v. Mineta*, 302 F.3d at 1125.

Further, general statements that BLM will conduct monitoring are also not an appropriate form of mitigation. Simply monitoring for expected damage does not actually reduce or alleviate any impacts.

5. BLM Must Assess Alternatives Using Quality Data and Scientifically Acceptable Methods of Analysis, Which Are Disclosed to the Public for Comment

BLM cannot evaluate consequences to the environment, determine avoidable or excessive degradation, and assess how best to designate and protect Areas of Critical Environmental Concern (ACECs) without adequate data and analysis. NEPA's hard look at environmental consequences must be based on "accurate scientific information" of "high quality." 40 C.F.R. § 1500.1(b). Essentially, NEPA "ensures that the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts." *Robertson v. Methow Valley Citizens Council*, 490 U.S. at 349. The Data Quality Act and BLM's interpreting guidance expand on this obligation, requiring that influential scientific information use "best available science and supporting studies conducted in accordance with sound and objective scientific practices." Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L. No. 106-554, § 515. *See also* Bureau of Land Management, Information Quality Guidelines, *available at* http://www.blm.gov/nhp/efoia/data_ quality/guidelines.pdf .

BLM's internal guidance also recognizes the importance of accumulation and proper analysis of data. The agency's Land Use Planning Handbook emphasizes the importance of using sufficient, high quality data and analytical methods, and making those available to the public. Appendix H of the Land Use Planning Handbook also directs: "The data and resultant information for a land

use plan must be carefully managed, documented, and applied to withstand public, scientific, and legal scrutiny." Appendix F-1 of the Handbook emphasizes the importance of providing a clear explanation of how analysis was conducted, stating: "Regardless of its source, sufficient metadata (data about data) should be provided to clearly determine the quality of the data, along with any limitations associated with its use." In other words, appropriate analysis of data is as important as the accumulation of sufficient data.

Further, both data and analyses must be disclosed to the public, in order to permit the "public scrutiny" that is considered "essential to implementing NEPA." 40 C.F.R. § 1500.1(b). BLM's guidelines for implementing the Data Quality Act also reiterate that making data and methods available to the public permits independent reanalysis by qualified member of the public. In this regard, NEPA "guarantees that the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision." *Robertson v. Methow Valley Citizens Council*, 490 U.S. at 349. NEPA not only requires that BLM have detailed information on significant environmental impacts, but also requires that the agency make this information available to the public for comment. *Inland Empire Public Lands Council v. U.S. Forest Service*, 88 F.3d 754, 757 (9th Cir. 1996).

Where there is scientific uncertainty, NEPA imposes three mandatory obligations on BLM: (1) a duty to disclose the scientific uncertainty; (2) a duty to complete independent research and gather information if no adequate information exists unless the costs are exorbitant or the means of obtaining the information are not known; and (3) a duty to evaluate the potential, reasonably foreseeable impacts in the absence of relevant information, using a four-step process. Unless the costs are exorbitant or the means of obtaining the information are not known, the agency must gather the information in studies or research. 40 C.F.R. § 1502.22. Courts have upheld these requirements, stating that the detailed environmental analysis must "utiliz[e] public comment and the best available scientific information." *Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1171-72 (10th Cir. 1999) (citing *Robertson v. Methow Valley Citizens' Council*, 490 U.S. at 350); *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1521-22 (10th Cir. 1992).

As the Supreme Court has explained, while "policymaking in a complex society must account for uncertainty," it is not "sufficient for an agency to merely recite the terms 'substantial uncertainty' as a justification for its actions." Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29, 52 (1983). Instead, in this context, as in all other aspects of agency decision-making, "[w]hen the facts are uncertain," an agency decision-maker must, in making a decision, "identify the considerations he found persuasive." *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 520 (D.C. Cir. 1983), *quoting Ind. Union Dept., AFL-CIO v. Hodgson*, 499 F.2d 467, 476 (D.C. Cir. 1974).

BLM must provide the public with an explanation of both the data used in analyzing the potential effects of management alternatives and the methods used to conduct the analysis, as well as an opportunity to provide comments and propose corrections or improvements.

6. BLM Must Respond to Public Comments and Specifically Address Scientific Uncertainty and/or Differing Scientific Opinions

Under Council for Environmental Quality (CEQ) regulations implementing NEPA, BLM must respond to substantive comments made during the public comment period for the EIS. 40 C.F.R. § 1503.4. An agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses are to:

1. Modify alternatives including the proposed action.
2. Develop and evaluate alternatives not previously given serious consideration by the agency.
3. Supplement, improve, or modify its analyses.
4. Make factual corrections.
5. Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

40 C.F.R. § 1503.4(a). Importantly, while agencies must attach comments considered "substantive" to the EIS (40 C.F.R. § 1503.4(b)), a comment need not be substantive to trigger the agency's response requirement.

NEPA requires that, in preparing a final EIS, BLM must discuss "any responsible opposing view which was not adequately discussed in the draft statement and indicate the agency's response to the issue raised." 40 C.F.R. § 1502.9. The Council on Environmental Quality interprets this requirement as mandating that an agency respond in a "substantive and meaningful way" to a comment that addresses the adequacy of analysis performed by the agency. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. [1] BLM's NEPA Handbook elaborates upon this requirement, providing that: comments relating to inadequacies or inaccuracies in the analysis or methodologies used must be addressed; interpretations of analyses should be based on professional expertise; and where there is disagreement within a professional discipline, "a careful review of the various interpretations is warranted." Handbook H-1790-1, Section V.B.4.a., p. V-11.

Failure to disclose and thoroughly respond to differing scientific views violates NEPA and obligates an agency to perform a compliant environmental analysis prior to approving a proposed action. *See*, *Robertson v. Methow Valley Citizens Council*, *supra* (EIS should reflect critical views of others to whom copies of draft were provided and respond to opposing views); *Sierra Club v. Bosworth*, 199 F.Supp.2d 971 (N.D.Cal. 2002) (failure to disclose and analyze scientific opinion that opposed post-fire logging violates NEPA); *Seattle Audubon Society v. Lyons*, 871 F.Supp. 1291, 1381 (W.D.Wash. 1994) (An EIS must "disclose scientific opinion in opposition to the proposed action, and make a good faith, reasoned response to it."); *Seattle Audubon Society v. Moseley*, 798 F.Supp. 1473, 1482 (W.D.Wash. 1992) (NEPA requires that the agency

[1] The U.S. Court of Appeals for the Tenth Circuit has found that the "Forty Questions" are "persuasive authority offering interpretive guidance" on NEPA from CEQ. *Davis v. Mineta*, 302 F.3d 1104, 1125 (10th Cir. 2002).

candidly disclose in its EIS the risks of its proposed action, in its EIS the risks of its proposed action, and that it respond to the adverse opinions held by respected scientists.").

Further, as discussed above, where there is scientific uncertainty, BLM cannot simply dismiss opposing scientific opinion and authority, but must provide a discussion of the support for its decision not to rely upon it. Accordingly, BLM must complete a conforming NEPA analysis that fully considers and responds to public comments, including opposing scientific opinion, and justifies any contradicting conclusions.

7. BLM Must Present Environmental Analysis and Information in a Manner that Facilitates, Rather than Impedes, Public Comment

NEPA requires BLM to "[e]ncourage and facilitate public involvement in decisions which affect the quality of the human environment." 40 C.F.R. § 1500.2(d). A critical part of this obligation is presenting data and analysis in a manner that will enable the public to thoroughly review and understand the analysis of environmental consequences. For this reason, NEPA requires the use of high quality data and the disclosure of the methodology underlying proposed decisions, as discussed above, and also explicitly requires that an EIS "be written in plain language" and presented in a way that "the public can readily understand." 40 C.F.R. § 1502.8. These requirements are specifically reinforced for an EIS; the "primary purpose" of this document is "to allow for informed public participation and informed decision making" so its language must be "clear" and "supported by evidence that the agency has made the necessary environmental analyses." *Earth Island Inst. v. U.S. Forest Service*, 442 F.3d 1147, 1160 (9th Cir. 2006); 40 C.F.R. § 1502.1.

Therefore, "an EIS must be organized and written so as to be readily understandable by governmental decisionmakers and by interested non-professional laypersons likely to be affected by actions taken under the EIS." *Oregon Environmental Council v. Kunzman*, 817 F.2d 484, 493 (9th Cir. 1987). Accordingly, where a plan is so unclear as to not permit review and understanding, it may be deemed "incomprehensible" and in violation of NEPA. See, e.g., *California, ex rel. Lockyer v. U.S. Forest Service*, 465 F.Supp. 2d 942, 949-950 (N.D.Cal. 2006) (management plan for Giant Sequoia National Monument was "incomprehensible" because it referenced but did not explain its reliance on certain law and regulations, and because it contained conflicting statements regarding applicable standards for management, which were never clarified).

Where the PRMP and FEIS rely upon existing authority, they must include a sufficient explanation of how such authority actually supports the action taken – especially where such authority (such as the ORV regulations requiring the agency to protect other resources and avoid conflicts with other recreationists) appears to require different actions and where these issues have already been highlighted to BLM in comments. Similarly, where the PRMP and FEIS include conflicting information for the same resources (such as acreage or management prescriptions) or conflicting conclusions about how decisions may harm and protect resources at the same time, the agency must not only correct errors, but also fully explain its conclusions and ultimate management decisions. Numerous inconsistencies in data, conclusions and compliance

were raised in our comments on the DRMP and DEIS. The PRMP must correct these deficiencies and fully comply with the requirements of NEPA.

B. Federal Land Policy and Management Act

The Federal Land Policy and Management Act (FLPMA), 43 U.S.C. § 1701 *et seq*., is BLM's organic act and guides the agency in managing public lands, drafting land use plans, and ensuring that the public has been involved in such decisions.

1. Duty to Inventory and Land Use Planning Requirements

FLPMA imposes a duty on BLM to identify and protect the many natural resources found on public lands. FLPMA requires BLM to inventory its lands and their resources and values, "including outdoor recreation and scenic values." 43 U.S.C. § 1711(a). FLPMA also obligates BLM to take this inventory into account when preparing land use plans, using and observing the principles of multiple use and sustained yield. *See* 43 U.S.C. § 1712(c)(4), (1). Through management plans, BLM can and should protect wildlife, scenic values, recreation opportunities, and wilderness character in the public lands through various management decisions, including by excluding or limiting certain uses of the public lands. *See* 43 U.S.C. § 1712(e). This is necessary and consistent with FLPMA's definition of multiple use, which identifies the importance of various aspects of wilderness characteristics (such as recreation, wildlife, and natural scenic values) and requires BLM's consideration of the relative values of these resources but "not necessarily to the combination of uses that will give the greatest economic return." 43 U.S.C. § 1702(c).

BLM's obligations in developing a land use plan include: applying principles of multiple use and sustained yield, prioritizing designation and protection for ACECs, considering the relative scarcity of values involved and the availability of alternative means and sites for realization of those values, weighing long-term benefits against short-term benefits to the public, and complying with pollution control laws.

2. Unnecessary or Undue Degradation Standard

FLPMA requires that: "In managing the public lands the [Secretary of Interior] shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands." 43 U.S.C. § 1732(b). In this context, because the imperative language "shall" is used, "Congress [leaves] the Secretary no discretion" in how to administer FLPMA. *Natural Resources Def. Council v. Jamison*, 815 F.Supp. 454, 468 (D.D.C. 1992). BLM's duty to prevent unnecessary or undue degradation (UUD) under FLPMA is mandatory, and BLM must, at a minimum, demonstrate compliance with the UUD standard. *See Sierra Club v. Hodel*, 848 F.2d 1068, 1075 (10th Cir. 1988) (the UUD standards provides the "law to apply" and "imposes a definite standard on the BLM").

C. Off-Road Vehicle Regulations and Executive Orders

BLM must ensure that it is in compliance with Executive Orders and agency regulations implementing these Orders in relation to off-road vehicle (ORV) use on public lands. Executive Order 11644 (1972) as amended by Executive Order 11989 (1977) and BLM's regulations (43 C.F.R. § 8342.1) require BLM to ensure that areas and trails for off-road vehicle use are located:

- to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability;
- to minimize harassment of wildlife or significant disruption of wildlife habitats, and especially for protection of endangered or threatened species and their habitats;
- to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands; and
- outside officially designated wilderness areas or primitive areas and in natural areas only if the agency determines that off-road vehicle use will not adversely affect their natural, aesthetic, scenic, or other values for which such areas are established.

These Executive Orders put the burden of proof on BLM to ensure that sensitive and protected conservation lands are not harmed by ORV use. Under these directives, BLM should start from the position of evaluating all uses of lands that may harm or conflict with the values mentioned above as closed to ORV use. The next step is to take a hard look at a reasonable range of alternatives under NEPA with adequate consideration of public input. BLM should provide ample evidence to show how they have located ORV areas and trails to minimize harm, or otherwise keep these areas closed to ORV use. Only after such deliberation has occurred can the agency sufficiently state that they have complied with their legal obligations in deciding how to designate certain ORV management areas.

D. National Historic Preservation Act

BLM has special stewardship responsibilities with respect to cultural resources on land that is under the agency's "jurisdiction or control" under the National Historic Preservation Act (NHPA), 16 U.S.C. § 470 *et seq*. A federal "undertaking" triggers the Section 106 process under NHPA, which requires the lead agency to identify historic properties affected by the action and to develop measures to avoid, minimize, or mitigate any adverse effects on historic properties. 16 U.S.C. § 470f; 36 C.F.R. §§ 800.4, 800.6. Because the drafting of a land use plan is an "undertaking," Section 106 review must occur prior to approving the plan in the record of decision.

The NHPA stipulates that consultation among agency official(s) and other parties with an interest in the effects of the undertaking on historic properties commence at the early stages of project planning, focusing on the opportunity to consider a broad range of alternatives. 36 C.F.R. § 800.1(c). Compliance with Section 106 is applicable "at *any stage* where the Federal agency has authority . . . to provide meaningful review of . . . historic preservation goals." *Morris County Trust for Historic Preservation v. Pierce*, 714 F.2d 271, 280 (3d Cir. 1983)

(emphasis added); *Vieux Carre Property Owners v. Brown*, 948 F.2d 1436, 1444–45 (5th Cir. 1991). Therefore, the agencies cannot rely on later review process as a justification for refusing to comply with the NHPA.

To satisfy the Section 106 compliance requirement, the Responsible Agency Official must consult with the State Historic Preservation Officer(s) (SHPO) and appropriate Tribes and/or Tribal Historic Preservation Officer(s) (THPO). In addition, Section 106 regulations require BLM to "make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey." 36 C.F.R. § 800.4(b)(1). As part of this duty, BLM must account for information communicated to it by parties expressing an interest in historic properties affected by the undertaking. *Pueblo of Sandia v. United States*, 50 F.3d 856, 860–61 (10th Cir. 1995).

Section 110 of the NHPA obligates agencies to identify sites that may be eligible for listing on the National Register. BLM should analyze the information obtained to identify eligible sites and commit to or require commitments for further inventory and submissions of proposals for listing. BLM should maximize the opportunity to obtain and use information on cultural resources to fulfill its obligations under the NHPA and increase our knowledge and protection of our cultural heritage.

E. Endangered Species Act

Congress enacted the Endangered Species Act (ESA) as "a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." 16 U.S.C. § 1531(b). As the Supreme Court observed, the statute "afford[s] endangered species the highest of priorities." *Tenn. Valley Authority v. Hill*, 437 U.S. 153, 194 (1978). To achieve its objectives, Congress directed the U.S. Fish and Wildlife Service (FWS) to list species that are "threatened" or "endangered," as defined by the ESA. 16 U.S.C. §§ 1533, 1532(6) & (20).

Once a species is listed, Section 7 of the ESA mandates that every federal agency "consult" with FWS or the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (collectively referred to as FWS) when taking any action that "may affect" listed species." 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a). *See also Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 422 F.3d 782, 790 (9th Cir. 2005). The purpose of the Section 7 consultation process is to insure that no agency actions "jeopardize the continued existence" of a listed species. *Id.* To facilitate the consultation process, the "action agency" prepares a "biological assessment," which identifies the listed species in the action area and evaluates the proposed action's effect on the species. 16 U.S.C. § 1536(c); 50 C.F.R. §§ 402.02, 402.12. The ESA defines agency action broadly. 16 U.S.C. § 1536(a)(2). *See also Lane County Audubon Soc'y v. Jamison*, 958 F.2d 290, 294 (9th Cir. 1992). It includes "*all* activities or programs *of any kind* authorized, funded, or carried out, in whole or in part, by Federal agencies." 50 C.F.R. § 402.02 (emphasis added). Agency actions include those "actions directly or indirectly causing modifications to the land, water, or air." 50 C.F.R. § 402.02.

Through a biological assessment, the agency determines whether formal or informal consultation is necessary. 50 C.F.R. § 402.13(a). When formal consultation is necessary, FWS prepares a "biological opinion" that determines whether the agency's action will result in jeopardy to the species. 16 U.S.C. § 1536(b)(3)(A); 50 C.F.R. § 402.14(g). If there is jeopardy, FWS sets forth "reasonable and prudent alternatives" aimed at avoiding jeopardy. 16 U.S.C. § 1536(b)(3)(A). If there is no jeopardy, FWS identifies the reasonable and prudent mitigation measures. 16 U.S.C. § 1536(b)(4).

Moreover, all federal agencies are obligated to conserve listed species by "carrying out programs for the conservation of endangered species and threatened species." 16 U.S.C. § 1536(a)(1). Under the ESA, "conserve" is defined as recovering a species. Therefore, the agencies are not only obligated to avoid jeopardizing the survival and recovery of listed species, but are also required to take steps within its purview to recover these species. 16 U.S.C. § 1532(3) (definition of "conserve").

F. Clean Air Act and Clean Water Act

FLPMA and its implementing regulations—along with the applicable land use plans—require that BLM comply with all federal, state, and local environmental laws. *See* 43 U.S.C. § 1712(c)(8); 43 C.F.R. §§ 1610.3-2, 2920.7(b)(3). BLM is obligated, by FLPMA to comply with the environmental standards established in the Clean Air Act, 42 U.S.C. §§ 7401, *et seq*., and the Clean Water Act, 33 U.S.C. §§ 1251, *et seq*. This means, for example, that BLM may not permit development that will result in exceedances of national ambient air quality standards, prevention of significant deterioration increment limits, air quality related values, and standards for hazardous air pollutants. BLM must conduct a full-scale quantitative analysis of the air quality impacts in the planning area and model these impacts. BLM must also model impacts to water quality and ensure that national and state standards will not be exceeded.

II. SPECIAL MANAGEMENT FRAMEWORK FOR THE MONUMENT

The Sonoran Desert National Monument was established by Presidential Proclamation No. 7397 issued in 2001 under the Antiquities Act of 1906, which authorizes the President to designate National Monument status to areas possessing significant historical, scenic, and/or scientific values. The Proclamation for Sonoran Desert National Monument identifies the significant resources that merit National Monument status and calls for their protection. Referred to as "objects of historic or scientific interest" in the Proclamation and "Monument Objects" in these comments, these resources include the "magnificent example of untrammeled Sonoran desert landscape," as well as numerous other objects.

A. BLM must prioritize protection of monument objects over multiple uses

The Federal Land Policy and Management Act (FLPMA) requires BLM to manage public lands under multiple-use principles unless an area has been designated by law for specific uses, in which case BLM must manage the land for those specific uses. 43 U.S.C. § 1732(a). In other words, BLM manages national monuments not under the FLPMA multiple use mandate, but

rather under the language of the proclamation or legislation establishing the monument. This is expressly provided for in FLPMA itself:

> The Secretary shall manage the public lands under the principles of multiple use and sustained yield, in accordance with the land use plans developed by him under section 1712 of this title when they are available, *except that where a tract of such public land has been dedicated to specific uses according to any other provisions of law it shall be managed in accordance with such law*." FLPMA, 43 U.S.C. § 1732(a) (emphasis added).

Pursuant to the legal authority granted by Congress in the Antiquities Act of 1906 (16 U.S.C. §§ 431-433), the President designated the Sonoran Desert National Monument for the explicit purpose of protecting and preserving identified historic and scientific objects. Proclamation No. 7397. Accordingly, the standard approach to multiple-use management does not apply to this Monument, and any effort to adopt such a management approach to the detriment of its natural and cultural values would be in violation of the Presidential Proclamation and the mandates of FLPMA. BLM must manage the Monument for the protection and preservation of its natural, historic and scientific values, and only allow uses other than those needed for protection of Monument Objects when those uses do not conflict with the directives of the Proclamation.

Because of its significance, which merited designation as a National Monument and inclusion in the National Landscape Conservation System (Conservation Lands), the Sonoran Desert National Monument requires different management from other BLM lands. The Conservation Lands, comprised of lands created by both presidential and congressional directive, is the largest and most far-reaching conservation initiative in the history of the BLM. The designation of National Monuments, together with the establishment of the Conservation Lands themself, represents the cornerstone of a new era in land stewardship, in which BLM focuses on a mission of stewardship to: "conserve, protect, and restore these nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations."

Secretarial Order 3308 speaks to the management of the National Landscape Conservation System. The Order states in pertinent part that "[T]he BLM shall ensure that the components of the NLCS are managed to protect the values for which they were designated, including, where appropriate, prohibiting uses that are in conflict with those values." The 15-Year Strategy for the Conservation Lands reinforces this by stating the "conservation, protection, and restoration of the NLCS values is the highest priority in NLCS planning and management, consistent with the designating legislation or presidential proclamation." NLCS Strategy at 8.

The BLM in Arizona has further recognized the special status of the Conservation Lands, issuing a "Strategic Plan" for its units of the Conservation System (available on-line at: http://www.blm.gov/pgdata/etc/medialib/blm/az/pdfs/strategies.Par.78028.File.dat/NLCS.pdf), which commits the agency to:

Emphasize management that supports, protects, and promotes the conservation values identified in proclamation or legislation for the lands within the National Landscape Conservation System by:

- Developing a clear description of the monument objects and conservation values for each national monument, national conservation area, and national scenic or historic trail and for the Arizona wilderness system as a whole.
- Implementing projects and actions that emphasize and protect the described objects and conservation values across all lands in the conservation system in Arizona, as well as, specific to individual areas.

We appreciate that BLM went through the process of identifying monument objects in the Draft RMP. As stated in BLM guidance on the management of Conservation Lands, IM 2009-215 specifically directs managers of monuments to "ensure that the RMP identifies the objects or resources for which the area was designated and illustrates how those objects or resources are protected by the plan." (emphasis added). Furthermore, the IM states that if there is a conflict between the enabling legislation and BLM's broader "multiple use" mandate, then the Proclamation takes precedence. This IM clearly affirms that not all uses must be accommodated within Monuments; BLM's priority is fulfilling the purposes of the Monument and protecting the Monument Objects. **BLM has not yet shown how each of the objects are being protected by the plan. This analysis must be performed before the RMP is complete.**

Recommendations: We applaud BLM for including a list of monument objects in the Draft RMP. BLM must now specifically describe how each of the objects are being protected and prioritized over other uses in the RMP.

B. BLM must designate a range of alternatives that protects monument objects from impacts

To comply with the legislation, current guidance, and FLPMA, as discussed above, all of the management alternatives must conserve Monument Objects first, and then make other management decisions that do not interfere with their protection and conservation. As described above, BLM must present a reasonable range of alternatives for the management of the monument. The management of the monument cannot lead to anything less than protection of the objects before all other uses. Thus, in order to comply with these requirements, the range of alternatives cannot include management decisions that will undermine protection of Monument Objects and purposes in favor of other resources or uses, or that will harm these values.

Recommendation: Under the Proclamation and the Antiquities Act cited above, all of the alternatives must conserve Monument resources first (and in particular, those resources that are "objects of interest"), and then make other management decisions that do not interfere with the conservation of Monument resources. Thus, in order to comply with these requirements, the range of alternatives cannot include management decisions that will undermine protection of Monument objects in favor of other resources or uses, such as recreation.

C. BLM should provide a historical narrative of the establishment and purpose of the monument

The designation of the Sonoran Desert National Monument was among the first round of national monument designations where management was given solely to the Bureau of Land Management for care and protection of the Monument Objects. It is also among the group of first designations that BLM is preparing RMPs for under America's newest system of public lands, the National Landscape Conservation System. BLM should be proud to manage a conservation unit of such stature.

In the RMP for the Canyons of the Ancients National Monument, BLM prepared a document entitled "History and Intent of the Proclamation for Canyons of the Ancients National Monument." Addendum to the Canyons RMP/ROD. This document provides a history of the landscape, agency, and former conservation efforts on up to the present day designation of the monument and National Landscape Conservation System.

Recommendation: BLM should provide a narrative within the RMP for the Sonoran Desert National Monument that demonstrates the rich history and the intent of Proclamation 7397 and the Monument's place in the National Landscape Conservation System.

III. TRAVEL MANAGEMENT

A. BLM should choose an alternative that proposes to designate the minimum road network necessary for management of the monument

The BLM's transportation planning should prioritize protection of Monument objects. Proclamation 7397 states that "[f]or the purpose of protecting the objects identified above, all motorized and mechanized vehicle use off road will be prohibited, except for emergency or authorized administrative purposes." As detailed below, the definition of "road" has important implications, necessitating a legal definition be used in this RMP. Furthermore, Proclamation 7397 obligates the BLM to develop a transportation plan "that addresses the actions, including road closures or travel restrictions, necessary to protect the objects identified in the proclamation." In order to comply with Proclamation 7397, the transportation plan set out in the Draft RMP should be revised to include a legal definition of a road and actually prioritize protection of Monument objects.

The Draft RMP/EIS does not currently contain an alternative that would designate the minimum road network necessary for protection of the monument objects. BLM should include this alternative and choose it as the preferred in the Proposed RMP to be consistent with current policy guidance for the National Landscape Conservation System.

The monument was created to protect the diverse array of resources described by the Proclamation, which recognizes that the impact of roads must be reduced to a level where objects in the monument will be safeguarded. Those objects include highly tangible features such as wildlife, geological wonders, and cultural and historic sites, as well as more intangible but

equally important features such as the untrammeled landscape, remoteness, wildness, and solitude.

The mission of the National Landscape Conservation System is to "conserve, protect, and restore these nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations." Omnibus Public Land Management Act of 2009 Pub. L. 111-11, § 2002. To fulfill this mission, the National Landscape Conservation System 15-Year Strategy has a goal, Goal 1F, for managing facilities within Conservation System units that conserves, protects, and restores the values for which those lands were designated. Action item 2 under Goal 1F of the Strategy states that **"[t]he BLM will only develop facilities, including roads, on NLCS lands where they are required for public health and safety, are necessary for the exercise of valid existing rights, minimize impacts to fragile resources, or further the purposes for which an area was designated."** This is a clear recognition that roads should be limited to the minimum network necessary for the management of the monument.

As discussed above, BLM is required to consider a reasonable range of alternatives in developing the EIS for the RMP. This mandate obligates the agency to "[R]igorously explore and objectively evaluate all reasonable alternatives." 40 C.F.R. § 1502.14(a). Since minimizing facilities and roads within units of the Conservation System is a stated priority, the Draft RMP for the Sonoran Desert National Monument must consider an alternative that would designate a minimum road network for the monument. This is similar to Alternative B proposed in the Proposed RMP/Final EIS for the Ironwood Forest National Monument, which presented the "minimum routes necessary for the management of the IFNM, including administrative access needs." Ironwood PRMP at J-168.[2]

Recommendations: BLM has policy direction for units of the National Landscape Conservation System that requires designation of roads only when required for public health and safety, are necessary for the exercise of valid existing rights, minimize impacts to fragile resources, or further the purposes for which an area was designated. This is, in short, the "minimum road network" necessary for protection of the values for which the unit was designated. BLM should both analyze a minimum road network alternative and choose it as the best option consistent with BLM policy and for the protection of monument objects.

B. BLM must distinguish between "on road" and "off road" use

For the purpose of protecting the monument objects, Proclamation 7397 requires "all motorized and mechanized vehicle use off road will be prohibited, except for emergency or authorized administrative purposes." In the Draft RMP, BLM interprets this to mean that only "cross-country travel," or travel off of designated routes, is prohibited. DRMP at 339. While we agree

[2] This was not the preferred alternative in the Ironwood PRMP. This is likely due to the fact that much of the PRMP was already being finalized before the Secretarial Order 3308 and the 15-Year NLCS Strategy was released. However, there is an outstanding protest on this issue asking that BLM resolve the conflict with its own policy direction by choosing Alternative B in the Record of Decision. We believe that BLM will eventually choose the minimum road network approach over the FLPMA multiple use approach in the Ironwood PRMP.

that cross-country travel is prohibited in the monument, BLM has not distinguished what use constitutes "on road" versus "off road" for the purpose of designating routes.

BLM's IM 2008-014 (reiterating IM 2006-173) defines a road as: **"**A linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use." (Available on-line at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/20080/im_2008-014.html).

As defined, a "primitive road" is "[a] linear route managed for use by four-wheel drive or high clearance vehicles. Primitive roads do not normally meet any BLM road design standard." Thus, primitive roads do not meet a traditional definition of "road," and should not be designated as roads for the purposes of protecting monument resources.

In addition, a 2005 Recreation Study of the Monument states that **"[o]ver 95% of the roads assessed had off-road use along the road (tracks and trails next to or leading from the main road)**. In 40% of the cases, the use was frequent all along the road, and about 47% of the time the roads had some or infrequent off-road use along the road." Foti et al. at 18 (emphasis added). This is unacceptable and must be remedied.

Recommendation: The definition of "road" in the RMP violates both applicable law and agency guidance. The BLM must use a legal definition of a road.

C. BLM must consider an alternative that prohibits motorized use in desert washes

Desert washes within the monument are important ecological features that support wildlife connectivity and habitat. The washes are also a named monument object of interest as expressed in the proclamation:

> The washes in the area support a much denser vegetation community than the surrounding desert, including mesquite, ironwood, palo verde, desert honeysuckle, chuperosa, and desert willow, as well as a variety of herbaceous plants. This vegetation offers the dense cover bird species need for successful nesting, foraging, and escape, and birds heavily use the washes during migration.

Also stated in the proclamation, "[f]or the purposes of protecting the objects identified above, all motorized and mechanized vehicle use off road will be prohibited," and the management plan must include action, "including road closures or travel restrictions, necessary to protect the objects identified in this proclamation." These provisions are clear that BLM is to close roads or restrict use where motorized or mechanized vehicles might damage monument objects of interest.

In a discussion of why BLM did not consider an alternative to open all washes to four-wheel drive travel, the Draft RMP/EIS states that "[t]his type of travel is inconsistent with Presidential Proclamation 7397, which expressly prohibits, with the exception of emergency or authorized

administration use, all motorized and mechanized vehicle use "off road" in the Monument. Furthermore, washes throughout the Lower Sonoran Planning Area contribute substantially to sustaining healthy, diverse, and productive ecosystems and cultural landscapes." DRMP at 41. A 2005 Recreation Study performed by Northern Arizona University and Sonoran found that off-road use along roads and in washes is a problem in the Monument (Foti et al. 2005, at 18). This, along with evidence of impacts to natural and cultural resources from the use of washes as travel corridors, leads to the conclusion that BLM should strongly consider closing all desert washes to motorized travel. In order to satisfy BLM's obligation to provide a "reasonable range of alternatives" in its NEPA analysis, BLM must look at an alternative that closes all desert washes to motorized vehicles.

Finally, desert washes are also not roads under a traditional definition for a road. As defined by BLM a road is "[a] linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use." While washes may be used from getting from place to place, they provide an off-road use that is prohibited by the Proclamation 7397.

Recommendation: We strongly urge BLM to consider closing all desert washes in the monument to motorized use. The use of desert washes for routes conflicts directly with BLM's obligations under Proclamation 7397 to protect monument objects and to designate a travel network that restricts travel so as to not undermine the purposes of the monument.

D. The route network for the Sonoran Desert National Monument must conserve, protect and enhance the purposes of the monument

As stated earlier in these comments, given that the purpose of the Monument is protection of "objects" and given that Monument roads were not built for the purpose of protecting Monument objects – and too often harm Monument objects -- "The question is no longer 'Why *shouldn't* this route be here?' The question regarding each BLM road in the Monument is now 'Why *should* it be here?' The Proclamation puts the burden of proof on each BLM route not encumbered by valid existing rights to demonstrate how it sufficiently contributes to preserving Monument objects. Roads that fail the "protection" test should be closed, and those that cannot be closed due to valid rights of way, should be limited to that specific administrative access only.

As described in further detail above, the protection mandate in the Monument Proclamations is clear: "…hereby set apart and reserved …, for the purpose of protecting the objects identified above…" and that "the national monument shall be the dominant reservation." The purpose of the Monument is to protect the objects identified. All BLM management activities in the RMP must be consistent with protecting the "objects" identified in the Proclamation.

The Draft RMP contains a "methodology for determining adequate protection of monument objects." Draft RMP at 1325. We support the use of this methodology for evaluating impacts to monument objects from the proposed route designations. While the methodology is a good way to approach the impact analysis, BLM does not take the appropriate steps to protect monument objects from the impacts identified. According to the Draft RMP:

> Each travel route and RMP alternative potentially has negligible, minor, moderate, or major impacts on monument objects. "Adequate Protection" means impacts on monument objects by travel management designation from specific open routes and the range of alternatives is either moderate, minor or negligible. Impacts in the moderate range would need to be mitigated to reduce them in the future. Draft RMP at 1325.

If BLM has found impacts to monument objects to be anything more than negligible, then it must take measures to close that route in the RMP. Any route that impacts monument objects automatically cannot meet BLM's burden of proof to show how it contributes to the protection of monument objects. For example, in the spreadsheet for impacts to monument objects from the travel network alternatives, the campsites at Gap Well, north of SR 238, BLM has found that the preferred alternative will have mostly minor to moderate impacts on the monument objects. This is in violation of Proclamation 7397 and BLM laws and policies. As stated in these comments above, the range of alternatives for the monument should not consider anything less than what is necessary for the full protection of the objects of interest. This example is particularly egregious since BLM has documented the impacts from motorized travel and off-road vehicles in the Gap Well area and has instated a temporary closure due to that damage.

The standard should not be "adequate" protection. The standard is whether the route is furthering the purposes of the national monument, i.e. if the route conserve, protect, and enhance the monument objects. Mitigation of impacts does not satisfy the mandates of Proclamation 7397 and BLM policy.

Recommendations: While the methodology for determining protection of monument objects is a good first step, the application of the methodology for management purposes is fundamentally flawed. The criteria for designing the travel management network in the RMP should be revised to clearly prioritize protection of Monument objects, provide for no new roads to be added to the network, and ensure that the benefits of closing roads are taken into account. Roads should only be kept open if they can be shown to be consistent with conservation, protection and enhancement of Monument objects. These criteria should be applied to revise the proposed travel management network and to ongoing monitoring and management of the network.

E. BLM must keep the temporary route closure in place until it can prevent recurrence

In 2008, BLM issued a temporary closure to off-road use for an area of the monument due to direct and repeated documented damage to monument objects and resources. *See*, Federal Register notice (May 14, 2008). In order for BLM to open up routes that are currently temporarily closed, the agency must make a showing that "the adverse effects are eliminated and measures implemented to prevent recurrence." 43 C.F.R. § 8341.2(a). The Draft RMP does not demonstrate that BLM has eliminated the adverse effects (i.e. abuse from ORVs) that caused damage and does not propose measures to prevent the recurrence of the damage.

Tenuously related, we are evermore concerned by the following sentiment in the Draft RMP:

> Alternative D would close 8.1 miles of route within this area. Closing large areas, with no or limited administrative access to important habitat areas for objects, could create new impacts by eliminating the ability to perform health and habitat assessments as they relate to objects and could result in minor to moderate impacts. DRMP at 923.

This statement overlooks the immense benefits to closing large areas to motorized vehicles that have been demonstrated in the planning area with the temporary closure in place. To the contrary, there is no evidence that BLM or others could not perform health and habitat assessments or other evaluations in closed areas with administrative access to the area or by using means other than a motorized vehicle.

Recommendations: BLM must keep the temporary closure within the monument in place until it has demonstrated that the adverse effects from off-road vehicles are eliminated and that it has measures in place to prevent recurrence. The Draft RMP fails to make these showings.

F. BLM must present signing, monitoring, and rehabilitation plans for route designations as required by BLM policy

The Draft RMP has not provided additional plans for signing, enforcing, or educating the public about the route network as required by BLM policy. BLM Manual 1626.06B1d states clearly that TMPs must contain guidelines for managing and maintaining the system of route, which, at a minimum require the following:

- development of route specific road, primitive road, and trail management objectives,
- a sign plan,
- education/public information plan,
- enforcement plan,
- and a process requiring the application of engineering best management practices.

In addition, BLM must include a plan for decommissioning and rehabilitating closed or unauthorized routes and a monitoring plan for implementing the travel plan.

BLM IM 2010-167, att.1 contains performance measures and action items for implementing these plans.

Recommendation: In order to comply with the BLM Travel and Transportation Manual and policy guidance, BLM should provide the requisite management guidelines and plans as mentioned above.

G. BLM should perform a route density analysis before designating routes in the planning area

In order to manage lands and wildlife at a landscape level, BLM must perform a baseline inventory, as required under NEPA, of the existing route network and its current density. BLM should then review current scientific literature to determine what the effect of certain route densities have on priority wildlife species. Without this important step, the travel management

decisions in the Draft RMP and current and future efforts to designate routes are not in accord with laws, regulations and policies regarding BLM land use planning.

We have included The Wilderness Society's recent Science and Policy Brief, "Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard BLM Lands" (Appendix A). Also included in Appendix A are two scientific reports prepared by TWS and discussed in the habitat fragmentation report: *Ecological Effects of a Transportation Network on Wildlife;* and *Protecting Northern Arizona's National Monuments: The Challenge of Transportation Management.* **BLM should take particular note of the report on Northern Arizona's National Monuments as this provides a useful model and recommendations on the evaluation and management of objects of interest for other BLM national monuments in Arizona**. In addition to summarizing the reports included, "Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard BLM Lands" provides a summary of available scholarly and government reports and studies on the impact of habitat fragmentation on wildlife, provides methods for calculating habitat fragmentation, and provides recommendations on how to integrate fragmentation analysis into travel management.

We also recommend you look at the travel planning criteria set out in the Record of Decision for the Dillon (MT) RMP (relevant sections attached), as an example of criteria that incorporate key aspects of BLM's ORV regulations as well as ecological metrics. This field office did not complete a comprehensive travel management plan as part of its RMP revision; however, it included road density targets and included an appendix outlining the principles it will use when completing a comprehensive travel management plan during implementation.

A habitat fragmentation analysis is especially important in this planning process where BLM must "undertake activities to conserve and restore plant and animal species and natural communities within [priority biological areas]," as noted above. One such activity that BLM should consider to satisfy this mandate is connectivity of important wildlife habitat areas by decreasing the density of the route network.

***Recommendation*:** BLM should use the information provided in Appendix A to measure habitat fragmentation, conduct a thorough fragmentation analysis, and inform decisions regarding road closure and other limitations on use in the RMP.

H. A travel network should be designated in the Lower Sonoran Field Office RMP

BLM should be designating a travel network for the Lower Sonoran Field Office at the same time as the RMP. By deferring route designation decisions, BLM is missing the opportunity to plan at the landscape level. There is a stated preference that BLM complete travel management plans concurrently with resources management plans. For example, BLM Manual 1626 states that:

> A defined travel and transportation network (system of roads, primitive roads, and trails) should be delineated concurrently with the development of the land use plan, to the extent practicable (including a reasonable range of alternatives). If it is not practical to delineate a travel and transportation network (through the development of a travel management plan (TMP) during the land use planning process, then a map of the known network of transportation linear features must be developed and made available to the public and a process established to designate a final travel and transportation network within five (5) years. BLM Manual 1626.06B.

BLM has not made a demonstration that it is not practical to designate a transportation network while engaging in the Lower Sonoran Field Office RMP process.

For plans where BLM has made a threshold showing that it is impractical to designate a transportation network concurrently with the RMP, BLM must set out a "clear planning sequence for subsequent road and trail selection and identification, including the public involvement process (focusing on user groups and stakeholders), initial route selection criteria, and constraints" and "[p]rovide a schedule to complete the area or sub-area road, primitive road, and trail selection process." BLM Manual 1626.06B2d.

The RMP should also identify priorities for completing the travel management plan. Special management areas, such as ACECs, special recreation management areas and citizen-proposed wilderness, will include travel designations within their boundaries. Priorities for sub-regions to receive comprehensive travel management planning, which can also be useful for guiding implementation, were identified in the Draft RMP issued by the Little Snake Field Office (available on-line at: http://www.blm.gov/co/st/en/fo/lsfo/plans/rmp_revision/rmp_docs.html) and we would encourage you to further prioritize areas in this manner as well. Please see Appendix F from the Little Snake Draft RMP, which sets out criteria for prioritizing areas to receive comprehensive travel management planning, including:

Special management areas
Areas identified as "limited to designated roads and trails"
Areas that meet fragile soil criteria
User and resource conflicts
Excessive complaints
Wildlife/wild horse population trends
Evidence of trail/road proliferation
Areas with high road densities
Impacts on cultural resources
Unacceptable erosion
Degradation of water quality
Impacts on visual resources
Loss of trail integrity
Habitat fragmentation and damage
Impacts on sensitive plants
Need to provide a variety of user experiences

If the agency does not complete travel management plans for all of the planning areas as part of the RMP, then the RMP must identify not only areas for use, but also reasons for permitting travel into an area and appropriate criteria for determining routes that will be made available for different uses, taking into account such factors as undeveloped recreation opportunities available and natural settings.

Recommendations: We support BLM's commitment to complete travel management concurrently with the RMP processes and to seize the opportunity presented by this RMP process to complete comprehensive travel management plan in conjunction with the RMP. BLM has not yet demonstrated that it is impractical to designate a travel network at this time. If BLM does defer it must set a schedule for travel planning. BLM should also prioritize what management areas it will plan for first ensuring that sensitive and important natural and cultural resources are protected from the adverse impacts of motorized use.

I. BLM must comply with the minimization criteria of the ORV regulations

The RMPs for the Lower Sonoran Field Office and the Sonoran Desert National Monument must comply with the Federal Regulations (43 C.F.R. §§ 8342.1 and 8342.2), codifying Executive Orders (E.O.) 11644 and 11989, that instruct BLM on ORV management. Specifically, BLM must take into account not only increases in ORV use, but also the damages caused to the natural resources by such use, and the heightened conflict between user groups as the number of ORVs increase and heretofore non-motorized areas are being transformed into motorized areas.

BLM's regulations relating to management of off-road vehicles acknowledge the need to address the manner in which motorized recreation can prohibit other experiences, requiring that both areas and routes for off-road vehicles be located to "minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors." 43 C.F.R. § 8342.1.

The BLM's ORV regulations also provide for protection of other values that are critical parts of not only a healthy ecosystem on BLM lands, but also of enjoying quiet recreation activities, such as hunting, photography and bird-watching, requiring that management minimize "damage to soil, watershed, vegetation, air, or other resources of the public lands" and harassment of wildlife or disruption of habitat; and to prevent impairment of wilderness suitability or adverse effects on natural areas. 43 C.F.R. § 8342.1.

Open areas are prohibited in the Sonoran Desert National Monument. In designating areas as "open" to ORV use (such that cross-county travel is permitted) in compliance with these legal requirements, the Colorado BLM's guidance is instructive on evaluating such alternatives.) provides:

> Open areas will be limited to a size that can be effectively managed and geographically identifiable to offer a quality OHV opportunity for participants. Expansive open areas allowing cross-country travel, without a corresponding and identified user need or

demand will not be designated in RMP revisions or new travel management plans. BLM Manual 1626.06A2a(1).

The preferred alternative proposes to designate an area as "open" to cross-country travel in the Draft RMP. BLM has not demonstrated the user need or demand for this area to be open to cross-country as required by BLM policy guidance.

Of particular concern is an area planned for a de-facto 40 acre off-road vehicle "race track" located in the Ajo SRMA at T12S, R6W, Sec r. DRMP at 155, 168, 185, 380, 398, 448, 476, 486, etc. It is inappropriate for BLM to plan to sanction an illegally created "race track" in the Lower Sonoran. As you can see from the satellite image of this area, it follows a dry wash, crossing numerous times. Sanctioning this illegal use of public lands will not only harm the dry wash habitat, but will also encourage and reward illegal activities on public lands. This area is also located within Sonoran pronghorn range. DRMP at 448.

Simply calling the area "previously disturbed" in the DRMP (at page 380) does not adequately inform the public that this area has been illegally created and used, nor does it inform the public about the significant and permanent losses of natural resources that has occurred.

The area description is in UTMs on NAD7:

NW corner is at approximately:	0322501
	3588074
The SW corner is at approximately:	0322408
	3587636
The SE corner is at approximately:	0322819
	3587696

GPS locations for photo #3 below is at approximately:

0322606
3587970

This race course is very large with steep banked turns and a hundred or more tires delineating curves.

Our specific concerns about this are as follows:

1. This area was illegally built on BLM property and that illegal act should not be rewarded by the government agency charged with enforcing laws designed to protect natural resources.

2. The authorization of this area will greatly encourage an influx of ORV users who are, clearly, not inclined to stay on designated roads or trails.

3. This illegal area has not been publicized outside of the Ajo area. The simple act of showing this area in the Draft RMP will give its existence wide distribution. At present, few people even in Ajo know of it.

4. There is no mention of developing a parking area for this area if it is sanctioned.

5. The area is in wide open desert with no natural barriers. Enforcement in this area will be nearly impossible and is not consistent with Best Management Practices for managing ORVs.

We provide additional photographs of the area below:

Photo #1 of NW corner, looking generally south. Note the tires (trash) left behind to mark the "route" of the track.

Photo # 2 looking approximately south. The truck is sitting on the east-west gravel road, a westward extension of Fees Road. The moguls are the entry to the north half of the 40 acres.

Photo #3 Looking approximately west. The terrain here is very hilly

Photo #4 A view of the illegal track, near the SE corner of the 40 acres (south of the Fees Road extension). Looking approximately SW.

Additionally, the open area that BLM proposes designate is "on the northern edge of a PM_{10} nonattainment area." Draft RMP at 392. Even if a need for cross-country travel was properly shown to exist for this area, it is ill-advised to promote a use that will elevate the existing problem with excessive PM_{10} emissions in the area. As stated in the Draft RMP, "[s]uch use in this area may cause regional air quality thresholds to be exceeded, particularly during high wind events." *Id*. BLM must balance any desire for an open ORV play area with their responsibility under FLPMA and its implementing regulations to comply with all federal, state, and local environmental laws. *See* 43 U.S.C. § 1712(c)(8); 43 C.F.R. §§ 1610.3-2, 2920.7(b)(3).

***Recommendation*:** BLM must design a travel plan that minimizes conflicts among users and damage to natural resources. We have raised several concerns with the designation of this open area due to the manageability and function that this area will serve. BLM should also strongly consider not designating the proposed open area due to air quality impacts and other consequences that stem from cross-country travel.

J. BLM must not consider claims under Revised Statute 2477 (R.S. 2477) in its travel planning process

As discussed above, BLM's Land Use Planning Handbook (H-1601-1) and the Executive Orders and federal regulations cited therein obligate the BLM to make travel management decisions, including, for instance, limiting use of ORVs to areas and routes where they will not damage natural resources or cause excessive conflicts with other users of the public lands. Assertions of R.S. 2477 rights-of-way should not affect this decision-making process.

As stated in BLM Manual 1626, travel planning must not address the validity of any R.S. 2477 assertions. The Manual requires the following statement to be included in all RMPs and TMPs:

> A travel management plan is not intended to provide evidence bearing on or addressing the validity of any R.S. 2477 assertions. R.S. 2477 rights are determined through a process that is entirely independent of the BLM's planning process. Consequently, travel management planning should not take into consideration R.S. 2477 assertions or evidence. Travel management planning should be founded on an independently determined purpose and need that is based on resource uses and associated access to public lands and waters. At such time as a decision is made on R.S. 2477 assertions, the BLM will adjust its travel routes accordingly. BLM Manual 1626.06A2h

A February 20, 2009 memo from Acting Director Ron Wenker directed BLM "not to process or review any claims under RS 2477, including the use of the disclaimer rule." Instruction Memorandum (IM) 2006-159, which addresses non-binding determinations that may be made by field or state offices, is very clear that there is no requirement for the agency to conduct a non-binding determination as part of travel planning in general or even in relation to specific road closures. Further, as noted in the guidance and by the Tenth Circuit Court of Appeals, the BLM cannot make determinations as to the validity of R.S. 2477 claims – only a court can make a final determination.[3] The IBLA has recently confirmed that BLM is legally permitted to complete

[3] Southern Utah Wilderness Alliance v. Bureau of Land Management, 425 F.3d 735, 757 (10th Cir.2005)

transportation plans for areas without addressing R.S. 2477 claims[4]. Where there is a valid R.S. 2477 claim, BLM still has the authority to manage the claim to ensure its compliance with environmental and other laws.

This RMP will not affect valid existing rights, so if an R.S. 2477 right-of-way is ultimately found to exist, decisions in the RMPA will be adjusted accordingly. In the interim, BLM cannot make decisions recognizing R.S. 2477 rights-of-way as part of the planning process. Alternative avenues exist – namely the federal courts – for those seeking recognition of R.S. 2477 rights and rights-of-way can be obtained under FLPMA for those seeking access.

Recommendations: BLM can neither make determinations regarding R.S. 2477 claims as part of this planning process nor permit those assertions to influence its decisions regarding permitting motorized use. The BLM is legally obligated to identify and protect the many natural resources found in the public lands under its management, including wildlife habitat, scenic values, cultural resources, and recreation opportunities, and to avoid unnecessary or undue degradation of these resources. 43 U.S.C. § 1701 *et seq*. Similar considerations are required when the BLM assesses whether to permit motorized use of areas or routes. 43 C.F.R. § 8342.1. The agency must adhere to applicable laws and policies while conducting travel planning, and must forego any approach that could lead to a legally-questionable validation of R.S. 2477 rights-of-way claims.

K. Comments pertaining to specific routes in the Monument

The following are specific recommendations by each proposed route in the Sonoran Desert National Monument based on personal experience and knowledge of the planning area. Each route has a corresponding reason for our recommendations. We have divided the Monument into three areas for convenience of reviewing and responding to our recommendations.

1. Northern Half of SDNM near North Maricopa Mountains Wilderness Area

Routes Recommended to Remain Open
8000: Main BLM road that parallels the El Paso Natural Gasoline Road
8001: Provide Access to Margies Cove West Trailhead
8001C: Provides access to North Maricopa Mountain Wilderness Area
8001E: Provide Access to Margies Cove West Trailhead
8002: Provide Access to Margies Cove East Trailhead
8002A: Provide Access to Margies Cove East Trailhead
8003: Juan de Anza National Historic Trail-Butterfield Trail; recommend non-motorized as proposed in Alternative D.
8004: Provide Access to Margies Cove West Trailhead and 8003
8004A: Provide Access to Margies Cove West Trailhead

[4] *See* Rainer Huck, 168 IBLA 365, 398-99 (April 18, 2006) ("BLM did not need to decide the validity of the R.S. 2477 assertions in order to make its route designations, especially since it did not intend its analysis to affect any R.S. 2477 validity determinations and indicated that the Plan would be adjusted to reflect any R.S. 2477 decisions."). The IBLA further declined to adopt the appellants' suggestion that "the Department must engage in a 10-year quest to inventory routes OHV users may have carved out of the public lands by virtue of repetitive use" as part of land management planning, particularly where claimants submitted little or no evidence. 168 IBLA at 399 n.17.

Routes Recommended to be Closed

8000A: Illegal dumping and irresponsible target shooting.
8000C: Illegal dumping and irresponsible target shooting.
8000D: Illegal dumping and irresponsible target shooting.
8000E: Illegal dumping and irresponsible target shooting.
8000F: Illegal dumping and irresponsible target shooting.
8000G: Illegal dumping and irresponsible target shooting.
8000L: Illegal dumping and irresponsible target shooting.
8000U: Unnecessary route.
8001A: Into proposed wilderness area.
8001B: Into proposed wilderness area.
8001D: Into proposed wilderness area.
8002B: Unnecessary road.
8002C: Into proposed wilderness area.
8003C: Unnecessary road
8004D: Unnecessary road
8004G: Unnecessary road
8005: Section of Anza Trail badly damaged by OHV use.
8005A: Unnecessary access to damaged section of Anza Trail. This section of Anza Trail will be closed to motorized vehicles.
8005D: Unnecessary access to damaged section of Anza Trail. This section of Anza Trail will be closed to motorized vehicles.
8006H: Into proposed wilderness area.
8006I: Into proposed wilderness area.
8039C: Into proposed wilderness area.
8039D: Into proposed wilderness area.

2. Area of SDNM between Interstate 8 and State Highway 238 near South Maricopa Mountain Wilderness Area

Routes Recommended to Remain Open

8029: Recommend administrative use only for access to AZ Game and Fish Wildlife Water
8030: Recommend administrative use only for access to AZ Game and Fish Wildlife Water
8030A: Recommend administrative use only for access to AZ Game and Fish Wildlife Water
8032: Main road west of South Maricopa Wilderness
8034: Provides access to Gila Bend
8036: Provides access to Gila Bend
8037: Provides access to northern and eastern portions of the South Maricopa Mountain Wilderness Area. Recommend following the same route as proposed in Alternative D.
8037A: Provides access to northern and eastern portions of the South Maricopa Mountain Wilderness Area
8037Q: Provides access to eastern portions of the South Maricopa Mountain Wilderness Area
8038: Provides access from Highway 238 to South Maricopa Mountain Wilderness Area
8038A: Provides access from Highway 238 to South Maricopa Mountain Wilderness Area
8038B: Provides access from Highway 238 to South Maricopa Mountain Wilderness Area
8038C: Provides access from Highway 238 to South Maricopa Mountain Wilderness Area
8039: Access along the rail road

Routes Recommended to be Closed

8031: Into proposed wilderness area.
8033: Redundant road
8033A: Redundant road
8033B: Redundant road
8034A: Redundant road
8034E: Redundant road
8035: Unnecessary route.
8035A: Redundant road
8037: Close at rail road crossing. Dangerous!
8037B: Redundant road
8037C: Redundant road

3. Area South of Interstate 8

Routes Recommended to Remain Open

8007: Vekol Road. Recommend following proposed route in Alternative D.
8007C: Provides access to White Hills
8008: Provides access from Vekol Road to Sand tank Mtns. Recommend following proposed route in Alternative D.
8008J: Part of scenic loop
8009: Provide access to Javelina and Sand Tanks Mtns.
8009B: Freeman Road provides access to 8009: Freeman Road
8010: Provides access between Vekol and Freeman Roads
8011: Provides access to Sand tank Mtns.
8012: Getz Well Road provides access to Sand tank Mtns.
8014: Provides access to road 8018
8016D: Part of scenic loop
8018C: Provides access to roads 8018 and 8013 from Gila Bend (A favorite route for locals.)
8019: Seasonal closure
8020: Provides loop between 8011 and
8012; leads to wildlife water
8022: Smith Road
8022A: Provides access to Table Top Wilderness Area
8022B: Provides access to Table Top Wilderness Area
8022C: Provides access to Table Top Wilderness Area
8022D: Provides access to southeast corner of the SDNM
8023: Provides access to eastern edge of SDNM
8023C: Provides access to eastern edge of SDNM
8023D: Provides access to eastern edge of SDNM
8023M: Provides access to eastern edge of SDNM
8023N: Provides access to eastern edge of SDNM
8024: Provides access to Lava Flow South Trailhead and Table Top Trailhead
8024A: Provides access to Lava Flow South Trailhead and Table Top Trailhead
8025: Provides access to southeast corner of the SDNM
8026: Provides access to Sand Tank Mtns.
8026A: Provides access to Sand Tank Mtns.
8026B: Provides access to Sand tank Mtns.
8026C: Provides access to Sand Tank Mtns.
8027: Provides access to Sand Tank Mtns.

8042: Access to Lava Flow North Trailhead
8042A: Provides access to Antelope Peak
8042B: Provides access to Antelope Peak
8044: Access to Lava Flow North Trailhead
8045: Access to Lava Flow North Trailhead
8046: Access to Lava Flow West Trailhead

Routes Recommended to be Close

8007B: Unnecessary-redundant
8007D: Unnecessary-redundant
8007E: Unnecessary-redundant
8007K: Unnecessary-redundant
8007F: Unnecessary-redundant
8008B: Unnecessary-redundant
8008D: Unnecessary-redundant
8008F: Unnecessary-redundant
8008G: Unnecessary-redundant
8008K: Unnecessary-redundant
8008H: Unnecessary-redundant
8009C: Unnecessary-redundant
8009D: Unnecessary-redundant
8009E: Unnecessary-redundant
8009F: Unnecessary-redundant
8011A: Unnecessary-redundant
8013: Unnecessary-redundant
8014: Unnecessary-redundant
8015: Unnecessary-redundant
8015A: Unnecessary-redundant
8016: Unnecessary-redundant
8017: Seasonal closure
8018: Seasonal closure
8018D: Unnecessary-redundant
8023B: Unnecessary-redundant
8023G: Unnecessary-redundant
8023J: Unnecessary-redundant
8023K: Unnecessary-redundant
8025A: Unnecessary-redundant
8027A: Unnecessary-redundant
8042B: Unnecessary-redundant
8042C: Unnecessary-redundant
8043: Unnecessary-redundant
8043A: Unnecessary-redundant

IV. LANDS MANAGED TO PROTECT WILDERNESS CHARACTERISTICS

The lands in the planning area possess some of the West's wildest qualities. For example, within the opening lines of Proclamation 7397 is the expression that this monument is "a magnificent example of ***untrammeled*** Sonoran desert landscape." (emphasis added). This language invokes the very same sentiment set out in the definition of "wilderness" in the Wilderness Act of 1964:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are ***untrammeled*** by man, where man himself is a visitor who does not remain. (emphasis added).

It is no mistake that roughly one-third of the Sonoran Desert National Monument has been designated as Wilderness and another 151,700 acres has been recognized by the BLM as having wilderness characteristics. Additionally, there are landscapes outside of the monument that are as deserving of this prestigious designation before it is too late.

In order to preserve these wilderness qualities before they are destroyed, section 201 of FLPMA mandates that BLM inventory the resources of the public lands, their resources and value. 43 U.S.C. § 1711. In the land use planning process, Section 202 of FLPMA requires that BLM take into account the inventory and determine which multiple uses are best suited to which portions of the planning area. 43 U.S.C. § 1712. BLM's mandate of multiple use and sustained yield, as well as other relevant law and BLM's current guidance, provides for inventory and protection of wilderness values.

Wilderness character is a resource for which BLM must keep a current inventory. As the U.S. Court of Appeals for the Ninth Circuit recently held:

> wilderness characteristics are among the 'resource and other values' of the public lands to be inventoried under § 1711. BLM's land use plans, which provide for the management of these resources and values, are, again, to "rely, to the extent it is available, on the inventory of the public lands, their resources, and other values." 43 U.S.C. § 1712(c)(4).

Oregon Natural Desert Ass'n v. Bureau of Land Management, 531 F.3d 1114, 1119 (9th Cir. 2008). Therefore, BLM is required to consider "whether, and to what extent, wilderness values are now present in the planning area outside of existing WSAs and, if so, how the Plan should treat land with such values." *Id*. at 1143. These obligations also apply to WSAs released by Congress, which BLM found to have wilderness characteristics. As the court stated: "wilderness characteristics are a value which, under the FLPMA, the Bureau has the continuing authority to manage, even after it has fulfilled its 43 U.S.C. § 1782 duties to recommend some lands with wilderness characteristics for permanent congressional protection." *Id.* at 1142.[5]

[5] We maintain that the April 2003 settlement agreement (Utah Settlement) between Secretary of the Interior Norton and the State of Utah in which BLM abdicated its authority to designate any additional WSAs is invalid and will ultimately be overturned in pending litigation. In addition, the Utah Settlement is based on an interpretation of FLPMA §§ 201, 202, and 603 that is contrary to FLPMA's plain language. Section 603 did not supersede or limit

A. BLM must complete a proper inventory of lands with wilderness characteristics

As stated above, BLM must maintain an inventory for lands with wilderness characteristics as directed by FLPMA. BLM Instruction Memorandum (IM) 2011-154 provides guidance on how BLM is to perform inventories of lands with wilderness characteristics as well as how to consider these lands for protection in land use plans. Attachment 1 of IM 2011-154 provides a guide for conducting and maintaining the inventory, which recognizes the following:

> In some circumstances conditions relating to wilderness characteristics may have changed over time, and an area that was once determined to lack wilderness characteristics may now possess them. The BLM will determine when it is necessary to update its wilderness characteristics inventory . . . [T]he BLM will consider whether to update a wilderness characteristics inventory or conduct a wilderness characteristics inventory for the first time [when] BLM is undertaking a land use planning process.

BLM has not updated its wilderness inventory since the early 1980s. Not only have there been many substantial changes in the region since that time, but this planning process also gives BLM the best opportunity to ensure that all BLM lands within the planning area have been inventoried for possible wilderness characteristics. To assist the agency in this undertaking, the Arizona Wilderness Coalition (AWC) submitted comprehensive and detailed information of lands possessing wilderness characteristics early on in the planning process as acknowledged by BLM. Draft RMP at 299.

Although BLM states that it conducted fieldwork in 2003 and 2005 to try to verify the findings of the 1980 inventory, it appears from the BLM reports that we have seen that BLM has a lot more work to do before it can make a conclusion one way or the other on the tracts that were scrutinized. The Draft RMP also contains this statement:

> Based on BLM's knowledge of the planning area and each inventory unit's current land uses and resource conditions, it may not necessarily be the case that all of the citizen's proposal in Alternative D contains wilderness characteristics as those characteristics are defined in the BLM Land Use Planning Handbook (H-1601-1) policy guidance. For example, off-highway vehicle use on some of these lands could affect wilderness characteristics. *Id*.

It is apparent from this statement that BLM has not completely reviewed the citizens' proposals for wilderness as required by law and policy.

BLM's authority under § 201 to undertake wilderness inventories, but rather relies explicitly on BLM having exactly that authority under § 201. Nor did § 603 in any way limit BLM's discretion under § 202 to manage its lands as it sees fit, including managing areas as § 202 WSAs in accordance with the Interim Management Policy (IMP). Every prior administration has created WSAs under § 202 and they plainly had authority to do so. This administration has such authority as well, making this a reasonable alternative deserving of consideration in this NEPA process.

During the planning process for the Ironwood Forest National Monument, BLM conducted a wilderness characteristics assessment using the AWC proposal as well as data gathered for the plan in the visual, recreation, vegetation, ecological site, and wildlife habitat resource inventories. Ironwood PRMP at 3-41. The plan states that "[t]he wilderness characteristics assessment confirmed the presence of the wilderness characteristics of size, naturalness and outstanding opportunities for solitude in the areas proposed by the AWC and in an additional area of the Roskruge Mountains." *Id*. BLM performed their own investigations and inventories of lands with wilderness characteristics and made determinations based on this information. BLM should follow similar procedures in the Draft RMP to be in accord with current policy and law.

Recommendation: We fully support and defend the information in the AWC and other citizens' wilderness proposal and BLM must give it full consideration as required by FLPMA and IM 2011-154.

B. BLM must document its decision regarding protection of lands with wilderness characteristics

IM 2011-154 not only requires maintaining an inventory of lands with wilderness characteristics, but also the consideration and documentation of whether BLM manages those lands to protect wilderness characteristics. With regard to the final planning decision in a RMP on protection of lands with wilderness characteristics, IM 2011-154 specifically provides:

> In making the final planning decision regarding management of lands with wilderness characteristics, consider both the resources that would be forgone or adversely affected, and the resources that would benefit under each alternative. As with any planning decision, document the reasons for its determination regarding management of lands with wilderness characteristics.

BLM fails to fully document the rational for its decisions regarding the management of lands with wilderness characteristics in the Draft RMP. We understand and appreciate that BLM is planning on compliance with IM 2011-154 before the release of the Proposed RMP/Final EIS. BLM should provide this information and allow for a supplemental comment period to address the agency's decisions.

Recommendations: BLM must fully consider and document its rational for its management decision regarding the protection of lands with wilderness characteristics. The agency must provide an additional comment period on these decisions in order to comply with FLPMA, NEPA and other laws, regulations and policies. We recommend BLM allow for a supplemental comment period on their rationale for these decisions before releasing the Proposed RMP/Final EIS.

C. BLM should protect all released WSAs as lands with wilderness characteristics

The Draft RMP makes the following statement regarding the management of released Wilderness Study Areas (WSA):

> The LS-SDNM planning area has a total of approximately 42,640 acres that were within three released WSAs. Proposals for lands managed to protect wilderness characteristics are presented under Alternatives C, D and E that include lands within these former WSAs. These areas are identified under each alternative and their acreage is provided. Specific public input on whether these areas are appropriate to manage to protect wilderness characteristics is requested. Draft RMP at 109.

BLM has policy guidance on how to manage released WSAs. BLM IM 2011-154 provides:

> Periodically, Congress considers a WSA for Wilderness designation. When Congress decides not to designate a WSA or a portion of a WSA as Wilderness and releases that WSA from FLPMA Section 603's non-impairment standard, the BLM shall take into serious consideration the Congressional action—as well as any changed circumstances—in the BLM's subsequent land use planning decisions for the released land. Document the basis for the BLM land use planning decisions regarding the management of the released land.

This planning process is the first time that the management of released WSAs has been considered since the Arizona Desert Wilderness Act of 1990. It has now been more than two decades after this passage of this legislation. Congress did not prohibit the management of wilderness character by releasing these areas from WSA status. Thus, it is more than appropriate to manage to protect the wilderness characteristics of these areas. The three areas under consideration (Butterfield Stage Memorial, Face Mountain and Saddle Mountain) all possess wilderness characteristics and should be managed as such. For more detailed recommendations on these specific areas, see section D below.

Recommendation: BLM should manage the released WSAs in the planning area for protection of their wilderness characteristics. All three areas possess wilderness characteristics and deserve to have these qualities prioritized over other potential uses.

D. Recommendations for specific units with wilderness characteristics

The following are specific recommendations for areas identified by BLM as possessing wilderness characteristics in the Draft RMP:

1. **Black Mountain:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states the following:

> On-the-ground OHV route inventories and associated travel management actions, and all other considered land use allocations, may have significant influence on the final determinations of lands managed, or not managed, to protect or maintain wilderness character. BLM must update its wilderness character inventory and complete a thorough ground assessment of the area to determine the presence or absence or wilderness character attributes.

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

2. **Cuerda de Lena Wash:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states the following:

> On-the-ground OHV route inventories and associated travel management actions, and all other considered land use allocations, may have significant influence on the final determinations of lands managed, or not managed, to protect or maintain wilderness character. The area appears to contain over 20 miles of vehicle or OHV route.

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

3. **Batamote Mountains:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. The designation of the Batamote Mountains as wilderness was also recently supported by Representative Grijalva in his letter to Secretary Salazar regarding the Interior Department's "Crown Jewels" initiative (dated Oct. 28, 2011). See Attachment 1. As stated in Grijalva's letter, Pima has supported wilderness designation for this area for decades and continues to support this area for designation to the day.

4. **Sauceda Mountains:** We fully support the inclusion of the entire area for protection of its wilderness characteristics as proposed in Alternative E.

5. **Sentinel Plain Complex:** We support the protection of the entire Sentinel Plain Complex as lands with wilderness characteristics. This includes the Northwest, Northeast and Central units as provided in the proposal submitted by the Arizona Wilderness Coalition and Center for Desert Archaeology in Attachment 2. Also included in Attachment 2 is

updated information on routes within the AWC proposed unit. This includes maps, photographic documentation and detailed descriptions of the current conditions of some of the routes within the proposal. We urge BLM to carefully consider this information when it is updating its own data for the Sentinel Plain unit.

BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for the Sentinel Plain unit as proposed (south of I-8) states the following:

> BLM also needs to complete a ground assessment of the uninventoried area western area and reassess it with the two combined initial inventory units, 2-123 and 2-153.

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone documented its rational for not protecting those wilderness characteristics.

In its original 1979 inventory, BLM split the unit into 2 areas and finding that one area was too small to qualify as wilderness and that the other was too large to be able to manage without difficulty. These rationales must be reassessed given proposal to combine the two units to manage as one and BLM's modern day management policy with regard to lands with wilderness characteristics.

With regard to the Northwest, Northeast and Central units as proposed in Attachment 2, we are unaware of any past or current information or inventory performed by BLM for these areas.[6]

We recommend that BLM acknowledge the wilderness characteristics as provided in the proposal in Attachment 2 and protect the entire area as managed to protect wilderness characteristics.

6. **Yellow Medicine Butte:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states the following:

> An inventory will be conducted by BLM and public comments will be received on the draft land use plan. The on-the-ground OHV route inventories and associated travel management actions, and all other considered land use allocations, may have significant influence on the final

[6] BLM lists "Painted Rocks South" on its list of inventoried units in 1980. We do not have enough information to know if there is significant overlap with the areas being proposed. Regardless, BLM seriously consider the areas proposed for wilderness characteristics protection as required under IM 2011-154 in order to maintain a current inventory.

> determinations of lands managed, or not managed, to protect or maintain wilderness characteristics

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. Also, the original BLM inventory combined the Yellow Medicine Butte and Dixie Peak areas. BLM should take this into consideration when it reinventories the area for wilderness characteristics.

We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

7. **Face Mountain:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states the following:

> On-the-ground OHV route inventories and associated travel management actions, and all other land use allocations, may have significant influence on the final determinations of lands managed, or not managed, to protect or maintain wilderness characteristics.

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

8. **Saddle Mountain:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states that BLM did not complete well-documented or detailed wilderness inventories for areas outside the former Saddle Mountain WSA and in the Palo Verde Hills area directly to the east. The Saddle Mountain wilderness inventory was an accelerated inventory completed in 1978 to accommodate the demand for the Palo-Verde/Devers power transmission line. BLM states that it will perform a field inventory and on-the-ground OHV inventories.

It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

9. **Gila Bend Mountains:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states that BLM will reassess the area to complete a final determination and ascertain if conditions have modified or if motorized routes have been naturally reclaimed.

   It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

10. **Oatman Mountains:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

11. **Cortez Peak:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

12. **Margie's Peak:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states that BLM will reassess the area to complete a final determination and ascertain if conditions have modified or if motorized routes have been naturally reclaimed.

    It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

13. **Butterfield Stage Memorial:** We fully support the inclusion of the entire area for protection of its wilderness characteristics. BLM has not provided a documented determination of its rationale for excluding the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. In fact, the report for identification of this area's wilderness characteristics states that vehicle management and target shooting issues would have to be addressed to maintain solitude and naturalness and that "on-the-ground OHV route inventories and associated travel management actions, and all other land use allocations, may have significant influence on the final determinations of lands managed, or not managed, to protect or maintain wilderness characteristics."

    It is clear that BLM has not even given this area's wilderness characteristics due consideration, let alone document its rational for not protecting those wilderness characteristics. BLM states that AWC did not submit a detailed narrative that shows how information significantly differs from info in prior inventories. We respectfully disagree and submit the AWC proposal for the area for BLM's reconsideration (Attachment 3).

    We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

14. **South Maricopa Mountains Addition:** We fully support the inclusion of the entire area for protection of its wilderness characteristics.

15. **Sand Tank Mountains East:** We fully support the inclusion of the entire area for protection of its wilderness characteristics as proposed in Alternative D. BLM has not provided a documented determination of its rationale for excluding some of the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. We also recommend the route network for this area as shown in Alternative D. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

16. **Sand Tank Mountains West:** We fully support the inclusion of the entire area for protection of its wilderness characteristics as proposed in Alternative D. BLM has not provided a documented determination of its rationale for excluding some of the area from its preferred alternative for managing to protect this area as lands with wilderness characteristics as required under IM 2011-154. We also recommend the route network for this area as shown in Alternative D. We recommend that BLM acknowledge the wilderness characteristics as provided in the AWC proposal and protect the entire area as managed to protect wilderness characteristics.

V. CULTURAL RESOURCE MANAGEMENT

A. BLM has yet to comply with the requirements of Section 106 of the National Historic Preservation Act for the road and route designations proposed for the Sonoran Desert National Monument

BLM has not complied with the requirements of Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, for the designation of roads and route in the Proposed Plan. A federal "undertaking" triggers the Section 106 process, which requires the lead agency to identify historic properties affected by the action and to develop measures to avoid, minimize, or mitigate any adverse effects on historic properties. 16 U.S.C. § 470f; 36 C.F.R. §§ 800.4, 800.6. Because the designation of roads and routes in a resource management plan is an "undertaking," Section 106 review must occur prior to approving these designations in the record of decision.

1. Designation of roads and routes for off-road vehicle use in a resource management plan is an "undertaking"

Prior to authorizing a proposed action, BLM must determine whether the proposed action is an undertaking under the NHPA. 36 C.F.R. § 800.3; *Mont. Wilderness Ass'n v. Fry*, 310 F. Supp. 2d 1127, 1152 (D. Mont. 2004). The Draft RMP contains no evidence that BLM undertook the analysis required by 36 C.F.R. § 800.3 nor does it reveal that BLM made a finding as required by this regulation.

BLM's regulations indicate that formal designation of ORV routes occur not at the implementation level but with "[t]he approval of a resource management plan. . . ." 43 C.F.R. § 8342.2(b); *see also, Norton v. S. Utah Wilderness Alliance*, 542 U.S. 55, 69 n.4 (2004) (holding the "affirmative decision" to open or close a specific ORV route occurs through land use planning). The *SUWA* Court's interpretation is consistent with national guidance from the Interior Department stating that "[p]roposed decisions to designate new routes or areas as open to OHV use . . . are subject to section 106 compliance." BLM IM 2007-030. Therefore, it is clear that road and route designations made during the land use planning process are undertakings requiring review under Section 106 of the NHPA prior to approval of the resource management plans for the Monuments.

As stated in the Draft RMP, only around 6% of the Sonoran Desert National Monument has been surveyed for cultural resources. PRMP at 264. Given the recognized impacts to cultural resources and the fact that these resources have priority status as Monument Objects, BLM should have a more complete inventory before allowing uses that impact these resources to continue. **BLM should prioritize the most sensitive, important, and at-risk areas for cultural resources and commit to performing surveys before making final resource allocations in the RMP.** This includes areas in close proximity to routes proposed for designation in the RMP.

The closest BLM monument to the Sonoran Desert National Monument, both geographically and ecologically, is the Ironwood Forest National Monument. The Proposed RMP/Final EIS (PRMP)

for the Ironwood Forest National Monument was published in September 2011. The Ironwood PRMP states that "cultural surveys were conducted in 2007 and 2008 for motorized routes in the monument, as well as some non-motorized routes. Surveys will eventually be completed for all the travel routes in the monument (roads, primitive roads, and trails) and are a priority for available funds. New information from the 2007 and 2008 surveys was considered in the route designations in the Draft RMP, and that resulted in several adjustments to those designations based on the need to protect cultural resources." Ironwood PRMP at J-151.

In fact, some of this work has already been done in the Monument. Bungart, P. W. and Anne Raney. *Faint Traces in Fragile Places: Cultural Resources Survey Along Selected Roads & Routes in the Sonoran Desert National Monument*. Circa Cultural Consulting. 2009. The Bungart Report provides information on cultural resources along routes and roads within the monument and should be given due deference as an expert report.

The Draft RMP states the impacts to cultural resources associated with travel routes in the area:

> Proliferation of unauthorized travel routes within the Decision Areas has increased over the last 10 years to the point that some cultural resources, formerly considered to be in remote locations with difficult access, have become quite easy to access by vehicle. In many cases, routes were discovered leading to sites or cutting through site areas. These additional routes, and the overall increases in all-terrain vehicle (ATV) use, have led to far higher rates of vehicle damage to many sites and increased site visitation. DRMP at 265.

It is foreseeable that this trend will continue and impacts to cultural resources, as described in Table 4.29 of the Draft RMP will become more intense over the life of the plan. Under Section 106, BLM must develop measures to avoid, minimize, or mitigate adverse effects of an undertaking on historic properties prior to authorizing the proposed action. 36 C.F.R. § 800.6. Here, BLM proposes to designate roads and routes in the national monuments through the land use planning process. Once BLM issues record of decision and the land use plan becomes final, the public may lawfully use roads and routes designated as open in the RMP. 43 C.F.R. § 8341.1(a); *see also id.* § 8341.1(c) (requiring action from BLM to identify open and closed routes following designation during the land use planning process). The lack of survey and inventories, discussed above, highlight the inability of BLM to understand how to address adverse effects. For instance, as documented in the Bungart Report, the use of certain roads and routes within the monuments has caused both direct and indirect adverse effects on cultural resources. The Bungart Report also provides BLM with a list of routes with cultural sites 100 m away or less (Table 4) and a list of routes with cultural sites 400 m away or less (Table 5) to show the resources that are most vulnerable to damage from the use of vehicles.

Monitoring, while a necessary component of managing cultural resources, is insufficient to address the on-going effects described in the Bungart Report and fails to represent the kind of proactive response to the threat posed by ORV use envisioned by Section 106. Simply because some adverse effects have occurred should not negate BLM's responsibility to analyze future, continued direct, indirect, and cumulative effects caused by a road or route.

In addition, the Bungart Survey Report made several recommendations as to the management of cultural resources in the monument. We incorporate the recommendations of this report into our comments, including:

> Before finalizing any long-term management plan, a comprehensive inventory strategy should be implemented that systematically and extensively samples corridors along various types of route designations, the results of which would be compared to sample surveys conducted in block areas isolated from roads and routes. This strategy would allow Monument managers to assess risks caused by existing and potential impacts to cultural resources. Bungart at 95.

Secretarial Order 3308 speaks to the management of the National Landscape Conservation System. This Order states that "[s]cience shall be integrated into management decisions concerning NLCS components in order to enhance land and resource stewardship and promote greater understanding of lands and resources through research and education." With the lack of information on cultural resources and uncertainty of impacts, **BLM should not designate more routes then the minimum necessary for the management of the monument and allow for the study of impacts from these routes to cultural and other resources**. A similar approach to what we are recommending was taken in the Grand Canyon-Parashant National Monument RMP for routes that had a high probability of impacting cultural resources:

> Ten high-potential route areas on the Monument are recommended for Class III (intensive) cultural resource inventory before route designation occurs in order to determine and mitigate potential route impacts in compliance with IM 2007-030. These routes are not designated with the Approved Plan but would be designated within five years from the signing of the ROD and once Class III inventory and Section 106 compliance is complete, at which time a separate decision will be issued. GCPNM ROD at 10.

In addition to Secretarial Order 3308, this common sense approach of designating routes only after BLM can be more certain about the impacts to monument objects is also supported by BLM's National Landscape Conservation System 15-Year Strategy. For example, Goal 1 of the Strategy discusses promoting science in BLM Conservation Lands as an outdoor laboratory and applying the findings to management of the Conservation Lands and other BLM lands. BLM should complete cultural resource surveys of all cultural resources along routes proposed for designation under laws and policy before any routes are chosen for designation.

***Recommendations*:** In accordance with NHPA, BLM must initiate and complete the Section 106 process prior to the designation of roads and routes located within the National Monuments, which will occur through the approval of the RMP and Record of Decision. BLM should not designate any roads without a proper cultural survey along those roads. The recommendations from the Bungart Report should be incorporated fully into the RMP for the Sonoran Desert National Monument. BLM should only designate the minimum road network necessary for the protection of the monument objects.

2. BLM failed to identify historic properties potentially affected by the proposed road and route designations

The DRMP does not support a conclusion that BLM made a "reasonable and good faith effort" to identify historic properties within areas of the national monuments potentially affected by proposed road and route designations. Section 106 regulations require BLM to "make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey." 36 C.F.R. § 800.4(b)(1). As part of this duty, BLM must account for information communicated to it by parties expressing an interest in historic properties affected by the undertaking. *Pueblo of Sandia v. United States*, 50 F.3d 856, 860–61 (10th Cir. 1995). In this particular case, BLM failed to undertake cultural resource inventories in association with proposed route designations as required by BLM Instruction Memorandum (IM) 2007-030 and also failed to consider information provided by Peter Bungart, an archaeologist with particular archaeological expertise in this area, concerning historic properties within the national monuments.

By neglecting to inventory proposed route designations for cultural resources pursuant to IM 2007-030, BLM failed to make a reasonable and good faith effort to identify historic properties in the monuments. IM 2007-030 provides guidance to BLM on implementing the requirements of Section 106 for ORV designations and travel management. BLM IM 2007-030. A 100 percent survey of the planning area is not required by the IM. *See* Proposed Plan, p. 5-66. Rather, BLM must inventory only those areas potentially affected by two specific types of designations: 1) new routes; and 2) existing routes when a "reasonable expectation" exists that proposed decisions will shift, concentrate, or expand travel into areas likely to have cultural resources. BLM IM 2007-030. Consistent with the regulations implementing Section 106, the IM requires a cultural resources inventory prior to designation of routes for ORV use. *Id*.

***Recommendation*:** BLM must satisfy its obligation to identify and inventory cultural resources within the area of potential effects associated with each proposed road. Such information is vital to BLM's ability to adequately meet their responsibilities under Section 106 of the NHPA. BLM IM 2007-030 supports the requirement that BLM complete an identification and inventory process prior to issuing records of decision for the RMPs.

B. BLM should define how it will manage cultural landscapes

The 15-Year Strategy for the National Landscape Conservation System states that BLM will "[m]anage cultural resources within the context of the cultural landscape and adjoining lands to provide the greatest conservation benefit." NLCS Strategy at 13. IM 2009-215 encourages BLM to "explore innovative ways to ensure compliance with both the designation and the FLPMA." The Canyons of the Ancients National Monument Resource Management Plan (Canyons RMP) contains one of the most innovative approaches toward the protection of cultural resources for BLM monuments. The Canyons RMP states that the "goal of the BLM at the Monument is to manage cultural resources on a landscape scale, in accordance with the mission of the NLCS, and to recognize the integral and interdependent relationships between sites." Canyons RMP/ROD at 2.

Just as the Canyons of the Ancients National Monument Proclamation discusses the "intertwined natural and cultural resources," the Proclamation creating the Sonoran Desert National Monument also discusses the connection of desert washes, bajadas, and other natural features leading to the settlement and connection of prehistoric and historic cultures. The Canyons RMP proposes to identifying "settlement clusters" in the monument—places where numerous sites are located in proximity to each other—and prohibiting or restricting uses that may directly or indirectly harm those clusters. Canyons RMP/ROD at 44.

We appreciate and support BLM's emphasis on the importance of landscape scale protections for cultural resources made evident by the following statement Draft RMP:

> Distinct cultural landscapes would be described and mapped as defined by human use of the environment to protect the physical integrity, enhance visitor experience, and maintain or enhance visual settings. Cultural landscapes are a new and holistic land use concept that attempts to understand human interaction with each other and their environment through time on a landscape scale. DRMP at 58.

We fully support this approach as consistent with BLM policy and direction. We recommend that the RMP further define landscape-level management of cultural and other resources. In the Canyons RMP for example, "Cultural Landscape" is defined as "[a]ll physical remains of past human occupation in their original setting within a defined geographical area." Canyons RMP/ROD at Glossery-2. **BLM should define cultural landscapes in a manner that is most appropriate for the resources of the planning area.**

***Recommendation*:** We are in complete support of BLM's goal to manage cultural resources on a much larger scale than has been common practice on BLM lands to date. BLM should further define cultural landscapes within the RMP and provide management prescriptions that ensure the long-term protection these resources.

VI. NATIONAL TRAILS

A. BLM should set additional actions for the protective management of National Historic Trails

The Juan Bautista de Anza, Butterfield Overland Stage Route, and Mormon Battalion National Historic Trails (NHT) have all been recognized by Congress for their national significance in our nation's history and settlement. The Anza NHT is also part of BLM's National Landscape Conservation System. The heightened conservation status of these trails deserves particular attention in this RMP.

There is a good recent example of special protective management in the Lander Field Office Draft Resource Management Plan (Lander Draft RMP)[7]. In the Lander Draft RMP, BLM has

[7] *Available at* http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander/docs/drmp-eis.html.

proposed two special designations to recognize and protect the California, Mormon Pioneer, Oregon and Pony Express National Historic Trails (NHTs): [8]

- the South Pass Historical Landscape Area of Critical Environmental Concern (ACEC); and
- the Heritage Tourism and Recreation Management Corridor.

These designations are significant both because they are designed to preserve not only the physical traces of the NHTs, but also their historic settings, and because BLM is deliberately attempting to establish favorable precedent for the management of other historic trails managed by BLM: "Upcoming RMPs could look to this RMP for guidance and ideas about how to best manage the NHTs while still allowing development that would not adversely impact the NHTs." Lander Draft RMP at 1256.

The Lower Sonoran/Sonoran Desert Draft RMP proposes similar management prescriptions to the Lander Draft RMP, but should also consider additional measures to appropriately protect the management of the NHTs for current and future generations:

- Designate a minimum 5-mile NHT corridor to allow for the protection of the historical and scenic values of the NHT.
- Outside of 5 miles from the NHTs, prohibition on "highly visible projects" and "projects out of scale with the surrounding environment," unless they will "cause no more than a weak contrast" on the NHTs.[9]
- VRM Class II.
- Remove or reclaim existing visual intrusions, such as roads, facilities and rights-of-way, in order to attain the Draft RMP's management goals for the NHTs.
- Prohibition on audible or atmospheric disturbances in excess of current levels.

Lander Draft RMP at 192-93, Maps 100, 104 and 132; *Id.* at 163, Maps 32, 100, 104 and 127.

Recommendations: We strongly recommend that BLM adopt these additional prescriptions as set forth in the Lander Draft RMP for the Lower Sonoran/Sonoran Desert Draft RMP. We support Alternative D with the addition of the above management actions for NHTs in the planning area. This includes the pertinent prescriptions in Sections 2.7.3 and 2.8.5 for the management of resources in relation to the NHTs.

B. BLM should designate the National Historic Trails in the Sonoran Desert National Monument as non-motorized

As stated above, the National Historic Trails, Wilderness Areas, and National Monuments, in addition to other designations, are all part of BLM's National Landscape Conservation System. This earns these areas unique distinction as well as special protection and management responsibilities. Within one particular area, the BLM is managing the Sonoran Desert National Monument, North Maricopa Mountains Wilderness Area, and the Juan Bautista de Anza

[8] The Lander Draft RMP also proposes to designate a series of Special and Extensive Recreation Management Areas (RMAs) for the NHTs. *See* Lander Draft RMP at 160-62. The overarching purpose of these RMAs is to "stop the movement toward a more industrial setting and trend toward a more primitive setting." *Id.* at 927.

[9] A "weak contrast" means that "[t]he element contrast can be seen but does not attract attention." BLM Manual 8431 – Visual Resource Contrast Rating, *available at* http://www.blm.gov/nstc/VRM/8431.html.

National Historic Trail—all managed as units of the National Landscape Conservation System and all revered for the natural and cultural values they possess. In addition, this area includes the Highway 238 Scenic Byway and Proposed Butterfield Stage Memorial Citizens' Proposed Wilderness Area, which are not part of BLM's Conservation System, but do merit recognition for their special conservation values.

As stated in the 15-Year Strategy for BLM's Conservation System, "[t]he BLM will only develop facilities, including roads, on NLCS lands where they are required for public health and safety, are necessary for the exercise of valid existing rights, minimize impacts to fragile resources, or further the purposes for which an area was designated." NLCS Strategy at 11. Neither the route along the NHT itself nor the travel routes in the immediate vicinity fall within any of the criteria provided in the NLCS Strategy. To the contrary, the area has seen repeated abuse by off-road vehicles and will continue to be threatened in the future as evidenced by the following statement in the Draft RMP:

> Threats to the NHT include increasing recreational use, particularly near urban areas, and removal of historic artifacts. These threats were realized in 2008 when the NHT and the access routes leading to it became unacceptably degraded by damage due to improper OHV use. A temporary closure in the fall of 2008 was followed by intensive restoration and repair work to address the excessive damage to the historic trails, vegetation, soils, and historic trail corridor setting . . . Over the long-term, there will continue to be the challenge of protecting the trail from visitor over use and unauthorized visitor activities. Draft TMP at 343.

As stated in the Draft RMP, the Anza, Butterfield, and Mormon Battalion NHTs are all named monument objects. The BLM's transportation planning should prioritize protection of Monument objects. Proclamation 7397 obligates the BLM to develop a transportation plan "that addresses the actions, including road closures or travel restrictions, necessary to protect the objects identified in the proclamation." BLM has already demonstrated that damage to monument objects has occurred and is likely to continue in the future within the temporary closure in place. Thus, the Draft RMP should not propose opening the routes in the area to motorized use.

In addition, in order for BLM to open up routes that are currently temporarily closed, the agency must make a showing that "the adverse effects are eliminated and measures implemented to prevent recurrence." 43 C.F.R. § 8341.2(a). The Draft RMP does not demonstrate that BLM has eliminated the adverse effects (i.e. abuse from ORVs) that caused damage and does not propose measures to prevent the recurrence of the damage.

Finally, regarding management of the NHT, the Draft RMP states that "[m]anagement would be consistent with the National Park Service (NPS) management plan and in cooperation with the NPS." Draft RMP at 203. "Motorized vehicles are generally not acceptable on off-road segments of national historic trails." Comprehensive Management and Use Plan for the Juan Bautista de Anza NHT at 26 (NPS 1996).

"A portion of the Anza route passes through the North Maricopa Wilderness in the Lower Gila Resource Area of the Phoenix District of the BLM in Arizona. The management plan for the area

proposes conversion of a 5.6 mile jeep trail to a primitive hiking and equestrian trail within the wilderness." Comprehensive Management and Use Plan for the Juan Bautista de Anza NHT, The Trail Environment at 3 (NPS 1996). When BLM was considering this action in 1996, there was less of a threat from ORVs in the area and the Sonoran Desert National Monument had not yet been created. It is substantially more important for BLM to consider the conversion of this portion of the Anza NHT as non-motorized as proposed in Alternative D.

Recommendations: We recommend that BLM choose Alternative D with regard to the management of the NHTs in the Sonoran Desert National Monument. This alternative is the only alternative that provides reasonable access to the special and important resources in this area while also protecting them from further harm.

VII. AREAS OF CRITICAL ENVIRONMENTAL CONCERN

An Area of Critical Environmental Concern (ACEC) designation is the principal BLM designation for public lands where special management is required to protect important resources. BLM Manual 1613.06. ACEC designations highlight areas where special management attention is needed to protect, and prevent irreparable damage to, important historic, cultural, and scenic values, fish, or wildlife resources or other natural systems or processes. BLM Manual 1613.02. In addition, an ACEC designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. Designation also serves as a reminder that significant values or resources exist which must be accommodated when future management actions and lands use proposals are considered near or within an ACEC. BLM Manual 1613.02.

The Federal Land Policy and Management Act (FLPMA) obligates the BLM to "give priority to the designation and protection of areas of critical environmental concern [ACECs]." 43 U.S.C. § 1712(c)(3). ACECs are areas "where special management is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes." 43 U.S.C. § 1702(a).

We fully support the designation of all four ACECs as proposed in Alternative E of the Draft RMP. As BLM describes in Appendix V, all four of these areas deserve special management attention and a priority placed on conservation over uses that may harm their values. As stated in BLM's ACEC Manual, the area must require special management attention to protect the relevant and important values (where current management is not sufficient to protect these values or where the needed management action is considered unusual or unique), which is addressed in special protective management prescriptions. For potential ACECs, management prescriptions are to be "fully developed" in the RMP. Manual 1613, Section .22 (Develop Management Prescriptions for Potential ACECs).

We generally support the management actions in Alternative E that would apply to all ACEC. The one exception is that all ACECs should be closed to all locatable and leasable mineral exploration and development and mineral material disposals including free use permits. The public lands within ACECs should be recommended for withdrawal. This is provided for in

Alternative D and we strongly recommend BLM choose this alternative with regard to mineral exploration and development to protect the important and sensitive resources found within the ACECs. In addition to the management actions for all ACECs, we provide the following recommendations for specific management prescriptions unique to each ACEC:

Coffeepot-Batamote ACEC: As stated in the Draft RMP, the purpose of the Coffeepot-Batamote ACEC is to protect for outstanding botanical diversity of the native and rare plant communities (including the Acuña cactus); lesser long-nosed bat, cactus ferruginous pygmy-owl and desert bighorn sheep habitat; and other wildlife populations along with unique landscape and scenic features. Draft RMP at 196. In order to achieve those goals, BLM should adopt the following additional management actions:

- The route system would be designated to limit wildlife habitat fragmentation, wildlife disturbance, and vegetation damage. Motorized vehicle routes that conflict with maintenance of wildlife habitat and cultural resources would be closed, limited, or mitigated. New route construction would not be allowed except for resource protection.
- Routes within washes would be prohibited.
- Closed to leasable exploration and development.
- Recreational development would be limited to the minimum required to protect resources and provide for public safety.
- Exclusion area for utility-scale renewable energy development.
- No new utility and/or communication facilities.
- Proposed withdrawal from locatable mineral entry
- Apply a VRM Class I or II scenic designation
- Closed to the disposal of mineral materials

Cuerda de Lena ACEC: The purpose of this designation is to protect wildlife, including the endangered Sonoran Pronghorn, cactus ferruginous pygmy-owl, and other species, as well as to protect cultural resources. While we are generally supportive of the management actions set out in Alternatives D and E, BLM should apply the following additional management prescriptions to meet this goal:

- The route system would be designated to limit wildlife habitat fragmentation, wildlife disturbance, and vegetation damage. Motorized vehicle routes that conflict with maintenance of wildlife habitat and cultural resources would be closed, limited, or mitigated. New route construction would not be allowed except for resource protection.
- Routes within washes would be prohibited.
- Closed to leasable exploration and development.
- Recreational development would be limited to the minimum required to protect resources and provide for public safety.
- Exclusion area for utility-scale renewable energy development.
- No new utility and/or communication facilities.
- Proposed withdrawal from locatable mineral entry
- Apply a VRM Class I or II scenic designation
- Closed to the disposal of mineral materials

Gila River Terraces and Lower Gila Historic Trails ACEC: The following additional management prescriptions should be set out in the RMP to help accomplish the goals of this ACEC:

- There should be a preference for retaining public land within the ACEC except where an exchange will further the protective purposes of the ACEC designation.
- The route system would be designated to avoid all sensitive natural and cultural resources. Any routes that conflict with maintenance of wildlife habitat and cultural resources would be closed, limited, or mitigated. New route construction would not be allowed except for resource protection.
- Routes within washes would be prohibited.
- Closed to leasable exploration and development.
- Recreational development would be limited to the minimum required to protect resources and provide for public safety.
- Exclusion area for utility-scale renewable energy development.
- No new utility and/or communication facilities.
- Proposed withdrawal from locatable mineral entry
- Apply a VRM Class I or II scenic designation
- Closed to the disposal of mineral materials

Saddle Mountain Outstanding Natural Area ACEC

- The route system would be designated to limit wildlife habitat fragmentation, wildlife disturbance, and vegetation damage. Motorized vehicle routes that conflict with maintenance of wildlife habitat and cultural resources would be closed, limited, or mitigated. New route construction would not be allowed except for resource protection.
- Routes within washes would be prohibited.
- Closed to leasable exploration and development.
- Recreational development would be limited to the minimum required to protect resources and provide for public safety.
- Exclusion area for utility-scale renewable energy development.
- No new utility and/or communication facilities.
- Proposed withdrawal from locatable mineral entry
- Apply a VRM Class I or II scenic designation
- Closed to the disposal of mineral materials

VIII. RECREATION

A. BLM should prohibit recreational target shooting and geocaching monument-wide

We support Alternative E's prohibition of recreational shooting in Sonoran Desert National Monument. Recreational shooting not only presents a human health and safety risk to the public, it is also a serious threat to cultural resources in the Monument. Target shooting at cultural features does not represent the proper care of Monument objects. By placing a prohibition on target shooting in the entire Monument, the threat to cultural resources from this form of vandalism should be at least minimized. For similar reasons, we also support prohibiting geocache activities, as proposed in Alternative D. Draft RMP at 177.

Recommendation: BLM should choose Alternative E for recreational target shooting and geocaching to address the obvious and documented negative impacts that these uses have on monument objects.

B. BLM must comply with the agency's current Recreation and Visitor Services Land Use Planning Guidance

In 2010, BLM issued new guidance (IM 2011-004) for recreation and visitor services planning in the land use planning process. The guidance transitions BLM from "benefits based" management to "outcomes focused" recreation management and eliminates the three recreation-tourism markets (community, destination, undeveloped). The updated handbook also changes recreation management to a three-category system wherein lands in the planning area can be designated as special recreation management areas (SRMAs), managed as extensive recreation management areas (ERMAs), or classified as public lands not designated as recreation management areas.

Under the new guidance, the management focus for SRMAs is to "protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics," whereas ERMAs are managed to "support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA." In SRMAs, recreation is to be the dominant use, and in ERMAs management is "commensurate with the management of other resources and resource uses." Whereas SRMAs are intended for more intensive management, ERMAs may be appropriate to designate for quiet-use, backcountry experiences and layer with other special designations that are compatible with quiet recreation, such as ACECs and lands with wilderness characteristics. Both SRMAs and ERMAs provide mechanisms for the BLM to actively manage different types of recreation to the benefit of users while protecting the other resources of the public lands.

The Lower Sonoran and SDNM Draft RMP fails to implement IM 2011-004, and instead prescribes recreation management based on "benefits based" management, recreation-tourism markets and the two-category system of Recreation Management Areas wherein all public lands are designated as an SRMA or ERMA. The Draft RMP acknowledges the updated guidance and states that required changes will be included in the Proposed RMP. Draft RMP at 1. We appreciate the LSFO's commitment to update the recreation management alternatives for this RMP and adhere to the new guidance; however, postponing those changes to the Proposed RMP does not allow for adequate public review and comment. BLM should issue the revised recreation alternatives as a supplement to the Draft RMP for the LSFO and provide an opportunity for public comment.

For the Lower Sonoran Decision Area, BLM must entirely revise the recreation management discussion and alternatives to comply with the guidance. The recreation management language in chapters 2 and 3 of the DRMP must be updated to reflect the revised Recreation and Visitor Services Land Use Planning Guidance. While much of the analysis informing the recreation management alternatives may still be applicable, BLM must use the new SRMA and ERMA templates instead of the Benefits Based Recreation Worksheets included in Appendix R, and also evaluate Recreation Management Area designations using the new three-category system in

which ERMAs require robust objectives, management actions, and implementation decisions, and some lands are not designated as RMAs. Attached are excerpts from the management framework for proposed SRMAs and ERMAs from the Colorado River Valley Draft RMP, which utilize the new guidance and templates. (Attachment 4).

Because the SDNM is fully contained in an SRMA through the range of alternatives, BLM could minimally update the recreation management plan for the Monument by replacing the RMZ Worksheets for the SDNM Planning Area (Appendix R) with the new SRMA template provided with IM 2011-004. The new templates reflect changes to the Land Use Planning Handbook resulting from the new guidance, including outcomes based management and elimination of market strategies.

Recommendations: BLM must update the recreation management analysis and alternatives to reflect the guidance set forth in IM 2011-004. The BLM should offer a supplemental comment period on the revised recreation alternatives prior to releasing the Proposed RMP for the LSFO.

C. Special Recreation Management Areas

1. Sonoran Desert National Monument

We support the BLM designating the full SDNM as a Special Recreation Management Area, and generally support the approach proposed in Alternative D as a goal for the recreational experience of the Monument. The Monument should be primarily managed for "visitors seeking an undeveloped, back country experience" and recreational opportunities that are produced by the "vast, undeveloped, and remote character of the landscape." Draft RMP at 175. This type of management is more consistent with the purposes as stated in the Monument Proclamation, as well as Secretarial Order 3308 for the management of the National Landscape Conservation System and BLM's recently released 15-Year Strategy for the National Landscape Conservation System.[10]

Presidential Proclamation No. 7397 designated the Sonoran Desert National Monument to protect an "untrammeled" landscape rich with biodiversity and historic resources. While the SDNM is a tourist destination, visitors travel to the Monument to experience the undeveloped desert landscape and learn about our western heritage in its untrammeled, frontier state. Therefore, recreation management is paramount to protecting the Monument objects and purpose and providing visitor experiences that reflect the values and primitive character of the Monument. Because the Monument was designated to preserve its undeveloped character, the recreation objectives and actions should pursue an undeveloped recreation strategy.

As stated in Secretarial Order 3308 for the management of the National Landscape Conservation System, "[c]omponents of the NLCS shall be managed to offer visitors the adventure of experiencing natural, cultural and historic landscapes through self-directed discovery." The NLCS 15-Year Strategy reinforces this commitment to self-exploration of NLCS units as well as

[10] Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Communications_Directorate/public_affairs/news_release_attachments.Par.16615.File.tmp/NLCS_Strategy.pdf.

the prime importance of conservation above other multiple uses in Conservation Lands units. The Strategy outlines goals and actions for implementing BLM's mission and vision for the National Conservation Lands. Specifically, Goal IF, Action Item 2 provides that "[t]he BLM will only develop facilities, including roads, on NLCS lands where they are required for public health and safety, are necessary for the exercise of valid existing rights, minimize impacts to fragile resources, or further the purposes for which an area was designated. Further, Goal 1E of the Strategy is to: "Limit discretionary uses to those compatible with the conservation, protection, and restoration of the values for which NLCS lands were designated." Recreation is one such discretionary use that must be managed in a way that is compatible with excellent stewardship of the natural and historic resources for which the Monument was designated.

For example, the Canyons of the Ancients National Monument Proposed RMP (Colorado) recognizes: "It is important to specifically manage [SRMAs] with the goal and objective of preserving the distinctive character and setting of the Monument." Canyons PRMP at 22. The proposed alternative would "promote an undeveloped recreation strategy, with minimal facilities and infrastructure to support recreation and transportation use." Canyons PRMP at 30. Likewise, the SDNM RMP should adopt a recreation strategy that celebrates and preserves the undeveloped character of the Monument.

Access to an undeveloped, backcountry experience should not promote the use of motorized vehicles as this use is most appropriate for passage or frontcountry recreation management zones. Both Alternatives D and E are flawed in that they list "four-wheel-drive touring" as a main activity for the undeveloped, backcountry areas of the monument. BLM should consider an alternative that allocates these backcountry areas of the monument as non-motorized destinations.

A good example of a backcountry recreation management zone managed for an undeveloped experience can be found in the RMP for the Agua Fria National Monument. As described in the RMP, the Back Country RMZ provides the following experience:

> The Back Country RMZ will provide an undeveloped, primitive, and self-directed visitor experience and landscape setting without provisions for motorized or mechanical access. The management emphasis will be to preserve natural, undeveloped landscapes. Back Country will be managed to maintain a natural landscape character. The Back Country RMZ will provide opportunities for adventure, challenge, solitude, and discovery. Facilities will be minimal: provided only where vital for resource protection or public safety, or for approved administrative purposes. Facilities will generally be limited to trails, signs and other amenities, which are essential to the protection of monument resources. Maintaining the integrity of the monument values and resources is integral to any activity.
>
> The desired recreation settings and associated experiences within this zone are mainly semi-primitive and non-motorized. The Back Country RMZ will offer non-motorized access and recreation opportunities within primitive settings, where self-reliant and properly equipped visitors can experience solitude. Encounters with other users will be lower than in the Front Country RMZ. Recreation experiences will be primitive, with

> hunting, hiking, backpacking, wildlife observation, cultural study, photography, and camping as the main activities. Trail and cross-country foot or horseback travel may be permitted. Agua Fria RMP/ROD at 2.2.9.3.

In order to preserve the primitive, undeveloped character of the Monument, BLM must manage the Monument in a way that prohibits any further damage to Monument objects that has already occurred from traditional uses in the area. Objective 3.2 in the Draft RMP is: "Impacts to Monument objects resulting from recreation use do not exceed 2001 levels," which is the year the Monument was proclaimed (Draft RMP at 176). In 2005, Northern Arizona University and Sonoran Institute released a report analyzing impacts to the Monument objects from recreation activities. (Foti et al. 2005). The report documents baseline recreation impacts to natural and cultural resources in the Monument, and identifies sites that are heavily impacted and in need of managerial attention.

One of the findings that stands out from this report is that 73.7 % of the 410 sites visited were impacted by ATV use. Foti et al. 2005, at Table 21. This is second only to "Campsites" for the most prominent recreational use having impacts in the monument. As demonstrated by the need to issue a temporary closure in a portion of the monument, ATV use is increasing. BLM should only designate the minimum transportation network that is necessary for protecting the monument objects in order to protect Monument Objects from further damage.

While we agree that recreation impacts to Monument objects should not exceed 2001 levels, the Recreation Impacts report indicates that in some areas the 2001 levels do not match desired conditions for the Monument. The RMP should therefore also commit to identifying recreation sites where baseline conditions indicate unacceptable impacts and taking action to reduce those impacts, regardless of the 2001 levels. The RMP should also establish a specific monitoring program for recreation impacts to Monument objects using the baseline physical data and management recommendations developed for the Recreation Impacts report.

Finally, we support the preferred alternative proposing to locate visitor and management infrastructure outside of the Monument Draft RMP at 176. The NLCS specifically provides for visitor services to be located outside the units and in gateway communities, which can help maintain the primitive character of the landscape while providing economic benefits to nearby communities.

Recommendations: We generally support the goal stated in Alternative D for managing recreation for an undeveloped experience in the SDNM and the zoning approach of Alternative E, with exception. As provided in Proclamation 7397, Secretarial Order 3308, and the 15-Year NLCS Strategy, BLM should be managing the Monument for access to an undeveloped, backcountry experience. Off-road vehicles should be generally prohibited in areas managed for an undeveloped, backcountry experience. Overall, we support the zoning approach taken in Alternative E combined with the goal for an undeveloped experience in Alternative D, without off-road vehicle touring as a main feature of these areas.

2. Lower Sonoran Field Office Planning Area

We generally support the BLM proposing to designate a large proportion of the Lower Sonoran Decision Area as SRMAs with back country settings in the preferred alternative. Draft RMP at 168. We also support the multiple SRMAs and RMZs amongst the range of alternatives that emphasize non-motorized recreation opportunities, such as the Saddle Mountain RMZ and Gila Bend Mountains SRMA/RMZ in the preferred alternative.

The RMP should put more meaningful management prescriptions in place to ensure that RMAs designated for quiet recreation activities such as hiking, hunting and wildlife viewing truly protect those experiences. RMAs and RMZs that primarily emphasize non-motorized recreation opportunities should be rights-of-way exclusion areas and closed to surface occupancy to preserve the natural landscape and associate viewsheds and soundscapes. Additionally, allowing for miles of motorized routes within back country areas by designating passage corridors along those routes does not adequately preserve or promote back country characteristics. The RMP should designate RMAs and/or RMZs that are completely closed to motorized vehicles to create unfragmented blocks of land for primitive, non-motorized recreation.

We also support creating non-motorized trails by converting primitive roads where possible rather than constructing new trails, as is contemplated in Alternative D for the Buckeye Hills East RMZ and Alternative E for the Saddle Mountain RMZ (DRMP 170 and 171, respectively).

Recommendations: The RMP should designate Recreation Management Areas that protect and promote non-motorized recreation experiences by closing those areas to motorized use and other intrusive development such as ROWs.

D. BLM should set criteria for processing special recreation permits in the planning area

The Lower Sonoran and SDNM Draft RMP states that Special Recreation Permits (SRPs) for both the Monument and the Lower Sonoran Decision Area will be authorized on a case-by-case basis as outlined in 43 CFR 2930.5, and also utilizing the decisions and guidance provided in Appendices Q, *Recreation Settings and Descriptions*, and R, *Benefits Based Recreation Worksheets* Draft RMP at 174 and 177. Furthermore, the Alternative E for the SDNM includes additional criteria for issuing SRPs, such as prohibiting competitive motor sports, limiting the number of participants and protecting Monument objects. This is a good start, but the RMP should include more specific criteria for issuance of SRPs in both the SDNM and the Lower Sonoran Decision Area to effectively manage commercial and competitive group activities that can significantly impact other resources, including other recreation experiences.

BLM regulations and policy, including 43 C.F.R. § 2930, BLM Manual 2930, Handbook H-2930-1, and Instruction Memorandum (IM) 2011-019, provide the agency with direction on authorizing and administering SRPs. Directives in these regulations and policies require, among other things, operating plans with detailed information, permit stipulations, bonding, and performance evaluations. BLM should use its discretion in drafting the RMP to go beyond the

minimum standards and set criteria, terms, and stipulations that will ensure to the protection of the monument objects and values.

Instruction Memorandum (IM) 2011-019 for the administration of BLM special recreation permits was issued in response to an event that was streamlined through the process, not well planned, and with little oversight, resulting in the death of eight people. Due to the nature of these types of large group events, it is critical that BLM set the right criteria up front for the safety of those involved and to protect the natural and cultural resources.

IM 2011-019 makes several new adjustments to the previous policies on SRPs. One of the most important changes is the agency's obligation to deny any SRP if the field office cannot guarantee that every step of the permit can be properly administered. BLM has to make a determination for every permit that "BLM has the capacity to properly administer the permit." IM 2011-019. Thus, even though this programmatic EA can provide standard criteria for a determination of the types of permits to consider, BLM must still document each step of the process for each permit and make an official determination as to whether the agency has the capacity to process, administer, and ensure that all of the terms and conditions of the permit is fulfilled, including, but not limited to providing law enforcement and other staff on hand to monitor the event and ensuring that the area has been restored after the use.

The BLM Handbook on Recreation Permit Administration (H-2930-1) clearly states that field offices can and should develop guidelines for issuing SRPs. The Handbook states: "Field Offices are encouraged to develop thresholds through land use planning for when permits are required for organized groups and events for specific types of recreation activities, land areas, or resource settings" H-2930-1 at 13. While the preferred alternative for the SDNM establishes that organized groups of more than 25 participants will require an SRP (DRMP 177), no such threshold is established for the Lower Sonoran Decision Area. In addition to establishing a threshold number of participants that would require an SRP, BLM should establish other types of thresholds that would trigger the need for an SRP, such as environmental impacts, area size and duration of use.

The Price Field Office RMP, Appendix R-10, (attached to these comments) provides an excellent example for evaluating SRP applications and issuing such permits. See, Attachment 5. It classifies SRPs into four distinct classes, ranging from least intensive to most intensive, based on specific factors such as type of equipment, size of area used, number of participants, etc. These factors are defined and then compared in a simple permit classification matrix consisting of Classes I through IV (with I being for smaller and less impacting events and IV being for larger, more impacting events). Each Class also has an example of the type of event that may fit into the category. After the Class is determined, the BLM can then look to see how permit types fit into Recreation Opportunity Spectrum Classifications and/or Recreation Management Areas. Various SRMAs can be broken into classes and it is easy to see what types of uses and events should be permitted for each area. Because the standards set out in the Price RMP are very specific (for example, surface disturbance of 5-40 acres ranks as "medium intensity"), BLM can easily determine whether to issue an SRP and where, and can better estimate cumulative impacts from such permits. The Lower Sonoran and SDNM RMP should augment its SRP management decisions by using the model provided by the Price RMP for classification of SRPs to define

which uses may be appropriate or inappropriate in specific areas. BLM has not only the discretion to establish SRP guidelines, but also the obligation to do so in order to protect the resources that the RMP is intended to protect and sustain.

Furthermore, BLM issued new guidance recently clarifying the SRP manual (IM 2011-019). The guidance requires the agency and applicant to show that they have taken measures to sufficiently administer the permit and remedy damage that may occur from the event.

Recommendations: BLM should supplement and strengthen the management actions for SRPs by including more specific criteria for when and how SRPs will be issued. The Price RMP provides a useful model for evaluating SRP applications.

IX. PRIORITY WILDLIFE SPECIES AND HABITAT

The preferred alternative includes a number of management prescriptions that will benefit wildlife and plants, including several threatened, endangered, candidate, sensitive or other special status species. (When we use the term special status species from this point forward, we are referring to all species that are listed as threatened, endangered, candidate, sensitive, or that have any other special status). We are generally supportive of the Preferred Alternative and a number of the specific management prescriptions outlined in the plan. We also have several comments and concerns.

A. Wildlife habitat areas and movement corridors should be strengthened to stand up as a model for all BLM planning efforts

We are encouraged to see the designation of priority wildlife habitat areas (WHA) and wildlife movement corridors (WMC) in the Draft RMP. This innovation in land use planning is a welcome and necessary step to assisting the survival of priority species in the face of climate change and other stressors. This also provides a model for the implementation of Secretarial Order 3308, which states that these lands "shall be managed as an integral part of the larger landscape, in collaboration with the neighboring land owners and surrounding communities, to maintain biodiversity, and promote ecological connectivity and resilience in the face of climate change." *See also*, 15-Year National Landscape Conservation System Strategy, Theme 2, which discusses an ecosystem-based approach to managing the landscape.

The success of the WHAs and WMCs will depend on the implementation of strong and lasting management actions set in the RMP. BLM is generally off to a good start with the proposed prescriptions in the Draft RMP. The follow provide a few more specific recommendations for these actions:

- Prohibit motorized vehicles in washes in both WHAs and WMCs.
- Designate as closed to all locatable and leasable minerals exploration and development (including geothermal and sodium), and mineral material disposals. Public lands located within the corridors would be recommended for withdrawal.
- Designate seasonal route closures within the RMP for designated routes and trails open to off-road vehicles as done in the Pinedale Field Office for the Trapper's Point ACEC,

designated to prevent the obstruction of a big game migration bottleneck. Pinedale Field Office RMP/ROD at 2-56.
- Designate Wildlife Movement Corridors as avoidance areas with uses concentrated in already disturbed areas.

In addition, BLM should reexamine the limitation for 3 miles of road per section or less within the wildlife movement corridors to focus instead on route densities for all priority wildlife in the planning area. We recommend that BLM commit in the RMP to calculating road density within the WHAs and WMCs as well as transportation effect zones in accordance with scientific literature and evaluate the likely impacts of potential route networks on wildlife species, habitat, and migration corridors. Overall goals of the transportation plan should include reductions in road density and edge effects and increases in core areas to provide greater habitat security.

Recommendation: We support the designation of Wildlife Habitat Areas and Movement Corridors in the planning area and encourage BLM to strengthen the management actions associated with these designations in the final RMP. BLM should also perform a route density analysis to determine the most appropriate density for the protection of wildlife in the WHAs and WMCs.

B. Monument wildlife species and habitat must be prioritized

BLM must protect monument objects as described in Proclamation 7397. The Proclamation describes many important wildlife species and their habitat as specific objects of interest to be prioritized for protective management over other uses of the area. This includes, but is not limited to, the following:

- Sonoran pronghorn
- Desert bighorn sheep
- Mule deer
- Javelina
- Mountain lion
- Grey fox
- Bobcat
- Lesser long-nosed bat
- California leaf-nosed bat
- Cave myotis
- Over 200 species of birds, including the elf own and western screech owl
- Sonoran desert tortoise
- Red-backed whiptail
- Sonoran green toads

As mentioned above, pursuant to the Proclamation and other laws and policies, BLM must inventory for all monument objects, including wildlife, and manage for the protection of those

objects above all other uses. For example, BLM should map the habitat for all monument species and restrict uses that have a known impact on that species or its habitat.

Recommendations: The Draft RMP fails to prioritize and protect wildlife and habitat under the Proclamation and other laws and policies. The RMP should restrict all uses that damage monument objects, including wildlife species listed in the Proclamation, including off-road vehicle use, designated routes, livestock grazing, and other uses that may lead to the damage of the wildlife resources in the monument.

X. INVASIVE SPECIES

BLM has an affirmative duty to evaluate the status of noxious and invasive species in the planning area and to manage these species to control their proliferation on public lands. Federal agencies are required by EO 13112, Invasive Species, to consider which agency actions may affect the status of invasive species and shall, to the extent practicable and permitted by law, do the following:

- Identify such actions.
- Subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.
- Not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Desert soils are particularly fragile, and development can have significant impact on the cryptogrammic crust, which is primarily made up of cyanobacteria, mosses, and lichens. When these soils are disturbed, the desert land generates more dust and the area is more susceptible to invasive plant species. As the Draft RMP acknowledges, invasive species "can be detrimental to the environment by directly causing harm to native species through either predation or competition (Van Devender et al. 1997). This, in turn, can affect general ecosystem functions." Draft RMP at 279. Additionally, large unnatural fires could result as a lack of invasive species management and can result in the replacement of native species with more invasives after a fire event in this ecosystem. Draft RMP at 154.

As recognized in the Draft RMP, one of the major catalysts for the spread of invasive species is surface use disturbance as caused by motorized vehicles and the building of roads, livestock

grazing, and development of infrastructure. The Draft RMP states that "[i]ncreases in surface disturbance may result in increases in noxious and invasive weeds from importation from vehicles, urban developments, roadways, livestock, equestrian users, and hikers, all of which could reduce native vegetation, alter vegetative composition, and reduce habitat suitability to some wildlife species." Draft RMP at 442. BLM should identify high density areas of invasive species and highly vulnerable areas and set management prescriptions in the RMP that seek to address invasives over the life of the plan.

In the land use planning process for the Beaver Dam Wash and Red Cliffs National Conservation Areas in Washington County, Utah, BLM is currently using The Nature Conservancy's Landscape Conservation Forecasting to evaluate current vegetation conditions, including invasive species, and come up with appropriate management options for the Mojave Desert ecosystem. This type of modeling provides the agency with the information needed to make cost-effective decisions over the next two decades. It includes mapping the existing conditions, ascribing and ecological value to the area based on how far it has departed from the natural range of variability, and provides recommendations for management options that might be used to address issues such as the proliferation of invasive species in the planning area. BLM could employ a similar mapping and modeling process in this planning area in order to ensure that the environmental analysis is complete and that decisions are being made with the best data available to the agency.

BLM is currently drafting a rapid ecoregional assessment (REA) of the Sonoran Desert ecoregion, which will cover the entire planning area and beyond. Information on the REA is available at: http://www.blm.gov/wo/st/en/prog/more/climatechange/reas/sonoran.html. One of the "change agents" that will be addressed in the Sonoran Desert REA is invasive species. We understand that BLM will be publishing the REA in early 2012. This is timely and significant information that BLM should incorporate into the RMP, changing management prescriptions as necessary to respond to this data. BLM should also incorporate the information into its EIS for the planning area and allow for a supplemental comment period on the RMP/EIS to respond.

Within the Sonoran Desert National Monument, invasive species must be managed to protect Monument objects. The Proclamation highlights a number of wildlife species as Monument objects, and also notes that the Monument provides crucial habitat for these species. The Proclamation also notes the spectacular biological diversity of the plant and animal species in the monument from creosote-bursage to palo verde and saguaro to the woodland assemblages. Protecting this diversity and habitats requires the BLM to ensure that native vegetation continues to thrive and invasive species do not take over the area.

Recommendations: In order for BLM to take the requisite hard look under NEPA, the Draft RMP should include a complete inventory and analysis of the vegetative condition of the planning area, including invasive species. BLM should also incorporate the data and findings into the RMP from the Sonoran Desert Rapid Ecoregional Assessment when it is completed in early 2012 and allow for a supplemental public comment period on this issue. Under FLPMA and other laws and regulations, BLM is required to manage public lands to prevent the introduction and proliferation of invasive species. BLM should take action in the RMP to set management prescriptions for managing invasives and limitations on surface disturbance which

cause the spread of these species, such as the use of motorized vehicles on routes in the planning area.

XI. LIVESTOCK GRAZING

Appendix E comprises a "Draft Compatibility Analysis: Livestock Grazing on the Sonoran Desert National Monument." We support the BLM evaluating whether grazing is compatible with the priority set out in the Proclamation to protect Monument objects. However, the evaluation set out in Appendix E and used to develop and evaluate a range of management alternatives must be improved to actually fulfill its stated objective and the BLM's obligations.

What is clear is that the status quo livestock grazing management will not suffice in the future for the Sonoran Desert National Monument. For example, in 2005, The Nature Conservancy entered into a cooperative agreement with the BLM's Phoenix Field Office to perform a study (TNC Study) of the impacts of livestock grazing within the Sonoran Desert.[11] Among the TNC Study's pertinent findings was the following statement about current grazing management strategies on Sonoran Desert public lands:

> Based on our review of the literature on grazing management strategies, we conclude that no currently described approach, including continuous grazing and each of the specialized grazing systems, is completely applicable to or appropriate for the Sonoran Desert ecosystem within their current formations. Furthermore, in conjunction with our review of stocking rate and drought management considerations, we conclude that continuous grazing in which livestock are maintained within fenced allotments yearlong is not a feasible grazing management strategy on Sonoran Desert public lands.[12]

These conclusions are based on factors that are specific to the Sonoran Desert ecosystem; namely, variable and low precipitation levels, frequent and extended drought, the particularly sensitive resources in the region, and lack of research in general on grazing impacts in the area.[13] In addition, the monument proclamation itself recognizes the benefit to the biological diversity within the monument by attributing the "especially striking" conditions of the Sand Tank Mountains area where "no livestock grazing has occurred for nearly 50 years." This should be taken into account when BLM is performing a compatibility analysis.

Section E.1.5 sets out "Legal Mandates Relating to Public Lands Grazing" but does not mention Proclamation 7397, which governs management of the Monument and sets out priorities for protecting Monument objects (also confirmed by Secretarial Order 3308 and IM 2009-215). Proclamation 7397 should be included in the list of applicable mandates.

Section E.2 describes the compatibility analysis conducted. The initial statement of the need for this analysis is compelling and consistent with the BLM's obligation to protect the Sonoran Desert National Monument, stating:

[11] Hall, J.A., S. Weinstein, and C.L. McIntyre. 2005. The Impacts of Livestock Grazing in the Sonoran Desert: A Literature Review and Synthesis. The Nature Conservancy in Arizona, Tucson.
[12] *Id.* at 11.3.
[13] *Id*. at 10.25.

> As directed by the proclamation that established the SDNM, authorized grazing use and associated management practices within the SDNM can continue only to the extent that livestock grazing is determined to be compatible with the **paramount purpose** of protecting the biological, ecological, scientific, and historic and archaeological objects of the Monument.

Draft RMP/EIS, p. 1042 (emphasis added).

However, although the analysis purports to be looking at the compatibility of grazing with the "paramount purpose" of protecting Monument objects, the analysis conducted is actually a land health evaluation (LHE) that is used "to ascertain whether the Arizona Rangeland Health Standards (land health standards) are met." Draft RMP/EIS, p. 1042. In evaluating whether grazing is "compatible" with **protecting** Monument objects, BLM should look to the existing use of the term in both the Wild and Scenic Rivers Act (16 U.S.C. § 1274(d)(1)) and the National Wildlife Refuge Administration Act, 16 U.S.C. § 668ee.

The National Wildlife Refuge Administration Act requires management of refuges in accordance with the mission of the National Wildlife Refuge System:

> to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States. . .

16 U.S.C. § 668dd(3)(A). Further, "wildlife-dependent recreational use" of refuges are permissible only if the Secretary finds that such use is "compatible." 16 U.S.C. §§ 668dd(3)(B) - 668dd(3)(D). The Act defines a "compatible use" as one that "will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge." 16 U.S.C. § 668ee(1).

Similarly, the Wild and Scenic Rivers Act requires agencies to manage a designated river segment primarily to "protect and enhance" its outstanding river values. 16 U.S.C. § 1281(a). Courts have held that, because of this statutory mandate, the BLM violates the Wild and Scenic Rivers Act "without first finding that such grazing is compatible with the protection and enhancement" of the outstanding river values. *Oregon Natural Desert Association v. Singleton*, 47 F.Supp.2d 1182, 1991 (D.Or. 1998). *See also, Oregon Natural Desert Association v. Green*, 953 F.Supp. 1133 (D.Or. 1997). Accordingly, once grazing practices are found to negatively impact outstanding river values, then maintaining grazing is "incompatible" and, in order to comply with the mandates of the statute, the BLM must consider ending grazing. *Oregon Natural Desert Association v. Green*, 953 F.Supp. at 1144. Further, an alternative that "is plainly incompatible with protecting river values" cannot be considered a realistic or feasible alternative. *Oregon Natural Desert Association v. Singleton*, 47 F.Supp.2d at 1195.

The significant difference between the Arizona Rangeland Health Standards and the proper evaluation of compatibility with protecting Monument objects is highlighted by looking at Standards 1 and 3, identified as used in the compatibility analysis, which do not look at

protection, but only at maintaining rangeland health. *See*, Draft RMP/EIS, p. 1053. In conducting an evaluation of the compatibility of grazing with protecting monument objects in the Cascade-Siskiyou National Monument, BLM contrasted the findings using rangeland health standards and using a test of compatibility with protection. *See*, *Determination of Compatibility of Current Livestock Grazing Practices with Protecting the Objects of Biological Interest in the Cascade-Siskiyou National Monument*, Table 1, p. 5 (available on-line at: http://www.blm.gov/or/resources/recreation/csnm/csnm-grazing.php). An examination of the approach used in the Cascade-Siskiyou National Monument will demonstrate the contrast between rangeland health and a compatibility assessment to evaluate whether livestock grazing is compatible with the paramount purpose of protecting monument objects.

The rangeland health standards and land health evaluation that relies upon them to yield a compatibility determination are not consistent with the BLM's obligations to protect Monument objects or the purposes acknowledged in the Draft RMP and Appendix E.

Recommendations: Using the correct standard will affect the determination of compatibility, as well as the development and selection of alternatives. *See*, Draft RMP/EIS, p. 139 ("For the SDNM Decision Area, implementation level allocations… reflect the findings of the compatibility analysis. Since the "LHE and the Compatibility Analysis will not be final until the RMP's Record of Decision is approved" (*Id*), the BLM can correct these flaws and update the compatibility analysis in accordance with the standards discussed above, including current science regarding livestock grazing in the Sonoran Desert. In addition, BLM should specifically acknowledge Proclamation 7397 as a controlling legal mandate.

XII. RENEWABLE ENERGY SITING

We appreciate the BLM completing an analysis of resource sensitivity to renewable energy development and the identification of areas as Prohibited/High sensitivity/Moderate sensitivity/Low known sensitivity for development. "Zoning" for renewable energy development in such a manner is critical for protection of wildlands and wildlife habitat and facilitation of permitting and construction of responsible projects with limited conflicts, controversy and delay.

While limited information regarding the exact process by which the screening was completed is included in the Draft RMP/EIS or Appendix N, which is devoted to this issue, the list of screens used and the resulting areas identified under Alternative E appear reasonable overall.

It is not clear whether the BLM incorporated bighorn sheep habitat or movement corridors data into their analysis. If this has not been done, the BLM should do so for the Final EIS/RMP, and if it has, the BLM should indicate so in the Final EIS/RMP.

A GIS analysis of overlap between Arizona Wilderness Coalition's Citizens' Wilderness Inventory (CWI) units and the proposed renewable energy zoning under Alternative E produced the following results:

- Prohibited: 267,544 acres of overlap
- High sensitivity: 132,108 acres of overlap
- Moderate sensitivity: 3,198 acres of overlap
- Low sensitivity: 863 acres of overlap

Renewable energy development is not appropriate in CWI units, and the **BLM should also classify as Prohibited areas all CWI units.**

We also analyzed overlap of the Arizona Game and Fish Department (AGFD) Gila Bend-Sierra Estrella wildlife linkages and the proposed renewable energy zoning under Alternative E.[14] While most of the AGFD identified linkages on BLM land are properly classified as Prohibited for renewable energy, there are three areas totaling 843 acres identified as Low sensitivity. BLM should change the sensitivity level for these three areas to Prohibited.

Recommendations: The BLM should incorporate bighorn sheep habitat or movement corridors data into their analysis for the Final EIS/RMP; if this has already been done, the BLM should indicate so in the Final EIS/RMP. The BLM should also classify all CWI units as Prohibited areas. Finally, the BLM should classify the three areas within AGFD linkages described above as Prohibited.

XIII. AIR QUALITY

FLPMA requires that BLM manage the planning area according to federal and state air quality standards. *See* 43 C.F.R. § 2920.7(b)(3) (requiring that BLM "land use authorizations shall contain terms and conditions which shall . . . [r]equire compliance with *air . . . quality standards* established pursuant to applicable Federal or State law") (emphasis added); *see also* 43 U.S.C. § 1712(c)(8) (requiring BLM in land use plans—which would therefore require implementation in daily management—to "provide for compliance with applicable pollution control laws, including State and Federal air . . . pollution standards or implementation plans"). These air quality standards include both the national ambient air quality standards (NAAQS) and the prevention of significant deterioration (PSD) increment limits.

The Draft RMP does not adequately analyze the impacts to air quality that will result from the area and route designations, and activities planned and permitted in this document. Because the planning area has levels of ozone that are near the point of exceeding NAAQS, or that are exceeding NAAQS, BLM must disclose that it is prevented by FLPMA and the Clean Air Act from approving *any activities* that would further exacerbate or exceed these levels. The failures described above are contrary to both FLPMA and the Clean Air Act, which require that BLM observe air quality standards, and NEPA, which requires that BLM disclose the impacts of the activities it is analyzing. BLM must prepare a comprehensive emissions inventory, which includes fugitive dust emissions, and then model these figures in near-field, far-field, and

[14] Note that the AGFD linkages are distinct from the Wildlife Movement Corridors identified in the Draft RMP/EIS. AGFD identified two wildlife linkages between the Sonoran Desert National Monument (SDNM) and nearby mountain ranges – the SDNM-Gila Bend Mountains linkage and the SDNM-Sierra Estrella linkage. The 2008 Beier et al. report on these linkages is available at: http://corridordesign.org/dl/linkages/reports/GilaBendMtns-SonoranDesertNM-SierraEstrella_LinkageDesign.pdf

cumulative analyses. Without doing so, BLM cannot know what impact these activities will have and whether it is complying with federal and state air quality standards. BLM may not authorize any activities which will contribute ozone precursors (NO_X and VOCs) or $PM_{2.5}$ to ambient concentrations in the planning area (e.g. it may not permit any vehicular travel on designated routes) if these emissions will lead to exceedances of federal or state air quality standards.

As required by the Clean Air Act (CAA), the Secretary of Interior has an "affirmative responsibility" to protect the air quality related values of Class I airsheds. Clean Air Act, 42 U.S.C. § 7475(d)(2)(B). Thus, the BLM and Interior Department's decisions in the RMP must also comply with this CAA mandate. There are several areas in the proximity that are designated Class I airsheds, including nearby wilderness areas and Saguaro National Park. Decisions in the RMP, such as designating a route transportation network may have direct and cumulative impacts on the air quality and visibility of these areas. BLM must analyze the impacts to these areas from decisions in the RMP in the EIS. BLM must also protect the air quality and visibility of these areas from decisions in the RMP.

Recommendations: FLPMA and the Clean Air Act require BLM to conform with all applicable "air quality laws, statutes, regulations, standards, policies and implementation plans." Law and regulation require BLM to assess the impacts to PSD increments at the RMP level. BLM must not authorize any uses or activities in the RMP, such as the designation of routes, which would lead to exceeding federal and state air quality standards. BLM must also analyze impacts to Class I airsheds in the region and protect the air quality and visibility of these areas from decisions in the RMP.

XIV. VISUAL RESOURCE MANAGEMENT

It is BLM policy that visual resource management (VRM) classes are assigned to all public lands as part of the Record of Decision for RMPs. The objective of this policy is to "manage public lands in a manner which will protect the quality of the scenic (visual) values of these lands." BLM Manual MS-8400.02. Under the authority of FLPMA, the BLM must prepare and maintain on a continuing basis an inventory of visual values for each RMP effort. 43 U.S.C. § 1701; BLM Manual MS-8400.06. Specifically, IB No. 98-135 states, "It is the intent and policy of both the Department and the Bureau of Land Management that the visual resource values of public lands must be considered in **all land-use planning efforts**" (emphasis added). In addition, IM 2009-167 states, "All field offices (FO) are required to have current VRIs in place and to have VRM classes designated within its LUPs. Both the inventory and management class determinations are critical for baseline NEPA visual impact analysis and compliance evaluation with visual resource management objectives and for facilitating appropriate advancement of all surface disturbing land use activities, including renewable energy projects." Therefore, BLM must update the visual resources inventory for the planning area and reclassify lands where necessary during the RMP amendment process.

In addition, NEPA requires that measures be taken to "assure for all Americans . . . aesthetically pleasing surroundings." Once established, VRM objectives are as binding as any other resource objectives, and no action may be taken unless the VRM objectives can be met. *See* IBLA 98-144,

98-168, 98-207 (1998). The RMP must make clear that compliance with VRM classes is not discretionary.

BLM should ensure that scenic value is a resource that is conserved and must establish clear management direction describing areas inventoried and possessing high scenic importance with clearly defined objectives that limit surface disturbance within important viewsheds, including:

1. Lands managed to preserve their natural values, such as lands with wilderness characteristics, backcountry recreation areas and the Sonoran Desert National Monument, should be managed as Class I to "preserve the existing character of the landscape."

2. Lands within popular and easily accessible vantage points should be managed for visual resources, such as VRM Class II to "retain the existing character of the landscape," including clear provisions dealing with human and surface disturbance.

3. ACECs and other special management designations and prescriptions should be used to protect scenic landscapes and lookout points within the resource area with stipulations specifically addressing and managing human development impacts, including VRM Class I to "preserve the existing character of the landscape" or VRM Class II to "retain the existing character of the landscape" as appropriate.

Alternative E only designates wilderness areas as Class I and certain lands with wilderness characteristics and lands within the monument as Class II. This is woefully inadequate to address the sensitive and important scenic values of the planning area. Alternative D is much more consistent with current applicable laws and policies with regard to visual resource management. We strongly urge BLM to choose Alternative D with regard to visual resource management.

Finally, the 2005 Recreation Study for the Monument (Foti et al. 2005) made the following findings with regard to recreation and the monument's viewshed:

> During the recreation impact study, an interesting relationship seemed to emerge related to "extremely" and "heavily" impacted areas and the visibility of non-recreational impacts (such as power lines, railroad tracks, the highway, landfills, and power lines). The study found, preliminarily, that impacts seem to be more prevalent on sites where non-recreational impacts were more visible. While there may be little that the monument can do related to some of the non-recreational impacts, there may be site mitigation techniques, which can be applied to affected sites. The monument may also be able to use this finding in the future as a way to limit the number of intrusions into the monument's viewshed.

Thus, BLM can get the most bang for its buck visually within the monument by decreasing the visibility of non-recreational impacts, which will in turn lead to less impacts from recreation in the monument.

Recommendations: BLM should choose Alternative D as its proposed alternative for visual resource management. Alternative E does not address the special visual management concerns that should be taken into consideration with special designations such as ACECs and lands

within the Sonoran Desert National Monument. Under no circumstance should lands in the monument be designated Class III or IV as Alternative E proposes. The objective of VRM Class III is **"**to partially retain the existing character of the landscape," and to manage so that "the level of change to the characteristic landscape should be moderate." This is inconsistent with protecting the scenic values of the Monument and the resulting benefits for protection of Monument objects, including cultural resources and wildlife.

XV. SOUNDSCAPES

The Draft RMP does not properly analyze and manage for soundscapes and access to quiet use recreation opportunities within the planning area. As discussed above, FLPMA requires the BLM to manage the multiple uses and resources of the public lands, which include fish and wildlife, watersheds, scenic values, recreation opportunities, scientific and historic values, and other natural values, such as wilderness characteristics. FLPMA also provides for the agency to do so by excluding or limiting certain uses of these lands. BLM's regulations relating to management of off-road vehicles similarly acknowledge the need to address the manner in which motorized recreation can prohibit other experiences. These regulations require that both areas and routes for off-road vehicles be located to "minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors." 43 C.F.R. § 8342.1 (emphasis added). Providing a "quiet" recreation experience, as also discussed in reference to opportunities for primitive, unconfined recreation and for solitude provided by lands with wilderness characteristics, also requires thoughtful management to provide for a quiet soundscape. Much research exists on the importance of natural sound to public land visitors.

BLM has a duty to analyze the impact from uses to the natural soundscape under NEPA. *See Izaak Walton v. Kimbell*, 516 F.Supp.2d 982, 985, 995-96 (D. Minn. 2007) (EA prepared by USDA Forest Service for plan to construct snowmobile trail adjacent to Boundary Waters Canoe Area Wilderness failed to properly analyze noise impacts from snowmobile use, as required by NEPA; EA provided no quantitative evidence of analysis of decibel levels to be projected by snowmobile use of the trail into adjoining wilderness).

In order to effectively preserve the natural soundscape in wilderness and other quiet recreation areas, BLM must quantitatively measure (1) the decibel (dB) levels of the natural soundscape; and (2) ORV dB levels on the natural soundscape. Quantification of ORV traffic volume, duration, and frequency are thus necessary components of soundscape analysis.

There are many tools available to BLM to adequately measure noise impacts and set prescriptions to prevent negative impacts. The Wilderness Society recently created a GIS model based on the System for the Prediction of Acoustic Detectability (SPreAD), a workbook issued by the Forest Service and Environmental Protection Agency for land managers to "evaluate potential … acoustic impacts when planning the multiple uses of an area." The Wilderness Society adapted the SPreAD model to a GIS environment so that potential noise impacts could be integrated with other variables being considered in the planning process. We can provide the most up-to-date version of this software at your request. The SPreAD-GIS model can be implemented in your existing ArcGIS software at no additional cost. The SPreAD-GIS model

was developed for the Forest Service, but its applicability extends seamlessly to BLM lands, as the inputs include vegetation and topography.

We encourage BLM to use the SPreAD-GIS model to determine what sounds will impact visitors in each segment of the planning area, and what steps must be taken to mitigate these impacts. It is important to note that the original SPreAD operates under the premise that in wilderness and other primitive recreation areas, **no noise should be audible above the natural soundscape.**

Recommendations: We recommend BLM conduct a soundscape analysis to guide formulation of intended user experiences, for example by analyzing how topography and vegetation might reflect or propagate vehicular sound and how that might affect quiet users, neighboring homeowners and wildlife habitat effectiveness. We ask that the alternatives specifically compare impacts of, and the potential for the increase of ORV noise on natural sound and other resources, consistent with the BLM's regulations.

XVI. CLIMATE CHANGE

A. The legal framework for addressing climate change in land use plans

BLM has a legal duty to address the impacts of climate change both from land management actions and to the resource area in the plan revision. Although not identified as a major issue during scoping in 2002, newer law, policies and directives around the evaluation, mitigation and adaptation of climate change have been developed since the initiation of this planning process. BLM must give meaningful consideration to this issue as it applies to the planning area.

There is a global scientific consensus that human-induced climate change is currently altering the landscape and ecological functions at an unprecedented rate. According to the U.S. Climate Change Science Program, the Southwest landscape could be greatly transformed due to drought, wildfire, invasive species, and rising temperatures.

The planning area will undoubtedly experience real effects of climate change during the 20 year period that the RMP is in effect. Many prescriptions in the RMP may contribute to and exacerbate the impacts of human-induced global climate change. In addition to a genuine analysis of impacts, it is imperative that BLM craft strategies for addressing the impacts of climate change both in terms of mitigating management decisions' contributions to climate change and adapting to inevitable impacts of climate change.

1. BLM must take a hard look at climate change impacts from management decisions in the environmental impact statement for the resource management plan

Impacts to the ecosystem from climate change include shrinking water resources; extreme flooding events; invasion of more combustable non-native plant species; soil erosion; loss of wildlife habitat; and larger, hotter wildfires. Many of these impacts have been catalogued in recent studies by federal agencies showing the impacts of climate change specifically in the United States such as the recent report entitled Global Climate Change Impacts in the United States, *available at* http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts.

Secretarial Order (S.O.) 3289 unequivocally mandates all agencies within the Department of Interior to "analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under the Department's purview." S.O. 3289, *incorporating* S.O. 3226 (emphasis added). This planning process falls squarely under this guidance and BLM must assess impacts from the proposed actions that may directly, indirectly, or cumulatively result in exacerbating climate change within this document.

BLM must fully analyze the cumulative and incremental impacts of the proposed decisions in the RMP. *Center for Biological Diversity v. National Highway Traffic Safety Administration*, 538 F.3d 1172, 1217 (9th Cir. 2008). In *CBD v. NHTSA*, the NHTSA failed to provide analysis for the impact of greenhouse gas emissions on climate change and was rebuked by the U.S. Court of Appeals for the Ninth Circuit, which observed that "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct." 538 F.3d at 1217. For example, off-road vehicle designations, oil and gas management stipulations, and renewable energy development may significantly increase or reduce greenhouse gas emissions contributing to climate change and must be analyzed under NEPA.

Further, NEPA regulations require that NEPA documents address not only the direct effects of federal proposals, but also "reasonably foreseeable" indirect effects. These are defined as:

> Indirect effects, which are caused by the action and are later in time or farther removed in distance, *but are still reasonably foreseeable*. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." 40 C.F.R. § 1508.8(b) (emphasis added).

BLM is required to take a hard look at direct, indirect, and cumulative impacts to and from climate change in the planning area in the RMP. The following sections provide recommendations for quantification of greenhouse gas emissions and assessment of baseline conditions in the planning area.

(a) *Quantification of Greenhouse Gas Emissions*

BLM must analyze greenhouse gas (GHG) emissions in the planning area as part of the RMP revision. In determining what levels of GHG emissions to measure as "significant" under NEPA, the agency should look at the relative percentage of GHG emissions reductions that an alternative could produce compared to the baseline carbon performance for the planning area. This is the approach taken in the President's Executive Order 13514. Setting an actual numerical threshold of significance is ill-advised as it is against the current policy trends of CEQ and other agencies and because it ignores the cumulative nature of climate change.

As a general approach, BLM should first assess and, wherever possible, quantify or estimate GHG emissions by type and source by analyzing the direct operational impacts of their proposed actions. Assessment of direct emissions of GHG from on-site combustion sources is relatively straightforward. For many projects, energy consumption will be the major source of GHGs. The indirect effects of a project may be more far-reaching and will require careful analysis. Within this category, agencies should evaluate, *inter alia*, GHG and GHG-precursor emissions associated with construction, electricity use, fossil fuel use, downstream combustion of fossil fuels extracted or refined by the project, water consumption, water pollution, waste disposal, transportation, the manufacture of building materials, and land conversion.

Because failure to conserve carbon sinks results in direct and quantifiable GHG emissions as well as indirect effects from reduction in carbon sequestration, the GHG effects of destruction of carbon sinks should be analyzed as part of the EIS. The GHG effects of destruction of carbon sinks should be analyzed both in terms of carbon already stored in the landscape and soil itself and in terms of the landscape's ongoing carbon-capturing properties. Such an analysis requires that an initial inventory of carbon storage potential be conducted for each landscape. The environmental review should assess and where possible quantify all the various component carbon pools – live trees, other vegetation, dead trees or vegetation (coarse, woody debris and snags), logs, litter, duff, and mineral soil – and the fluxes of carbon to and from these pools, due to natural processes like decay and fire, and those associated with management, harvest and/or manufacture of extracted resources, including the burning of fossil fuels needed to remove, transport, and process those materials. In conducting this assessment, fluxes associated with fire management and the restoration of the resilient native ecology should be accounted for separately. Net fluxes from terrestrial pools to the atmosphere may occur from management activities, such as prescribed and natural fire management, but may be considered beneficial, if they enhance the long-term carbon storage ability of the ecosystem and enhance ecosystem integrity.

While quantifying the GHG emissions from decisions in the RMP is important, BLM is also required to include qualitative analysis of impacts. A suggested approach for this type of analysis can be found in the "Risk Assessment" section in the attachment on addressing climate change in land use planning. See Attachment 6.

(b) *Addressing Climate Change Conditions*

BLM baseline data on climate change must be sufficient to permit analysis of impacts under NEPA. Importantly, 40 C.F.R. § 1502.15 requires agencies to "describe the environment of the areas to be affected or created by the alternatives under consideration." Establishment of baseline conditions is a requirement of NEPA. In *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988), the Ninth Circuit states that "without establishing . . . baseline conditions . . . there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." The court further held that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process."

There is a growing body of scientific information already available on climate change baseline conditions, much of it generated by or available through federal agencies. It is our understanding

that the Rapid Ecoregional Assessment for the Sonoran Desert will be released early next year. **BLM should make a commitment to incorporate the findings from the Sonoran Desert Rapid Ecoregional Assessment into the RMP/EIS and make adjustments to management as necessary.**

Where there is scientific uncertainty, NEPA imposes three mandatory obligations on BLM: (1) a duty to disclose the scientific uncertainty; (2) a duty to complete independent research and gather information if no adequate information exists unless the costs are exorbitant or the means of obtaining the information are not known; and (3) a duty to evaluate the potential, reasonably foreseeable impacts in the absence of relevant information, using a four-step process. Unless the costs are exorbitant or the means of obtaining the information are not known, the agency must gather the information in studies or research. 40 C.F.R. § 1502.22. Courts have upheld these requirements, stating that the detailed environmental analysis must "utiliz[e] public comment and the best available scientific information." *Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1171-72 (10th Cir. 1999) (citing *Robertson v. Methow Valley Citizens' Council*, 490 U.S. at 350); *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1521-22 (10th Cir. 1992).

As the Supreme Court has explained, while "policymaking in a complex society must account for uncertainty," it is not "sufficient for an agency to merely recite the terms 'substantial uncertainty' as a justification for its actions." *Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29, 52* (1983). Instead, in this context, as in all other aspects of agency decision-making, "[w]hen the facts are uncertain," an agency decision-maker must, in making a decision, "identify the considerations he found persuasive." *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 520 (D.C. Cir. 1983), *quoting Ind. Union Dept., AFL-CIO v. Hodgson*, 499 F.2d 467, 476 (D.C. Cir. 1974).

BLM's duty to evaluating reasonably foreseeable significant adverse impacts includes "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22(b). Such impacts are especially significant in the face of climate change.

BLM must provide the public with an explanation of both the data used in analyzing the potential effects of management alternatives and the methods used to conduct the analysis, as well as an opportunity to provide comments and propose corrections or improvements.

B. BLM must craft long-term management prescriptions without permanent impairment and unnecessary or undue degradation to the resources in the face of climate change

FLPMA gives BLM the authority to manage and plan for emerging issues and changing conditions that global climate change will affect in the planning area. FLPMA mandates that when BLM revises land use plans, it must "use and observe the principles of multiple use and sustained yield set forth in this and other applicable law" 43 U.S.C. § 1712(c).

> The term "multiple use" means the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. . . a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources. . . and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output. 43 U.S.C. § 1702(c) (emphasis added).

Additional pertinent requirements of FLPMA that specifically apply to land use planning include using "a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences; consider[ing] relative scarcity of the values involved; and weigh[ing] long-term benefits to the public against short-term benefits. *Id*. FLPMA also provides that BLM must "take any action necessary to prevent unnecessary or undue degradation to managed resources." 43 U.S.C. § 1732(b). Collectively, the provisions of FLPMA highlighted above necessitate on-the-ground implementation of climate change policies.

With particular regard to the Sonoran Desert National Monument, wilderness areas, national historic trails, and other units within the National Landscape Conservation System, Secretarial Order 3308 states that these lands "shall be managed as an integral part of the larger landscape, in collaboration with the neighboring land owners and surrounding communities, to maintain biodiversity, and promote ecological connectivity and resilience in the face of climate change." (emphasis added).

The impacts of climate change should be a major factor in every alternative that is created since it is an undeniable reality that will drive all land use planning decisions. As provided in the Oregon/Washington BLM State Office guidance document IM OR-2010-012, "[r]esource management plans and other broad programmatic analyses are actions that would typically have a long enough duration that climate change could potentially alter the choice among alternatives." Thus, it is clear that BLM must consider planning for climate change within the context of the broader landscape during the development of the RMP for the planning area.

C. BLM must take measures to mitigate the impacts from climate change under NEPA

In addition to the agency's duty under NEPA to take a hard look at the impacts of climate change to and from decisions in the resource management plan, BLM must also include a range of alternatives that includes a strategy for mitigating these impacts. CEQ regulations instruct agencies to consider alternatives to their proposed action that will have less of an environmental impact, specifically stating that "[f]ederal agencies shall to the fullest extent possible: . . . Use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will

avoid or minimize adverse effects of these actions upon the quality of the human environment." 40 C.F.R. § 1500.2(e) (emphasis added); *see also*, 40 C.F.R. §§ 1502.14, 1502.16.

Further, general statements that BLM will conduct monitoring are also not an appropriate form of mitigation. Simply monitoring for expected damage does not actually reduce or alleviate any impacts. Instead, a vigilant science-based monitoring system should be set out in the RMP in order to address unforeseeable shifts to the ecosystem. A detailed monitoring approach is also required under the BLM's planning regulations:

> The proposed plan shall establish intervals and standards, as appropriate, for monitoring and evaluation of the plan. Such intervals and standards shall be based on the sensitivity of the resource to the decisions involved and shall provide for evaluation to determine whether mitigation measures are satisfactory, whether there has been significant change in the related plans of other Federal agencies, State or local governments, or Indian tribes, or whether there is new data of significance to the plan. The Field Manager shall be responsible for monitoring and evaluating the plan in accordance with the established intervals and standards and at other times as appropriate to determine whether there is sufficient cause to warrant amendment or revision of the plan. 43 C.F.R. § 1610.4-9 (emphasis added).

Such vigilant monitoring is absolutely necessary in order to create an effective adaptive management framework in the face of climate change.

The following is our recommended approach to developing management prescriptions to allow the land and resources to adapt to the impacts of climate change while meeting the agency's legal obligations:

Recommendations: The revision to the land use plan for this area provides BLM with an excellent opportunity to analyze the impacts from climate change to the planning area over the next two decades, as well as the contribution to climate change from management decisions made in the plan. This analysis should in turn lead to the development of thoughtful management prescriptions and alternatives in the land use plan that will address how BLM will mitigate these causes and adapt its management over the coming years to prevent permanent impairment and unnecessary or undue degradation to the resources in the face of climate change. The Lower Sonoran Field Office and Sonoran Desert National Monument will especially be informative in broader climate change research efforts and recommendations due to the nature of the landscape and ownership (i.e. mostly federally-owned lands of different gradients and levels of protection).

Like other land management agencies, BLM has been struggling to define how it can meet its legal obligations to analyze the baseline conditions and environmental impacts associated with climate change in light of scientific uncertainty and complexity as well how to set management prescriptions that mitigate and adapt to additional or exacerbated stressors caused by a changing climate.

In its Fourth Assessment Report, the Intergovernmental Panel on Climate Change reviewed a number of impacts on biodiversity associated with anticipated changes in climate world-wide

and concluded, "Overall, climate change has been estimated to be a major driver of biodiversity loss in cool conifer forests, savannas, mediterranean-climate systems, tropical forests, in the Arctic tundra, and in coral reefs… In other ecosystems, land-use change may be a stronger driver of biodiversity loss at least in the near term…" but "beyond 2050 climate change is very likely to be the major driver for biodiversity loss globally" (Fischlin et al. 2007, p.241). The IPCC notes further that, "Although links between biodiversity intactness and ecosystem services remain quantitatively uncertain, there is high confidence that the relationship is qualitatively positive" (Parry et al. 2007). Thus, the IPCC has concluded that through its influence on biodiversity, climate change is likely to have direct negative consequences on the provision of ecosystem services. In response, they prescribe "an iterative risk management process that includes both mitigation and adaptation, taking into account actual and avoided climate change damages, co-benefits, sustainability, equity and attitudes." (IPCC 2007) (emphasis added).

Under the pressures of global change, it must be acknowledged that many objects of conservation are at risk wherever they are found, and the traditional natural resource management paradigm of modifying ecosystems to increase yield must change to a new paradigm of managing wildland ecosystems to minimize loss – specifically loss of the ecosystem composition, structure, and function that yields the benefits we seek from wildlands. **Natural resource management must change from a paradigm of maximum sustained yield to a paradigm of risk management.**

Although there is no widely-accepted method of assessing and managing risk, we recommend breaking risk down into its component parts—vulnerability, exposure, and uncertainty—as a useful way to think about risk to biodiversity and productive potential. **In the attached recommended approach to addressing climate change in land use planning, we recommend an approach for assessing risk in the planning area as well as an approach for management of that risk for BLM to comply with its legal obligations under NEPA and FLPMA as set out above.**

XVII. SOCIOECONOMICS

A. Non-Market Values

The Draft RMP/EIS does not account for the non-market values associated with undeveloped wild lands. Non-market values have been measured and quantified for decades. There is a well-established body of economic research on the measurement of non-market values, and the physical changes (decreases in the source of these values) brought about by oil and gas development and motorized recreation are very easy to measure quantitatively.

One of the most important purposes of public lands is the provision of public goods. Non-market goods often fall into the category of public goods. These are things like opportunities for solitude, outdoor recreation, clean air, clean water, the preservation of wilderness and other undeveloped areas that would be underprovided if left entirely to market forces. The BLM has an inherent responsibility to see that these public goods are provided and in quantities that meet the demand, not just of local residents, but of every U.S. citizen.

This analysis is especially important when considering the protection of lands with wilderness characteristics since these lands produce benefits and values that are seldom captured in the existing market structure. The literature on the benefits of wilderness is well established and should be used by the BLM to estimate the potential value of the lands with wilderness characteristics in the Monument. Krutilla's (1967) seminal paper on the valuation of wilderness led the way for countless others who have done research all providing compelling evidence that these lands are worth much more in their protected state. Morton (1999), Bowker et al. (2005) Krieger (2001) and Loomis and Richardson (2000) provide an overview of the market and non-market, use and non-use values of wilderness and wildlands. See Walsh et al. (1984), Bishop and Welsh (1992), Gowdy (1997), Cordell et al. (1998), Loomis and Richardson (2001) and Payne et al. (1992) for several more examples.

An assessment of the non-market benefits of the irreplaceable cultural and paleontological resources of the Monument is absolutely critical. Damage from motorized and mechanized recreation, and the potential that such access has to increase vandalism coupled with the potential damage from resource extraction makes this analysis even more important.

Peer reviewed methods for quantifying both the non-market and market costs of changing environmental quality have been developed by economists and are readily applicable to the present case. For a catalog of these methods see Freeman (2003). For a complete socioeconomic analysis, BLM should adapt these methods to conditions in the Monument to obtain a complete estimate of the economic consequences of the proposed Alternatives.

***Recommendations*:** BLM should measure and account for changes in non-market values associated with the level of motorized recreation and other uses and development proposed in this RMP. To do otherwise omits a very important socioeconomic impact that is the direct result of management actions. The BLM must assess the non-market economic impacts to the American public. This analysis must include the passive use values of undeveloped lands such as the lands with wilderness characteristics and the passive use values of irreplaceable cultural resources.

B. Economic Benefits of Natural Amenities

The Draft RMP does not to fully address the impacts that the management of the planning area will have on the local economy. The economic impact that undeveloped lands have on local economies is well documented and has grown in importance as the U.S. moves from a primary manufacturing and extractive economy to one more focused on service sector industries. This shift means that many businesses are free to locate wherever they choose. The "raw materials" upon which these businesses rely are people, and study after study has shown that natural amenities attract a high-quality, educated, talented workforce – the lifeblood of these businesses. More and more evidence has accrued indicating that the West is not a resource-dependent region. Public lands, especially areas such as the Sonoran Desert National Monument which have been recognized for their unique natural and cultural attributes, are increasingly important for their non-commodity resources – scenery, wildlife habitat, wilderness, recreation opportunities, clean water and air, and irreplaceable cultural sites.

A vast and growing body of research indicates that the economic prosperity of rural Western communities depends more and more on these amenities and less and less on the extraction of natural resource commodities. See Whitelaw and Niemi 1989, Rudzitis and Johansen 1989, Johnson and Rasker 1993 and 1995, Freudenburg and Gramling 1994, Snepenger et al. 1995, Power 1995 and 1996, Bennett and McBeth 1998, Duffy-Deno 1998, McGranahan 1999, Nelson 1999, Rudzitis 1999, Morton 2000, Lorah 2000, Deller et al. 2001, Johnson 2001, Shumway and Otterstrom 2001, Lorah and Southwick 2003, Rasker et al. 2004, Holmes and Hecox 2004 and Reeder and Brown 2005, for some examples.

New residents in the West often bring new businesses, and more and more of these are not tied to resource extraction. Some are dependent directly on the recreation opportunities on the surrounding public lands. Entrepreneurs are also attracted to areas with high levels of natural amenities. The Federal Reserve Bank of Kansas City has found that the level of entrepreneurship in rural communities is correlated with overall economic growth and prosperity (Low 2004). Retirees and other who earn non-labor income are also important to rural western communities. This income is important for the counties impacted by Draft RMP. Retirees are attracted by natural amenities that are available on undeveloped public lands.

Growth in the service sector is tied to the natural and other amenities in the area. The Sonoran Desert National Monument, along with other public lands in the region enhance the area's attractiveness for both skilled workers and employers. Protected public lands provide indirect support for local and regional economies, a fact that is increasingly being recognized by communities throughout the West. These lands provide a scenic backdrop, recreation opportunities and a desirable rural lifestyle, and many other tangible and intangible amenities that attract new residents, business and income to the West.

As noted above, a vast and growing body of research indicates that the environmental amenities provided by public lands are an important economic driver in the rural West. In a letter to the President and the Governors of all the Western states, 100 economists from universities and other organizations throughout the United States pointed out that, "The West's natural environment is, arguably, its greatest long-run economic strength" (Whitelaw et al. 2003). Several studies of specific communities have also found that protected public lands contribute to economic prosperity. In a report examining the economic health of Doña Ana County, New Mexico, the Sonoran Institute (2006) found that the county is set to prosper. The area possesses an abundance of natural amenities, beautiful scenery, and many of the other natural amenities and attributes correlated with economic growth in the rural West. Barrens et al. (2006) also focused their research in neighboring New Mexico, estimating the total economic benefits of protecting the state's inventoried roadless areas. They estimate that these areas provide between 563 and 880 jobs, generate from 13.7 to 21.5 million dollars of personal income and, most importantly, induce economic growth rates that are faster for counties containing roadless areas than for those without.

Local communities with nearby protected wildlands reap measurable benefits in terms of employment and personal income (Rasker et al. 2004). "Telework" using electronic communication has made it possible for more and more people in the West, and all over the country, to choose where they live and work. Many businesses are able to conduct national or

international commerce from any location they choose. Other entrepreneurs simply choose to live in a particular place and build businesses in response to local needs. Retirees are also not tied to a specific location by employment. All of these people often seek an attractive place to live. Research supports the assertion that protected public lands contribute to rural economic health (Rasker et al. 2004, Rudzitis and Johnson 2000, Rudzitis and Johansen 1989). As development increases near the Monument (a prediction made in the Draft RMP), this landscape will become even more integral to the community (as its backdrop or setting), contributing to and even creating the amenities on which the communities' economies depend. See Haefele et al. (2007) for a detailed description of the amenity economy and the ways in which local economies benefit from protected public lands.

The Center for the Study of Rural America, at the Federal Reserve Bank of Kansas City (the Rural Center) has developed a set of Regional Asset Indicators that are linked to the potential for economic growth in rural counties (Weiler 2004). The Rural Center describes the regional asset indicators as providing "…new, forward-looking metrics that regions can use to better understand their economic assets and to help inform private, public, and nonprofit regional development strategies." [15] These Regional Asset Indicators often corroborate and extend the findings of Rasker et al (2004).

An area's amenities often act as a key driver of economic prosperity. The Rural Center has developed an index to measure the level of human amenities for each county, which includes a measure of natural amenities (developed by the U.S. Department of Agriculture), access to healthcare, innovation (which is also measured separately as an additional Regional Asset Indicator below), recreation areas and restaurants. These are then standardized into one index for each county (Center for the Study of Rural America 2006a).

One of the facets that the Rural Center includes in its Human Amenities Index is the Natural Amenities score calculated by the U.S. Department of Agriculture. It is instructive to pull this score out by itself. The index is based on climate factors (warm winters and mild summers), proximity to water bodies and varied topography.

Other Regional Asset Indicators reflect the quality of a region's workforce. Because areas which have abundant amenities are more able to attract and retain a high quality workforce, the Human Amenity Index is very important for the region as it may well be the key to enhancing and maintaining the other important workforce and demographic indicators discussed below. Human amenities have been found to be positively correlated with both income and employment growth (Center for the Study of Rural America 2006a).

Workforce indicators include the entrepreneurship, the general availability of skilled workers and the proportion of a region's workforce in creative occupations. A creative work force increases a region's human capital and its level of innovation and entrepreneurship - this index measures the level of specialized, highly creative occupations that are unique to an area, making a distinction

[15] Federal Reserve Bank of Kansas City, Regional Asset Indicators. The Regional Asset Indicators for every U.S. County can be downloaded here, along with documentation on the development of the Indicators and additional research showing their importance to rural economies.
http://www.kansascityfed.org/home/subwebnav.cfm?level=3&theID=9602&SubWeb=12

between these unique concentrations and creative jobs that can be found in almost any location. The Center for the Study of Rural America (2006b) found that a creative workforce is positively correlated with growth in employment.

Business owners create jobs and wealth in a local economy and stimulate growth as the income and employment they generate filters through the economy. Entrepreneurship and long-term economic growth have been found to be correlated (Low 2004). Entrepreneurs can have both small and large impacts in local communities. Some small businesses may not produce large employment or income benefits; however, they enhance the local quality of life and the level of human amenities (for example local restaurants may not produce large numbers of jobs, but do contribute to the area's amenity index). Others bring both direct and indirect employment and income.

Thompson et al. (2006) studied rural economies and found that areas with higher levels of entrepreneurship experienced higher employment growth. Low et al. (2005) analyzed the characteristics of rural economies to assess their potential for entrepreneurship and economic growth. They found that lifestyle amenities, local workforce skills, access to capital and information and innovative activity were the strongest indicators of an area's ability to attract and maintain entrepreneurial activity.

In addition to attracting a quality workforce, amenities also attract retirees and others with non-traditional sources of income (Nelson 1999). These new residents in turn spur economic development (Deller 1995). Residents who rely on non-labor income become both a pool of customers and clients for new business and a potential source of investment capital. Research into the motivation that drives entrepreneurs and businesses to choose particular locations consistently finds that amenities and quality of life top the list (Rasker and Hansen 2000, Snepenger et al. 1995, Rasker and Glick 1994, Whitelaw and Niemi 1989). Protective management of the Monument presents an opportunity to attract more small businesses into the area to further enhance this sector. Both Dolores and Montezuma Counties are comparable in their levels of creative workers and both counties have a surplus of skilled workers. These counties also have a high level of entrepreneurship. Protective management of the Canyons of the Ancients National Monument will enhance the attractiveness of the area for creative and skilled workers and for entrepreneurs further enhancing this facet of the area's economy.

***Recommendations*:** The BLM must collect and analyze actual data on the economic impacts of the alternatives. Some suggested analyses and sources of data can be found in *"Socio-Economic Framework for Public Land Management Planning: Indicators for the West's Economy"* (Attachment 7). BLM must make a thorough examination of the full socioeconomic impacts likely to occur if the management alternatives are implemented. These analyses must take into account the impacts that BLM land management actions will have on the surrounding communities, including the added cost of providing services and infrastructure, the long-term costs of the likely environmental damage, and the impacts on other sectors of the economy. The BLM must examine the role that protected public lands (including lands with wilderness characteristics) play in the local economy.

XVIII. CONCLUSION

It has been an honor to be so intimately involved in the management planning process for Lower Sonoran Field Office and Sonoran Desert National Monument over the years. We are pleased that the Draft Resource Management Plan has at last been released, and we look forward to the completion and implementation of the Final RMP.

Please feel free to contact us if you would like to discuss and of our comments or recommendations in more detail.

Sincerely,

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XIV. ATTACHMENTS

Attachment 1: Letter from Representative Grijalva to Secretary Salazar (dated Oct. 28, 2011).

Attachment 2: Boundary and Preliminary Route Analysis: Sentinel Plain. Arizona Wilderness Coalition (2011) and Sentinel Plains Complex Wilderness Citizens' Proposal (2011).

Attachment 3: Arizona Wilderness Coalition Proposal for the Butterfield Stage Memorial Wilderness Area (2004).

Attachment 4: Excerpts from the management framework for proposed SRMAs and ERMAs from the Colorado River Valley Draft RMP.

Attachment 5: BLM Price Field Office RMP, Appendix R-10.

Attachment 6: Recommended Risk Assessment and Management Approach for Addressing Climate Change in BLM Land Use Planning.

Attachment 7: Socio-Economic Framework for Public Land Management Planning: Indicators for the West's Economy.

Appendix A: Habitat Fragmentation

1. *Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard BLM Lands*, The Wilderness Society, 2006.
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ATTACHMENT 1

RAÚL M. GRIJALVA
7TH DISTRICT OF ARIZONA

COMMITTEE ON NATURAL RESOURCES
Subcommittee on Water and Power
Subcommittee on Parks, Forests and Public Lands – *Ranking Member*

COMMITTEE ON EDUCATION AND THE WORKFORCE
Subcommittee on Early Childhood, Elementary and Secondary Education
Subcommittee on Higher Education and Workforce Training

CONGRESSIONAL PROGRESSIVE CAUCUS,
Co-Chair

Congress of the United States
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October 28, 2011

The Honorable Ken Salazar
Secretary
Department of the Interior
18th and C Street NW
Washington D.C. 20240

Dear Mr. Secretary,

I would like to commend your efforts to craft a wilderness agenda that can be enacted in the 112th Congress. At your request, the Arizona Bureau of Land Management recently reached out to a number of elected and tribal stakeholders regarding lands that enjoy broad support for wilderness designation. In Arizona's 7th Congressional District, which I proudly represent, Pima County submitted two letters of recommendation for areas that deserve to be protected in perpetuity under the Wilderness Act. I would like to emphasize the importance of Pima County's support, and convey my own strong recommendation that these areas are included in your report to Congress this fall.

Several areas within the Ironwood Forest National Monument are well suited for wilderness designation. Such a designation for Ragged Top, the iconic feature of the Monument, has been locally supported dating back to 1987, when the Pima County Supervisors unanimously voted to support designation there. In August of this year, Pima County reaffirmed support for wilderness around Ragged Top and other areas including the Silverbell, West Silverbell, and Sawtooth Mountain units. Despite longstanding support and a high degree of wilderness suitability at these sites, the Monument still does not host a single unit within the National Wilderness Preservation System. I hope this will change, and I look forward to working in a cooperative manner with your department, local officials and other stakeholders in formally recognizing wilderness lands in Ironwood Forest National Monument.

I would also like to call your attention to the Batamote Mountains in my district, which lie north of the Town of Ajo. Pima County has supported wilderness designation for this spectacular Sonoran desert range, both in 1987 and in an August 2011 letter. The Arizona Wilderness Coalition submitted wilderness recommendations for this area in 2004, and the area is included in the BLM's preferred alternative for wilderness characteristics in the Draft Resource Management Plan for the Lower Sonoran Field Office. With outstanding opportunities for solitude and a primeval character rare for our region, these mountains would make a fine addition to the wilderness system.

The community of southern Arizona has continually supported a strong emphasis on conservation management of our public lands. Wilderness is an important component of this management approach, protecting core areas in ways that benefit humans and wildlife in myriad ways. Arizona is blessed with a rich legacy of bipartisan support for wilderness, and I am hopeful that your pending report will further contribute to our shared efforts to conserve the crown jewels of our state.

Thank you for considering these important areas as you prepare your report for Congress. I look forward to working with the administration, local stakeholders, and other interests in protecting these lands across southern Arizona.

With respect and very sincerely,

Raúl M. Grijalva

Rep. Raúl M. Grijalva
Ranking Member, House Subcommittee on National Parks, Forests and Public Lands

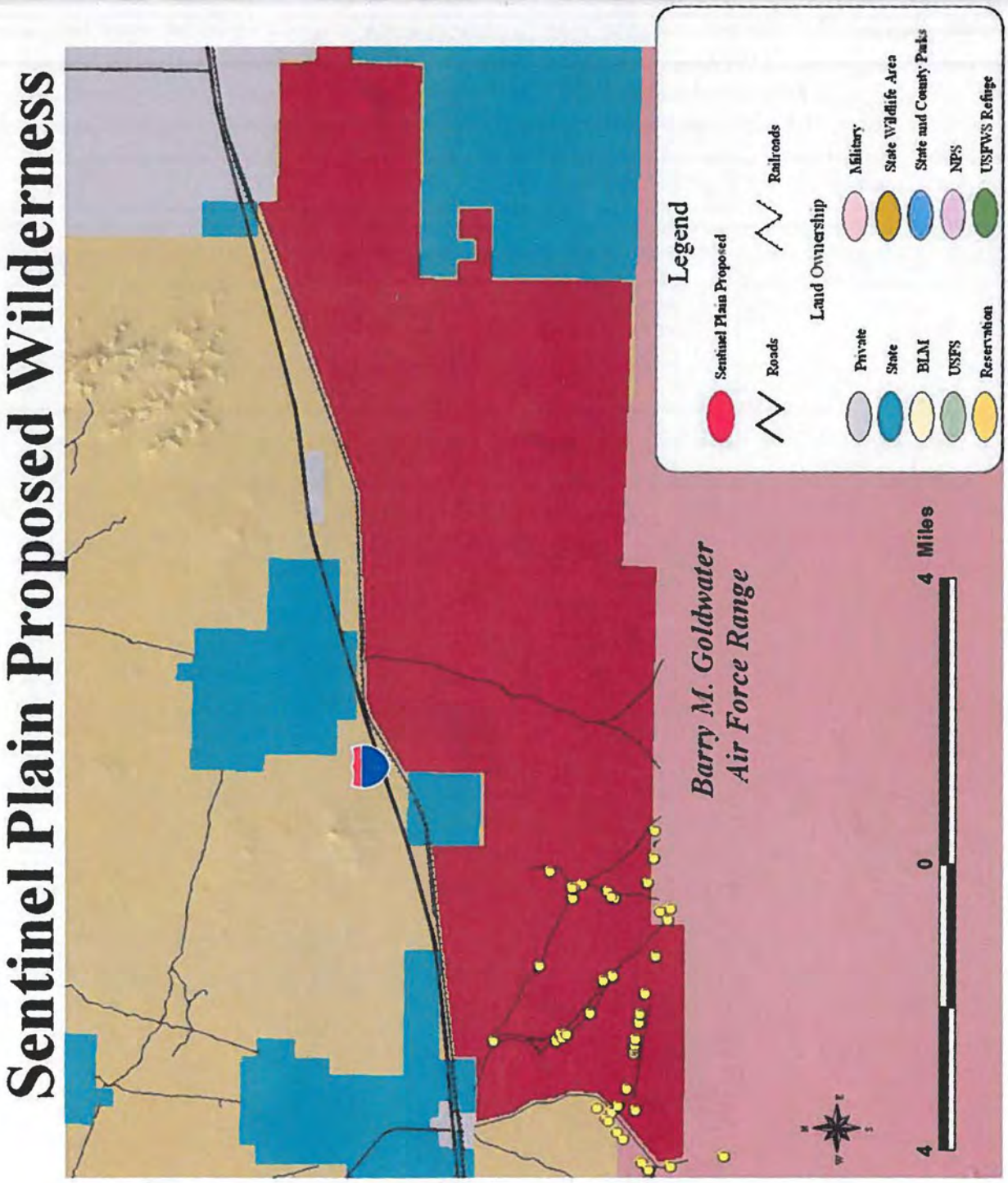
ATTACHMENT 2

Boundary and Preliminary Route Analysis: Sentinel Plain

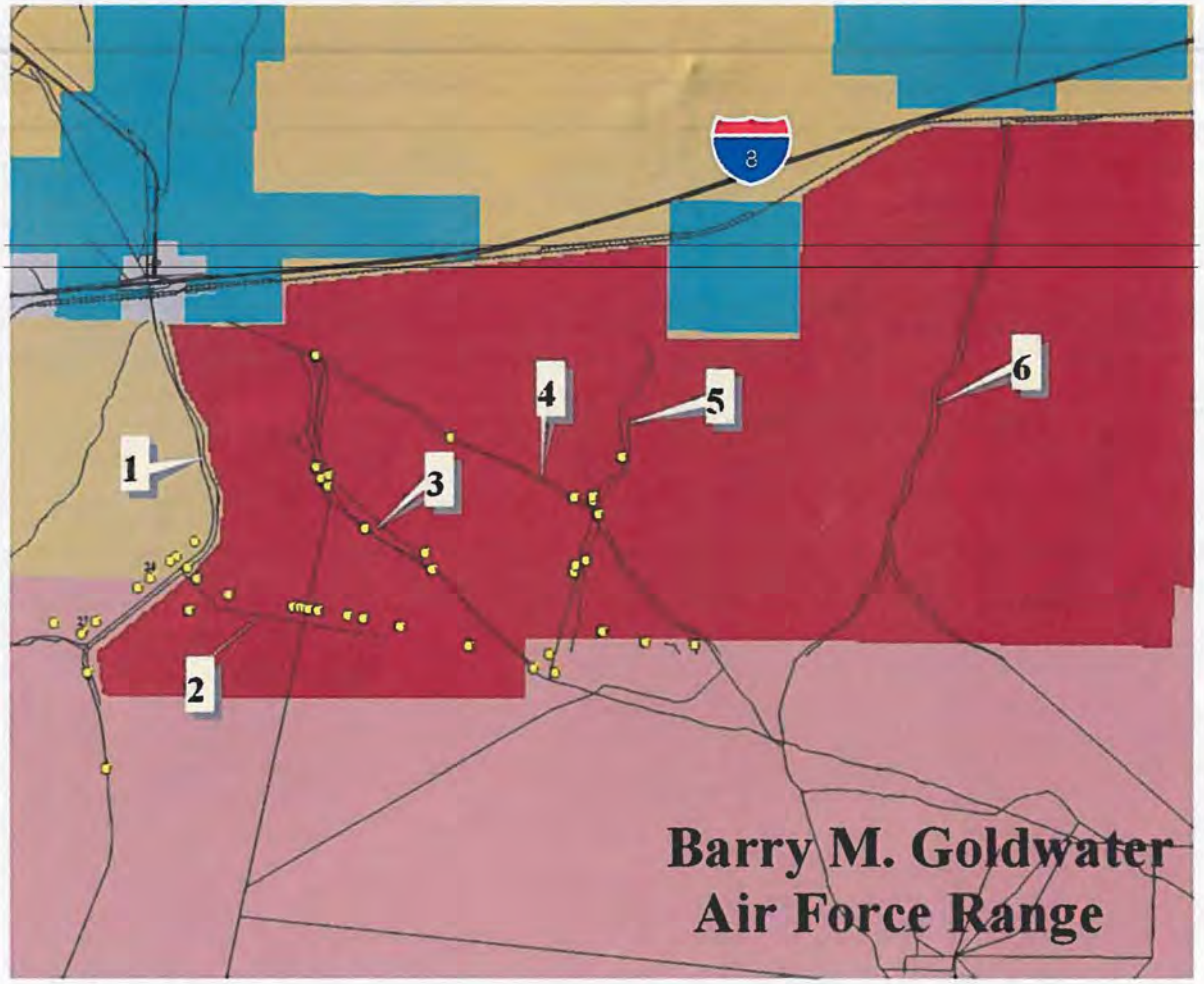
Area Overview

The Sentinel Plain proposed Wilderness is located south of I-8 and southeast of Hyder, AZ. Wilderness inventory for this area was completed during 2003, 2006, 2009, and 2010 by the Arizona Wilderness Coalition. The map below shows points at which data was collected on each of the routes inside the proposed wilderness area. Data collected includes pictures, route information, human impacts, and conservation values of the area around each point.

AWC Photo Points, Sentinel Plain



AWC Inventoried Routes, Sentinel Plain



Boundaries, cherry-stems, and open/closed routes for Sentinel Plain

Boundaries of the proposed wilderness area
Northern boundary: Boundary follows the BLM land tenure and the railroad tracks.
Eastern boundary: Private and state trust land.
Southern boundary: Route #1
Western boundary: Route #1

Boundary modifications since 2008:
In our original proposal, the Western boundary extended west of Route #1 and we had recommended closure of this route. Because of land uses in the area and access to the Range, this boundary was pulled back and the route changed to "keep open".

Routes recommended to remain open
#1: Provides access to the BLM land to the west, the Sentinel Plain proposed wilderness to the east, and the Barry Goldwater Range to the south. Route is in excellent condition, is well-maintained and bladed. It is the route south of the Sentinel exit off Interstate 8.

Routes recommended as cherry-stems
none

Routes recommended for closure
#2: This route traverses a large lava field and there are several archeological and cultural resources along it. This route is being reclaimed and eventually disappears (see last photo point along the route). It does not lead to other routes or to the Range. Therefore, because it does not provide access to any features or destination and it encourages continuing incursions into the roadless core of this area, it should be closed to protect the biological, archeological, and cultural resources of this landscape.

Just south of the junction of this route and route #1 is Hill 849, which provides a scenic overlook of the entire Sentinel Plain area. The spur that leads to this elevated feature would make an excellent trail to the overlook.

Photo #19: Spur to Hill 849 with overlook.

#3: This route heads south and then southeast to the Range. Unfortunately, the road crosses large areas of fragile biological soil crusts. Damage to these crusts from off-route vehicle travel as well as trash dumping has occurred along this route. This route should be closed to protect the roadless core of this area and protect the other biological, archeological, and cultural resources of this landscape.

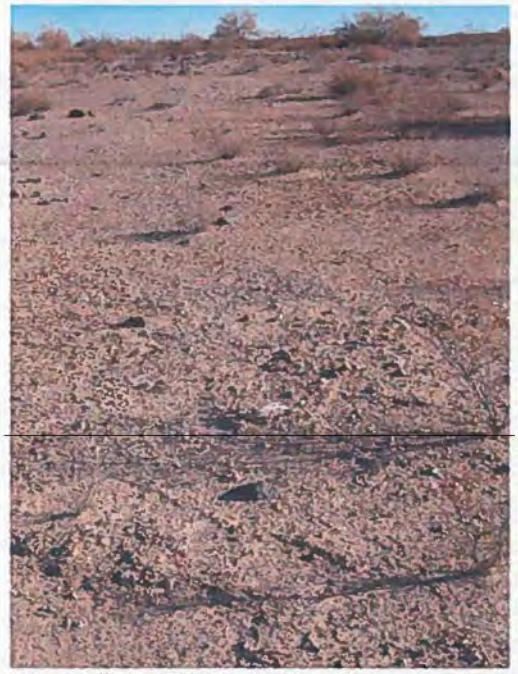


Photo #38: Biological soil crusts along route #3

#4: This route heads southeast into to the Range but is being reclaimed by natural processes and vegetation as shown in the photo below. Therefore, this route should be closed to allow the area to completely re-vegetate and to protect the roadless core of this area.

Photo SP-34: Route is being reclaimed by vegetation

#5: Northern half of this route has eroded and is being reclaimed by natural processes. The southern half of this route crosses areas of fragile biological soil crusts. It should be closed protect the roadless core of this area and protect the other biological, archeological, and cultural resources of this landscape.

Photo #48: Route dies off at northern end.

#6: This route is not accessible from the Route #1, which is the major access route to the Sentinel Plain area. Route is being reclaimed by natural processes as evidenced from satellite photos and should be closed because of lack of use and to protect the roadless core of this area.

Other routes in the area

There is a route shown on the Maricopa County road map that heads from private property west of Gila Bend across state trust land, across the wilderness proposal area, and onto the Barry Goldwater Military Range. The route cannot be seen by satellite, which implies that it has been entirely reclaimed by natural processes. This route is also redundant with Route #1 and Hwy 85 south of Gila Bend. Neither the Range nor the state trust land is open to the public without a permit; this route also begins on private property and may not be accessible without the owner's permission.

There is also one other route shown on the map above from the Maricopa County's road map. It runs north-south and intersects Routes #2 and #3. This route is being reclaimed by natural processes and is filled with vegetation as evidenced by a satellite view of the area. Since this route is redundant with Route #1 (which is a bladed, maintained road), this route should be closed permanently.

Sentinel Plain Wilderness Complex Citizens' Proposal

Sentinel Peak – Central Unit. Photo by Andy Laurenzi

Submitted by
Arizona Wilderness Coalition and the Center for Desert Archaeology
November 25, 2011

Sentinel Plain

Sunset on the Sentinel Plain with Painted Rock Mts. in background. Photo by Andy Laurenzi

General Area Description

The Sentinel Plain lava field and associated small shield volcanoes, collectively referred to as the Sentinel-Arlington Volcanic Field (SAVF), are located ~75 km southwest of Phoenix, Arizona. One of twelve volcanic fields in Arizona and the only one in southwestern Arizona, it consists of 20+ eruptive centers ranging from 4-6 km in diameter and 30-200 m in height. The SAVF is composed of Pliocene-Pleistocene alkali olivine basaltic lava flows and covers ~600 km2. Because of the general aridity of the area, extreme heat and poor soil development much of the area is sparsely vegetated with woody vegetation. The austerity of the area provides an other-worldly character that contributes to a unique and outstanding wilderness environment.

The wilderness proposal is situated in the main body of the SAVF located south of the Gila River and west of the Painted Rock Mountains ~25km west of the Town of Gila Bend, primarily within Maricopa County, Arizona (Figure 1). The public lands within the Sentinel Plain are bordered to the south by the Barry M. Goldwater Air Force Range. Interstate 8 bisects the lower third of the main body of the SAVF and northern area is roughly defined by the Gila River channel where columnar basalt cliffs line the river from just west of the Dendora Valley downstream to the Maricopa County line. The wilderness proposal is broken into 5 contiguous units, termed Sentinel Plain_South, Sentinel Plain_Central, Sentinel Plain_NorthwestA, Sentinel Plain_NorthwestB and Sentinel Plain_Northeast. Recent route inventories by the BLM (BLM

2011) indicate that only 55 miles of routes are located within the roughly 80,000 acre complex and all of these are lightly used (BLM 2011).

Wilderness Characteristics

Size

All five units meet the size criteria as set out in BLM Instruction Memorandum (IM) 2011-154 as all are "roadless areas with over 5,000 acres of contiguous BLM Lands."

Central Unit - 18646 acres
Northeast Unit - 10555 acres
NorthwestA Unit - 8197 acres
NorthwestB Unit - 9570 acres
South Unit- 32348 acres
Total - 79316acres

Naturalness

The Sentinel Plain proposed wilderness units "generally appear to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable" as outlined in The Wilderness Act of 1964 and IM 2011-154. A major contributing factor to lands within Sentinel Plain meeting this minimum qualification for wilderness is that much of the area has experienced limited human use due to its remote nature, limited topographic relief, low mineral potential and scant vegetation resources suitable for livestock grazing. Searing heat and little moisture all combine to make this a sub-optimal area for human settlement and as such much of the area exhibits little evidence of "man's work".

The few indications of human use are born out in the limited two tracks that occur in the complex. Impacts to naturalness from the current route network are minimal considering that visitors cannot see the evidence of roads unless they are using them or within 100 feet of them as they are very difficult to discern even when traveling on them. All of these routes within the proposed units are less than 3 meters wide, total approximately 54 miles in length in the entire complex and receive light use (Table 1). What is particularly noteworthy is that most of these occur on desert pavements or in sandy soils, and in many instances can be removed with a large rake suggesting that road reclamation can be accomplished easily and inexpensively.

Vegetation cover is very sparse. Woody vegetation of any kind is lacking in large areas and any appreciable woody growth occurs in a few isolated drainages and small basins. The vegetation found here is classified as part of the Creosotebush (*Larrea tridentata*)-White Bursage *(Ambrosia dumosa*) Series of the Lower Colorado River Valley Subdivision within the Sonoran Desertscrub biogeographic division (Brown 1982). The field reconnaissance recorded the presence of Creosotebush, White Bursage, Foothills and Blue Paloverde (*Cercidium microphyllum, C. floridum*), Ocotillo (*Fouquieria splendens*), Barrel Cactus (*Ferocactus sp.*), Saguaro (*Cereus gigantea*) and Cholla Cactus(*Opuntia sp.*). Mesquite (*Prosopis sp.*) was reported from the area along some drainages (Crumbo 2000). Following wet winters, the spring bloom can be quite spectacular and provides a stunning back drop to an otherwise austere landscape.

In portions of the Northwest and Northeast Units the proposal includes the floodplain of the Gila River where dense stands of salt cedar (Tamarix microphylla) that include occasional velvet mesquite (Prosopis velutina) and Gooddings willow (Salix gooddingii) occur. The density of the vegetation along with occasional flooding from large flood events as rendered most of this portion of the floodplain undisturbed by recent human use.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

The Sentinel Plain proposed wilderness unit possesses both opportunities for solitude and primitive and unconfined recreation. The opportunities for both exist within most of the unit excepting those portions in close proximity to Interstate 8. There is a power line bisecting the Northwest Units, however it is a low voltage line on wooden poles and is unobtrusive.

Solitude

The BLM's IM 2011-154 and Wilderness Inventory and Study Procedures Handbook H-6310-1.22 section (b)(1) gives direction on the assessment of solitude in inventory units. In this section five features for evaluating solitude are given.

a. *Size and configuration:* The units meet the 5,000-acre size criteria, and it is not long and narrow and does not have irregular extensions or cherry-stems.
b. *Topographic screening:* There are no significant topographic features in this unit other than Sentinel Peak and one other unnamed shield volcano which provide slight undulation in the terrain. However there are many, small shallow basins that can easily screen overnight campers. Wildhorse Canyon in the Northeast is bordered by irregular basalt cliffs and provides excellent opportunities in its upper end for solitude. Visitors can experience solitude from others simply from the fact that there are no topographic features to provide views of the surrounding terrain; the flatness is the topographic feature that provides isolation. In many ways the sparseness of the landscape coupled with the lack of any evidence of human use across large vistas are significant factors in providing a sense of remoteness and isolation.
c. *Vegetative screening:* In the flats and on the lava fields vegetation is sparse, not providing for a high degree of vegetative screening, but in and around small basins and drainages, microphyllous woodland is better developed and vegetative screening increases. The areas found along the Gila River provide complete solitude given the density of shrub and tree canopy throughout the Gila River floodplain in this area.
d. *Ability of user to find a secluded spot:* seclusion on the Sentinel Plain starts immediately with the feeling of vastness that is all encompassing when walking in the wide open flats with little topography to provide reference for travelers and except at the edges no sign of human uses. Visitors must use their orienteering skills to effectively navigate this vast plain.
e. *Presence of outside sights and sounds:* The Barry M. Goldwater Air Force Range creates noise impacts from their training maneuvers, but this is a disturbance for all southwestern AZ wilderness areas. Many desert wilderness travelers call this, "The sound of fascism". The other noise disturbance present in the southern portion is that of the highway traffic on Interstate 8, which provides the southern boundary of the Central Unit and northern boundary of the Southern Unit. The Endangered American Wilderness Act of 1978 addressed the issue of "purity" and how Congress did not intend for wilderness designation to be completely isolated from the "sights and sounds" of man (H. R. 95-

540). In the House Report (No. 95-540) referring to the Sandia Mountain Wilderness in New Mexico as quoted in the BLM handbook H-6310-1 states:

> "The "Sights and sounds" of nearby Albuquerque, formerly considered a bar to wilderness designation by the Forest Service, should, on the contrary, heighten the public's awareness and appreciation of the area's outstanding wilderness values."

This standard applies in the case of the Sentinel Plain with the existence of the Barry M. Goldwater Air Force Range and the interstate. The Wilderness Act of 1964 was created "In order to ensure that an increasing population, accompanied by an expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition" P.L. 88-577; 16 U.S.C. § 1131 section 2 (a). Designation of the Sentinel Plain as wilderness would help offset the impacts to the landscape caused by the Barry M. Goldwater Range and the interstate and help fulfill the intent of the Wilderness Act as interpreted and tested by Congress.

Primitive and Unconfined Recreation

The Sentinel Plain allows a variety of primitive and unconfined recreational activities as required and described in IM 2011-154. Various levels of hiking, backpacking, hunting, horseback riding, photography, bird watching, and sightseeing for botanical, zoological, and especially cultural and geological features are all possible as well as primitive and unconfined recreational opportunities within the Sentinel Plain. The opportunities for primitive and unconfined recreation are outstanding in this area if visitors do as Henry Hunt suggests in his book, "Hidden Trails in the Sonoran Desert: Hiking the Desert Wilderness of South-Central Arizona":

> "...this area is ideal for hikers. Of course you must first rid yourself of the notion that to hike means to go somewhere, to climb a mountain or visit a cave. Hiking is first and foremost an engagement with the land around you. It is the land that comes first in your thoughts, not the hiking. The Sentinel area can cure you of bad habits. Its vastness, its sameness, the uniqueness and the openness, all serve to center you into your awareness of yourself."

Supplemental Values

Various supplemental values exist in the Sentinel Plain Wilderness Complex units. Supplemental values are described in section 2(c) of The Wilderness Act as, "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." The various supplemental values contained within the Sentinel Plain unit tip the scales in favor of designation. Sentinel Plain has the necessary merits without supplemental values to meet the intent of the wilderness act, but the geologic, wildlife, and cultural values are the core justification for this citizen's proposal.

Geologic Values:

The geology of the Sentinel Plain is unique and distinctive in character. The striking SAVF is one of the youngest displays of volcanism in Arizona. Its basalt lavas date from the Pliocene to the middle Miocene, making them just a few million years old. Geological studies undertaken at Arizona State University (Cave 2007) suggest that the SAVF, lightly mantled by aeolian dust and basaltic rubble, is similar to surfaces seen in Mars imagery. The SAVF also represent basaltic plains-style volcanism, an emplacement style of volcanism intermediate between classic

flood volcanism and large shield-building volcanism which has been previously recognized on Mars. This clearly qualifies as unique geologic values.

Basaltic rubble area that resembles areas seen on Mars imagery. Photo by John Anderson

Wildlife Values:

The Sonoran pronghorn (Antilocapra americana sonoriensi)is federally listed as endangered and is wildlife of special concern in Arizona according to the Arizona Game & Fish Department Heritage Data Management System. This species is a historic inhabitant of southwest Arizona. They require a variety of habitats for forage and migration. Some of these habitats include open creosote-bursage areas, allowing for expansive views to locate and escape predators. The Sonoran pronghorn populations are quickly decreasing due to habitat fragmentation and loss. Protection of any population in the state is crucial to their survival. Habitat protection is the only way this species will not be extirpated from Arizona. On two separate occasions Sonoran pronghorn tracks and scat have been observed in the Southern Unit, once in 2000 and another time during a road inventory in 2005. All of this unit has been identified as potential recovery area in the Sonoran pronghorn recovery plan prepared by the United States Fish & Wildlife Service.

Fresh Sonoran pronghorn track observed in 2005
Photo by Jason Williams

Archeological/Cultural Values:
One of the most significant values associated with the Sentinel Plain is in the Northwest A&B and Northeast Units along the basalt cliffs that line the southern and northern banks of the river and on flat mesa-like areas immediately adjoining the cliffs. Here the river forms a "narrows" of sorts and at several locations are significant and extensive petroglyph assemblages of prehistoric Patayan and Hohokam cultures. Three sites in this area have been reported in the literature and speak to significance of these sites in both size, time depth (Archaic period through to the Historic period) as well as stylistic element of two major prehistoric cultures (Hedges 1993). Additionally are the historic inscriptions that bear witness to some of the earliest Euro-American travelers in the area. Many of the petroglyphs sites found farther upstream have been irrevocably damaged by inundation from Painted Rocks reservoir and extensive vandalism. Wilderness will provide a significant level of long-term protection to these sites.

Patayan Glyph at Hummingbird Point-Northwest Unit. Photo courtesy of Henry Wallace.

On the flat mesas both north and south of the river are a diverse array of geoglyphs, rock alignments and intentional cleared areas of desert pavement. "Mehlinger's Mesa" on the north side of the river is especially noteworthy where many rock patterns have been mapped.

Geoglyphs are often referred to by archaeologists as "fragile patterns" that are easily disturbed by vandals, vehicles and people inadvertently or intentionally moving stones.

Geoglyph area in the Northwest Unit. Photo courtesy of Henry Wallace

The evidence of past human activity is not limited to prehistoric people but also include well worn sections of trails that are likely associated with Mormon Battalion and Cooke's Wagon Road and possibly the Butterfield Overland stage if not the Juan Bautista de Anza National Historic Trail. One section on the Northeast unit includes a segment of the Fourr Toll Road in existence for decade in mid 19th century located above the historic location of the Oatman Stage Stop. The infamous Oatman massacre site is located in the Northeast Unit and includes remnants of wagon road the Oatman family was using at the time of the attack.

Inscription by OW Randall, a Texas Ranch owner who made two trips to California during the Gold Rush days. Photo courtesy of Rose-Ann Tomkins.

Historic wagon road at the site of the Oatman Massacre. Photographer unknown.

Boundary and Routes

There are approximately 54 miles of recommended route/road that have been identified by the BLM route inventory presented in the draft Lower Sonoran Field Office Resource Management Plan, 50 miles of which are characterized as tertiary roads which receive light use or reclamation and due to the surface topography will be relatively easy to reclaim. There is one cherry stemmed road in the Northeast Unit.

The boundaries for the Sentinel Plain Complex Units was created through on-the-ground, route inventory of the area utilizing BLM route inventory obtained as GIS shapefiles from the BLM Phoenix District.

Central Unit: The Southern Pacific Railway and Interstate 8 bound the southern boundary of this unit. The western boundary is formed by state trust lands and the gravel access road from I-8 to Oatman Flat. The eastern boundary from state trust land and the gravel access road from I-8 the Painted Rocks Campground. The northern boundary is a gravel connector road between the Painted Rocks campground road and the access road to Oatman Flat.

Northeast Unit: Gravel access road from I-8 to Painted Rocks Dam Camground forms the eastern boundary, the southern boundary utilizes the gravel connector road from the I-8 to Painted Rocks campground and the gravel access road from I-8 to Oatman Flat. The northern boundary is where public lands adjoins private and state trust land and the western boundary if private land the I-8 to Oatman gravel access road and its extension north across the Gila River.

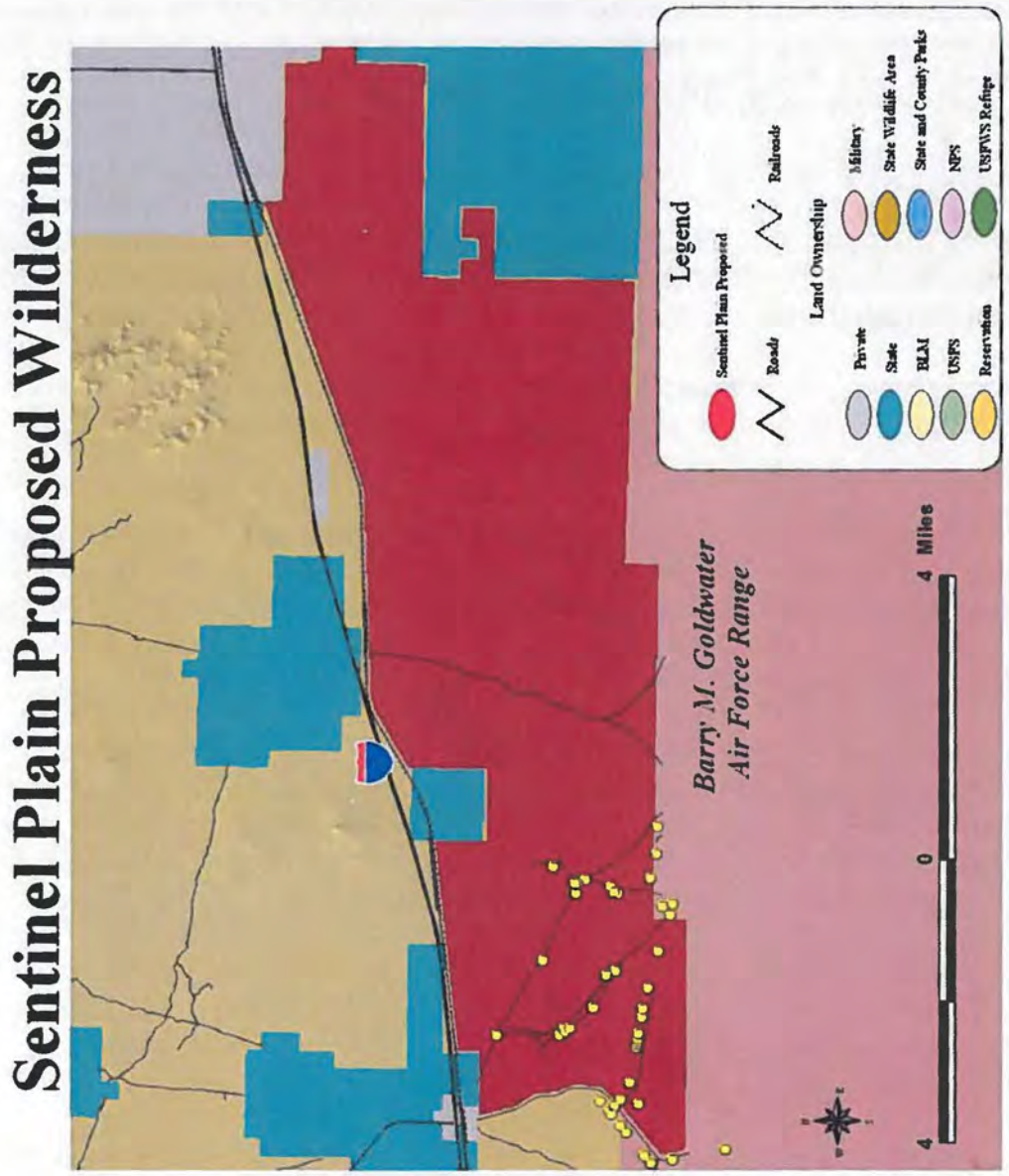
Northwest UnitA: Eastern boundary is formed by the gravel access road from I-8 to Oatman Flat, the northern boundary by heavily used gravel road at the base of Oatman Mountain. The western boundary by a low voltage power line on wooden poles and the southern boundary by two large state trust land parcels.

Northwest UnitB: Western boundary by low voltage power line on wooden poles, western and southern boundaries by state and private land parcels, and northern boundary by heavily used gravel road at base of Oatman Mountain.

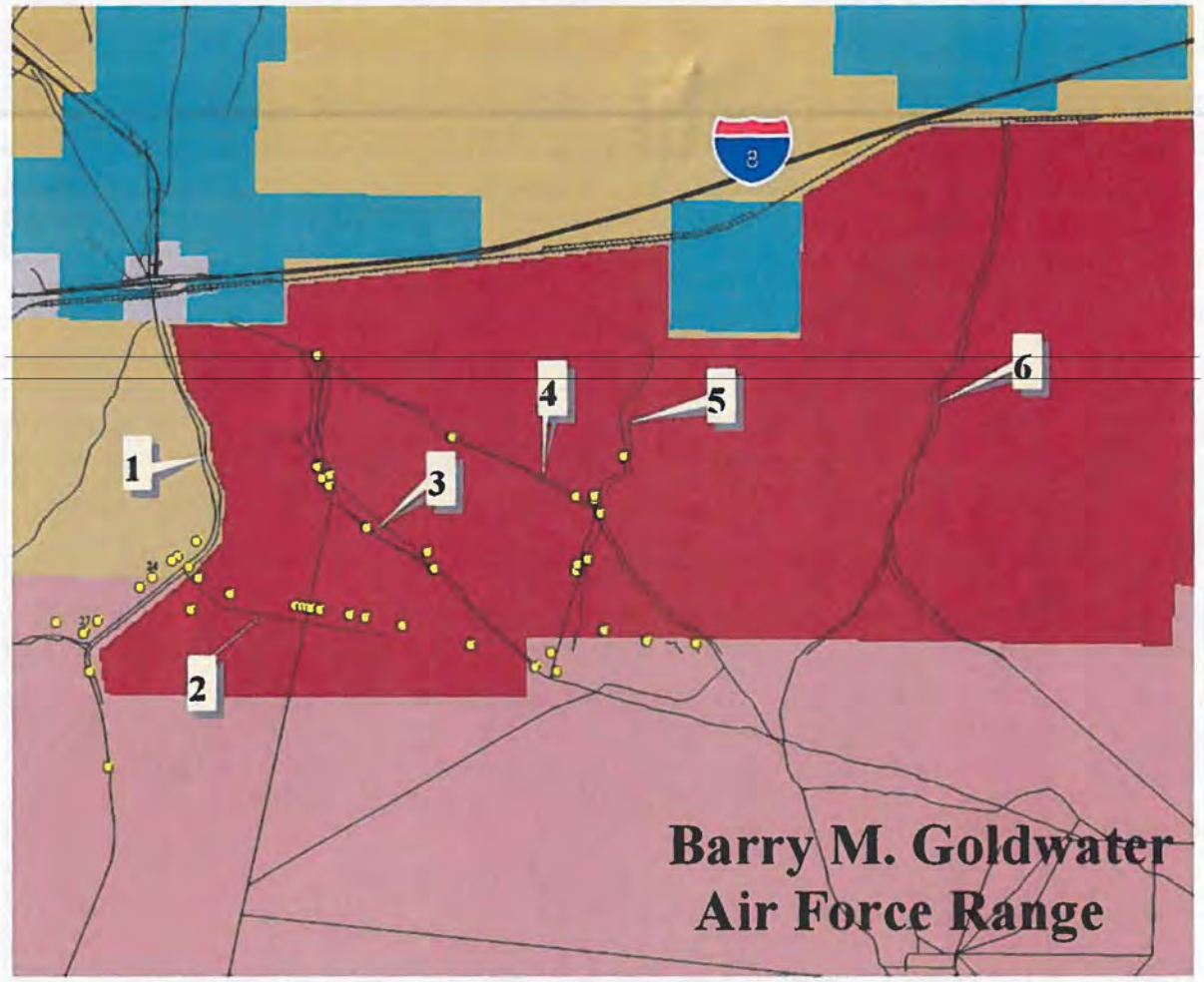
Southern Unit: Information for the Sentinel Plain_Southern Unit is provided below based on wilderness inventory for this area was completed during 2003, 2006, 2009, and 2010 by the Arizona Wilderness Coalition:

The map below shows points at which data was collected on each of the routes inside the proposed wilderness area. Data collected includes pictures, route information, human impacts, and conservation values of the area around each point.

AWC Photo Points, Sentinel Plain_Southern Unit



AWC Inventoried Routes, Sentinel Plain Southern Unit



Boundaries, cherry-stems, and open/closed routes for Sentinel Plain

Boundaries of the proposed wilderness area

Northern boundary: Boundary follows the BLM land tenure and the railroad tracks.
Eastern boundary: Private and state trust land.
Southern boundary: Route #1
Western boundary: Route #1

Boundary modifications since 2008:
In our original proposal, the Western boundary extended west of Route #1 and we had recommended closure of this route. Because of land uses in the area and access to the Range, this boundary was pulled back and the route changed to "keep open".

Routes recommended to remain open

#1: Provides access to the BLM land to the west, the Sentinel Plain proposed wilderness to the east, and the Barry Goldwater Range to the south. Route is in excellent condition, is well-maintained and bladed. It is the route south of the Sentinel exit off Interstate 8.

Routes recommended as cherry-stems
none

Routes recommended for closure
#2: This route traverses a large lava field and there are several archeological and cultural resources along it. This route is being reclaimed and eventually disappears (see last photo point along the route). It does not lead to other routes or to the Range. Therefore, because it does not provide access to any features or destination and it encourages continuing incursions into the roadless core of this area, it should be closed to protect the biological, archeological, and cultural resources of this landscape.

Just south of the junction of this route and route #1 is Hill 849, which provides a scenic overlook of the entire Sentinel Plain area. The spur that leads to this elevated feature would make an excellent trail to the overlook.

Photo #19: Spur to Hill 849 with overlook.

#3: This route heads south and then southeast to the Range. Unfortunately, the road crosses large areas of fragile biological soil crusts. Damage to these crusts from off-route vehicle travel as well as trash dumping has occurred along this route. This route should be closed to protect the roadless core of this area and protect the other biological, archeological, and cultural resources of this landscape.

Photo #38: Biological soil crusts along route #3

#4: This route heads southeast into to the Range but is being reclaimed by natural processes and vegetation as shown in the photo below. Therefore, this route should be closed to allow the area to completely re-vegetate and to protect the roadless core of this area.

Photo SP-34: Route is being reclaimed by vegetation

#5: Northern half of this route has eroded and is being reclaimed by natural processes. The southern half of this route crosses areas of fragile biological soil crusts. It should be closed protect the roadless core of this area and protect the other biological, archeological, and cultural resources of this landscape.

Photo #48: Route dies off at northern end.

#6: This route is not accessible from the Route #1, which is the major access route to the Sentinel Plain area. Route is being reclaimed by natural processes as evidenced from satellite photos and should be closed because of lack of use and to protect the roadless core of this area.

Other routes in the area

There is a route shown on the Maricopa County road map that heads from private property west of Gila Bend across state trust land, across the wilderness proposal area, and onto the Barry Goldwater Military Range. The route cannot be seen by satellite, which implies that it has been entirely reclaimed by natural processes. This route is also redundant with Route #1 and Hwy 85 south of Gila Bend. Neither the Range nor the state trust land is open to the public without a permit; this route also begins on private property and may not be accessible without the owner's permission.

There is also one other route shown on the map above from the Maricopa County's road map. It runs north-south and intersects Routes #2 and #3. This route is being reclaimed by natural processes and is filled with vegetation as evidenced by a satellite view of the area. Since this route is redundant with Route #1 (which is a bladed, maintained road), this route should be closed permanently.

BLM's duty to evaluate lands with wilderness characteristics

In order to preserve these qualities before they are destroyed, section 201 of FLPMA mandates that BLM inventory the resources of the public lands, their resources and value. 43 U.S.C. § 1711. In the land use planning process, Section 202 of FLPMA requires that BLM take into account the inventory and determine which multiple uses are best suited to which portions of the planning area. 43 U.S.C. § 1712. BLM's mandate of multiple use and sustained yield, as well as other relevant law and BLM's current guidance, provides for inventory and protection of wilderness values. As required by IM 2011-154, BLM must evaluate and document new information provided regarding lands with wilderness characteristics.

> When new information regarding wilderness characteristics meets the minimum standard for further review, as soon as practicable, the BLM shall evaluate the information regarding the validity of proposed boundaries of the area(s), the existence

of wilderness inventory roads and other boundary features, the size of the area(s), and the presence or absence of wilderness characteristics.

We are unaware of any previous wilderness inventory completed for the areas identified in this proposal. If the area has been surveyed at some point, it is likely that it has not been looked at since the original inventory over three decades ago. BLM must take this significant new information into account and determine whether these areas possess wilderness characteristics. If found to possess wilderness characteristics as described in the proposal, BLM must make a determination as to the management of the areas during the planning process.

Conclusion

The Sentinel Plain Complex Units meets all the requirements for protection under the Wilderness Act of 1964 and deserves the protection that only a wilderness designation can bestow. The unique geologic landscape is virtually untouched by human use and provides tremendous opportunity for solitude and remoteness. Sentinel Plain is a gem for geology researchers and students, and it is an area rich in thousands of years of human use up through the historic period.

References

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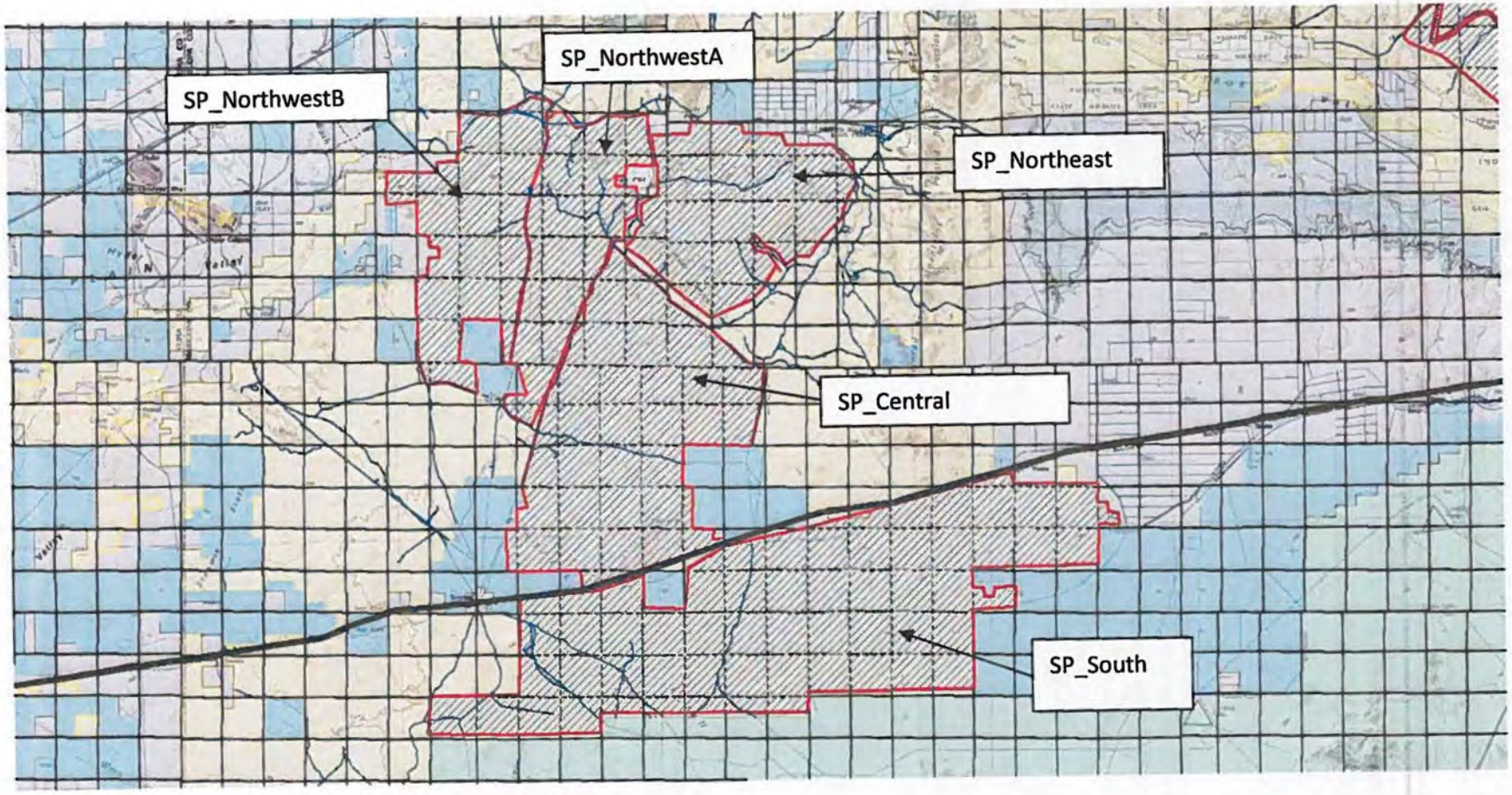

Figure 1. Sentinel Plains Wilderness Complex

Appendix A

FID_PFO_Ro	ROUTE_TYPE	WIDTH	WASH	SURFACE_PR	OBS_USE1	OBS_USE2	USE_LEVEL	ROAD_NO_	ROAD_NAME	COMMENT	LENGTH
35712	None	0.0									2.20
35737	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.21
35758	Reclaiming	0.0		Gravel	Null	Null	Non_Existent		Dead Car Road	Almost impassable in places due to vegetation	0.19
35456	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.39
35463	Reclaiming	2.0		Rock	Null	Null	Non_Existent				0.07
35472	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.06
35482	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.10
35487	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.14
35535	Reclaiming	2.0		Rock	Null	Null	Non_Existent				0.15
35557	Reclaiming	2.0		Rock	4WD	Null	Non_Existent			Road along old powerline.	0.30
35571	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.24
35610	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.00
35627	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.07
35795	Reclaiming	2.5		Gravel	Null	Null	Non_Existent		Dead Car Road	Almost impassable in places due to vegetation	0.80
35636	Reclaiming	2.0		Gravel	Null	Null	Non_Existent				0.03
35642	Reclaiming	2.5		Soil	4WD	ATV/Motorcycle	Light				2.11
35648	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.46
35649	Reclaiming	0.0		Soil	4WD	ATV/Motorcycle	Light			Original unattrib POSNLINE data	0.12
35679	Reclaiming	2.0		Rock	4WD	Null	Non_Existent			old powerline rd; hard-to-follow desert pavement	0.76
35680	Reclaiming	2.5		Soil	Null	Null	Non_Existent			ROAD FORMS DES RIP VEG WASH	3.58
35697	Reclaiming	2.0		Soil	4WD	Null	Non_Existent			Old powerline rd; hard-to-follow desert pavement	0.31
35699	Reclaiming	2.0		Soil	4WD	Null	Non_Existent			Old powerline rd; hard-to-follow desert pavement	0.00
35707	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.48
35802	Reclaiming	3.0		Soil	Null	Null	Non_Existent				0.95
35812	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.02
35814	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.02
35819	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.06
35821	Reclaiming	2.5		Gravel	Null	Null	Non_Existent			East end almost invisible from gravel rd; desert pav	0.68
35840	Reclaiming	2.5		Soil	Null	Null	Non_Existent				1.50
35843	Reclaiming	0.0		Unknown						Original unattrib POSNLINE data	0.46
35908	Reclaiming	2.5		Soil	Null	Null	Non_Existent			road forms small des rip veg wash	1.16
35736	Secondary	0.0									0.01
35411	Secondary	0.0									0.28
35534	Secondary	0.0									0.78
35544	Secondary	0.0									0.05
35567	Secondary	0.0									0.05
35615	Secondary	0.0									0.03
35622	Secondary	0.0									0.02
35629	Secondary	0.0									0.02
35637	Secondary	0.0									0.02
35698	Secondary	0.0									0.87
35715	Secondary	0.0									0.19
35717	Secondary	0.0									0.00
35732	Secondary	0.0									0.13
36457	Secondary	0.0									1.33
35412	y_Road_Unpav	2.5		Gravel	4WD	2WD	Heavy				0.00
35430	y_Road_Unpav	2.5		Gravel	4WD	2WD	Heavy				0.26
35572	y_Road_Unpav	0.0		Gravel	4WD		Light			Original unattrib POSNLINE data	0.06
35581	y_Road_Unpav	2.5		Gravel	4WD	Null	Light				0.02

Appendix A

FID_PFO_Ro	ROUTE_TYPE	WIDTH	WASH	SURFACE_PR	OBS_USE1	OBS_USE2	USE_LEVEL	ROAD_NO_	ROAD_NAME	COMMENT	LENGTH
35585	y_Road_Unpav	0.0		Gravel	4WD		Light			Original unattrib POSNLINE data	0.03
35588	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.02
35591	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.02
35592	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.00
35734	y_Road_Unpav	0.0		Unknown						Original unattrib POSNLINE data	0.00
35747	y_Road_Unpav	0.0		Gravel	4WD	Null	Light		Dead Car Road	Almost impassable in places due to vegetation	0.62
33805	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.47
33806	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.91
33820	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.55
33821	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.23
33825	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.07
33830	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.70
33833	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.06
33834	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.09
33850	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.12
33887	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.23
33932	y_Road_Unpav	2.5	Not a Was	Sand	4WD	ATV	Light				0.37
33933	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	ATV	Light				1.07
33951	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.97
33953	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.02
33954	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.02
33955	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.02
33966	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.58
33968	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.18
34004	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.60
34051	y_Road_Unpav	3.0	Not a Was	Gravel (Natural)	ATV	4WD	Light				0.00
34052	y_Road_Unpav	3.0	Not a Was	Gravel (Natural)	ATV	4WD	Light				1.63
34060	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.09
34061	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.14
34062	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.31
34067	y_Road_Unpav	3.0	Not a Was	Gravel (Natural)	ATV	4WD	Light				0.99
34070	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.08
34071	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.05
34074	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.06
34075	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.00
34076	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.06
34079	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.01
34080	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.06
34106	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.13
34107	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.16
34108	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.01
34109	y_Road_Unpav	3.0	Not a Was	Gravel (Natural)	ATV	4WD	Light				1.00
34111	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.64
34160	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.61
34162	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.00
34163	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.04
34165	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.05
34166	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.06
34173	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.56

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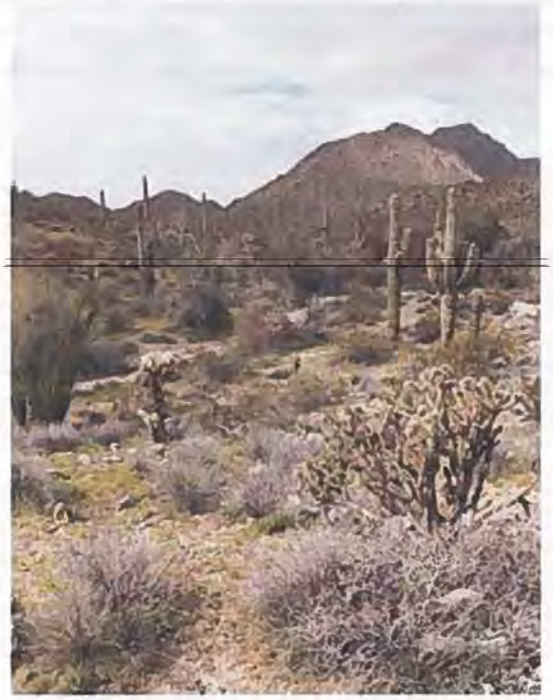
FID_PFO_Ro	ROUTE_TYPE	WIDTH	WASH	SURFACE_PR	OBS_USE1	OBS_USE2	USE_LEVEL	ROAD_NO_	ROAD_NAME	COMMENT	LENGTH
34175	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.01
34180	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				1.67
34227	y_Road_Unpav	2.0	Not a Was	Gravel (Natural)	4WD	-	Light			TRACKS FADE	0.92
34228	y_Road_Unpav	2.5	Not a Was	Gravel (Natural)	4WD	-	Light				0.48
34237	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				1.13
34454	y_Road_Unpav	2.0	Not a Was	Rock	4WD	-	Light				0.58
34490	y_Road_Unpav	2.0	Not a Was	Gravel (Natural)	4WD	-	Light				1.65
34709	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				3.66
34879	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				0.83
34935	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light			GRATED RD	0.61
34942	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light			GRATED RD	0.38
34974	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light			GRATED RD	0.42
35007	y_Road_Unpav	2.5	Not a Was	Soil	4WD	-	Light				2.95
35436	y_Road_Unpav	2.5		Gravel	4WD	ATV/Motorcycle	Light				0.09
35471	y_Road_Unpav	2.0		Rock	4WD	Null	Light			rare use 2 track	0.06
35493	y_Road_Unpav	2.0		Rock	4WD	Null	Light			rare use 2 track	0.21
35543	y_Road_Unpav	0.0		Gravel	4WD	Null	Light				0.01
35548	y_Road_Unpav	0.0		Gravel	4WD	Null	Light				0.02
35550	y_Road_Unpav	0.0		Gravel	4WD	Null	Light				0.01
35551	y_Road_Unpav	0.0		Gravel	4WD		Light			Original unattrib POSNLINE data	0.04
35556	y_Road_Unpav	0.0		Gravel	4WD	Null	Light				0.01
35566	y_Road_Unpav	2.0		Gravel	4WD	Null	Light				0.04
35609	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.07
35613	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.02
35616	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.03
35617	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.00
35623	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.00
35625	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.01
35626	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.01
35630	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.02
35638	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.02
35640	y_Road_Unpav	2.5		Gravel	4WD	4WD	Light				0.01
35641	y_Road_Unpav	2.5		Packed_Sand	4WD	Null	Light				0.01
35658	y_Road_Unpav	2.5		Packed_Sand	4WD	Null	Light				0.18
35668	y_Road_Unpav	2.5		Packed_Sand	4WD	Null	Light				0.14
35695	y_Road_Unpav	2.5		Soil	4WD	Null	Light				0.53
35700	y_Road_Unpav	0.0		Unknown						Original unattrib POSNLINE data	0.02
35716	y_Road_Unpav	0.0		Unknown						Original unattrib POSNLINE data	0.19
35719	y_Road_Unpav	2.5		Gravel	4WD	Null	Light		Dead Car Road	Almost impassable in places due to vegetation	0.09
35733	y_Road_Unpav	0.0		Unknown						Original unattrib POSNLINE data	0.13
35860	y_Road_Unpav	0.0		Unknown						Original unattrib POSNLINE data	0.81
											54.46

ATTACHMENT 3

B. Butterfield Stage Memorial



Unit Description

The Butterfield Stage Memorial proposed wilderness in located in Maricopa County directly south of the existing North Maricopa Mountains Wilderness inside the Sonoran Desert National Monument. It is approximately 12 miles east of the community of Gila Bend and 22 miles west of Maricopa. Elevation in the unit ranges from 2,766 feet atop Estrella Mountain to 1200 feet on the gently sloping western bajada. The primary vegetation communities consist of palo verde/saguaro in the higher mountains with an abundance of cholla cacti. The bajada areas contain saguaros, triangle bursage, and an abundance of creosote (USDI 1987). The washes are lined with thicker stands of palo verde and ironwood trees providing habitat for birds and mammals. The unit also is host to high quality desert tortoise and bighorn sheep habitat. mule deer, gambel's quail, mountain lions, red tail hawks, and numerous species of reptiles also inhabit this unit.

The unit's name comes from the 1858 government contract issued to New Yorker, John Butterfield and his Butterfield Overland Mail Company to complete an overland mail route from St Louis to San Francisco passing through the southern deserts to Fort Yuma (www.discoverseaz.com 2004). This route passes through the Sonoran Desert National Monument and forms the northern boundary of the proposed Butterfield Stage Memorial Wilderness.

Wilderness Characteristics

Size: 9,618 acres

Naturalness

The Butterfield Stage Memorial proposed wilderness "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable" as outlined in section 2(c)(1) of the Wilderness Act of 1964. This unit is made up of the southern end of the North Maricopa Mountains and contains numerous rugged ridges and valleys falling away to the desert bajadas. The vegetation is mostly palo verde/saguaro with cholla, ocotillo, prickly pear, and numerous other species of small and large cacti. The thick stands of saguaros, continuous with the North Maricopa Mountains Wilderness and surrounding areas rivals that of Saguaro National Park. There has been relatively little disturbance of the natural systems in this area due to its rugged character. The few impacts that are present are 2.5 miles of user created routes that are "substantially unnoticeable". These routes will easily return to natural condition with little effort. Maps, complete descriptions, and analysis for these routes are included in the end of this report. There are no range improvements other than fences inside this unit and no AZ Game and Fish water catchments.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

The Butterfield Stage Memorial proposed wilderness unit possesses both opportunities for solitude and primitive and unconfined recreation. The opportunities for both exist within most of the unit. The BLM's *Wilderness Inventory and Study Procedures* manual H-6310-1.22 section (b)(1) gives direction on the assessment of solitude in inventory units. In this section five features for evaluating solitude are given.

a. **Size and configuration:** The unit meets the 5,000-acre size criteria, and it is not long and narrow or have irregular extensions or "cherry stems".

b. **Topographic screening:** There are many steep ridges and small canyons that surround the highest point of Estrella Mountain that visitors can find solitude on and around. These ridges and canyons provide outstanding isolation and solitude from other visitors as well.

c. **Vegetative screening:** In the mountains and bajadas the vegetative screening is exceptional with stands of saguaro and palo verde. Inside and along washes the vegetative screening increases with mature stands of palo verde and ironwood trees. While the nature of the desert landscape does not provide outstanding screening, it is always surprising how isolated one can feel only short distances from roads or other people.

d. **Ability of user to find a secluded spot:** It is not difficult to find seclusion in the many washes and small canyons that fan out from Estrella Mountain.

e. **Presence of outside sights and sounds:** The Butterfield Stage Memorial unit is bounded on all four sides by roads, which have little effect on the solitude

that can be experienced inside the unit. The southern boundary is at State Highway 238 and does have some effects on solitude, as this is a paved road and has higher volumes of traffic than the other dirt roads that surround the unit. Outstanding opportunities for solitude can still be easily found in the interior of the unit.

Primitive and Unconfined Recreation

The Butterfield Stage Memorial unit provides for a variety of primitive and unconfined recreational activities. "'A primitive and unconfined type of recreation' refers to those activities that provide dispersed, undeveloped recreation which do not require facilities or motorized equipment" (USDI 2001a [H-6310-1, Section .22(A)(1)(b)(2), page 22]). The Butterfield Stage Memorial unit offers various levels of hiking from flat walking in the bajadas, to rock scrambling on the peaks and ridges. Backpacking, hunting, photography, bird watching, and sightseeing for botanical and zoological features are all possible primitive and unconfined recreational opportunities within the Butterfield Stage Memorial proposed wilderness. Access to all sides of the unit is extremely easy because roads bound the entire unit, offering visitors a wide array of choices in where to access the unit. Opportunities for backpacking are excellent if trips are combined with the North and South Maricopa Mountains Wildernesses. Overnight camping is available on the area's western bajada and eastern canyons.

Supplemental Values and New Information

The Butterfield Stage Memorial unit has numerous supplemental wilderness values that will best be protected through wilderness designation. Section 2(c)(4) of The Wilderness Act clearly explains what supplemental values are, "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value" (P.L. 88-577 § 2(c)(4); 16 U.S.C. § 1131 (c)(4)). The BLM was directed by Congress in the 1976 FLPMA (House Report 94-1163) to consider the full realm of natural values that roadless areas provide:

> *Emphasis should be on multiple natural values of roadless areas as part of an overall multiple use framework for a general area rather than primarily recreational uses. In addition to the public recreational use values, interim protection of the area as a WSA and possible future designation as wilderness should augment multiple use management of adjacent or nearby lands in protecting watershed and water yield, wildlife habitat preservation, preserving natural plant communities and similar natural values.*

Protecting the Butterfield Stage Memorial unit as wilderness will provide protection for an array of natural and cultural resources such as prehistoric cultural sites, historic travel corridors, vast stands of saguaros, and help sustain viable populations of bighorn sheep and Sonoran desert tortoise. The Butterfield Stage Memorial proposed wilderness is completely within the Sonoran Desert National Monument, which was designated to protect the uninterrupted stands of saguaro, populations of bighorn sheep within the Maricopa Mountains, and the historic and prehistoric artifacts that are spread through out the monument (USDI 2001b). The Butterfield Stage Memorial unit contains many of objects identified in the January 2001 Presidential Proclamation creating the monument, which provides significant supplemental values giving justification for protecting this unit as Wilderness.

The various supplemental cultural values range from prehistoric habitation sites and travel corridors to the historical use of Butterfield Pass as a shortcut for the Butterfield Stage route between the Santa Cruz and Gila rivers. The unit contains numerous shell and lithic scatters associated with prehistoric travel (see photos NM-1-19, 20). In 1987 BLM reported that 4,480 acres of this unit were culturally sensitive because they contained evidence of "prehistoric rockshelters, rock rings and habitation sites" (USDI 1987: 78).

The historic Butterfield Stage Route forms the northern boundary, which was first used in 1858 by the Butterfield Overland Mail Company to complete an overland mail route from St. Louis to San Francisco passing through the southern deserts to Fort Yuma (Discover Southeast Arizona 2004). The Spanish explorer, Juan Bautista de Anza, first used the route in his 1775 expedition to take settlers to the Pacific coast to colonize near the San Francisco Bay area. It is also the route used by the Mormon Battalion in 1846 when they marched from Council Bluffs, Iowa, to San Diego California using the route through Butterfield Pass. This 2,000-mile march was the longest in US history (US Mormon Battalion, Inc. 2004). The proposed Butterfield Stage Memorial does not protect the route itself, but it does protect the scenery and landscape that these expeditions experienced during their travels across the desert. The route provides an excellent experience for motorized users as it has interpretive signs along its length telling the tale of the Butterfield Stage and it is a relatively easy route, lending itself to family outings and other motorized users who prefer to initially experience the desert from a vehicle.

Sensitive species are considered a supplemental value that must not be overlooked. Species such as the Sonoran desert tortoise and bighorn sheep can be used as focal species because protection of these species for the long-term will help to ensure healthy ecological processes for their habitat areas (Soulé and Noss 1998). The Butterfield Stage Memorial proposed wilderness would protect these species more fully than leaving the area open for more road building and other developments that could be proposed on other BLM lands within the monument. Below and attached as appendixes are reviews of why these species need wilderness for effective populations to continue in the Sonoran Desert. All species described here are at risk and would be more adequately protected with wilderness designation. Occurrence and status information was determined by submitting GIS shapefiles to be queried in the Arizona Game and Fish Heritage Data Management System (HDMS) in March of 2003.

Sonoran desert tortoise *Gopherus agassizii* (Sonoran population)

The unit contains valuable habitat for the Sonoran desert tortoise, which is considered a species of concern for the US Fish and Wildlife Service and the Arizona Game and Fish Department (HDMS 2003). In the 1987 Wilderness FEIS BLM concluded that the Butterfield Stage Memorial unit contained 2,870 acres of crucial Desert tortoise habitat that supported 220 adult Desert tortoises. Current population estimates are unknown, but with an increase in motorized and non-motorized recreation these numbers have probably declined and would be further protected by wilderness protection. The literature review and documentation included in Kim Crumbo's, *Roads and Desert Tortoise: The Impact of Roads on the Threatened Desert Tortoise* in

Appendix G of this proposal clearly demonstrates that sustainable Desert tortoise populations will be best protected by reducing road densities and limiting access to Tortoise habitat. Wilderness protection clearly offers the most protective and long-term tool available to federal land managers such as the BLM to accomplish these tasks.

desert bighorn sheep *Ovis canadensis mexicana*

The desert bighorn sheep is a charismatic animal that over the millennia has become well adapted to the harsh desert conditions. The desert bighorn sheep is a heavily managed species in the Sonoran Desert, but the historical carrying capacity of its habitat in the many desert mountain ranges is not well known. In the 1987 Wilderness FEIS BLM claimed that there were 6,310 acres of crucial habitat for this species in the Butterfield Stage Memorial unit, and that about 10 adult sheep roamed the area because of its contiguous borders with the North Maricopa Mountains Wilderness. The desert bighorn sheep represents three different types of focal species status: flagship, habitat quality indicator, and wilderness quality indicator (Parsons 2003).

Its status as a flagship species is justified in that permits for hunting this species are typically auctioned off at $125,000 and more at an annual Desert Bighorn Sheep Society fundraiser. Hunters and people who enjoy watching wildlife find viewing or hunting Bighorns a privilege that is far too uncommon. The desert bighorn sheep can be used to promote conservation and habitat protection because if people respect and enjoy this majestic species then they are more likely to want to protect what it needs for survival.

The desert bighorn sheep is a habitat quality indicator because it requires a very specific habitat of steep slopes greater than 55 percent, and free of visual obstructions or

dense vegetation (Krausman et. al. 1999). Many estimates have been made on appropriate population numbers and habitat size requirements. The Butterfield Stage Memorial unit does not represent on its own a large core area of habitat, such as the North and South Maricopa Mountains Wildernesses. However, it is essential connective habitat that is only split by state route 238 and the railroad on the south side from the South Maricopa Mountains, and by the historic 4-wheel drive Butterfield Stage Route on the north from the North Maricopa Mountains Wilderness. Parsons (2003) recommends 48 square miles with 890 acres of suitable lambing habitat for viable sub-populations, which is represented in the North and South Maricopa Mountains Wildernesses. Parsons (2003) and Krausman and Leopold (1986) both warn against overlooking the value of habitat patches of 4 square miles or more near larger habitat areas. These smaller habitat areas, such as Butterfield Stage Memorial, can provide valuable migration and dispersal corridors, and serve as seasonal or part time habitats for individual bighorns (Parsons 2003). Butterfield Stage Memorial unit without a doubt provides habitat for the Maricopa Mountains bighorn populations, but it could also provide valuable dispersal corridor to the South Maricopa Mountains Wilderness. The existence and persistence of desert bighorn sheep in the Butterfield Stage Memorial unit will best be continued by protecting the unit as wilderness and closing the routes recommended by the AWC to protect the bighorn sheep from potential disturbance from motorized recreational activities.

Lastly, desert bighorn sheep are considered wilderness quality indicator species because they inhabit the most beautiful, rugged, and inaccessible terrain that is normally representative of wilderness. Bighorn sheep populations are often more robust in areas

where there is more wilderness and roadless land than any other land allocation, such as the southwestern deserts of Arizona's Cabeza Prieta NWR, Organ Pipe Cactus NM, and Barry M. Goldwater Range. Hopefully the Sonoran Desert NM can continue to be high quality habitat for this species with inclusion of the Butterfield Stage Memorial unit into the National Wilderness Preservation System.

Historical Review: The Arizona BLM Wilderness Inventory (1978-87)

The BLM's initial wilderness inventories were completed under the requirements of section 603 of the Federal Lands Policy and Management Act (FLPMA) of 1976. The BLM started an initial inventory of all public lands under their management in Arizona and sorted out all lands that "clearly and obviously" lacked wilderness characteristics. Through this process the Butterfield Stage Memorial (unit # 2-164) was chosen for further study as an initial inventory area. In the initial inventory process started in 1978 the BLM reported in their *Wilderness Review, Arizona Initial Inventory of Public Lands Administered by Bureau of Land Management Decision Report September 1979* that, "Comments were not specific enough to eliminate the necessity of field work for any portion of this unit. This entire unit will be intensively inventoried" (USDI 1979).

The BLM's *Wilderness Review, Arizona Intensive Inventory of Public Lands Administered by Bureau of Land Management Proposal Report May 1980,* states that, "The unit is essentially natural with man's work substantially unnoticeable" (USDI 1980a). The BLM also recognized the outstanding opportunities for solitude and primitive and unconfined recreation by stating, "The diversity of terrain and vegetation combine to provide an outstanding opportunity for solitude. While opportunities exist for

primitive and unconfined recreation, these are not outstanding because they are limited by the area's small size" (USDI 1980a). These findings are consistent with the direction given to BLM in the *Wilderness Inventory Handbook, Policy, Direction, Procedures, and Guidance for Conducting Wilderness Inventory on the Public Lands September 27, 1978.* The point that is not mentioned in the initial and intensive reviews is the supplemental values of prehistoric, historic, and ecological value for desert bighorn sheep and desert tortoise. The 1978 *Wilderness Inventory Handbook* did direct BLM to include these supplemental values in the intensive review process, but they were left out of the documentation in these phases.

The Butterfield Stage Memorial did become a WSA through the process described above and was further studied through the Wilderness EIS process completed by the BLM in 1987. In BLM's FEIS for the Lower Gila South EIS Area they did not recommend the Butterfield Stage Memorial for inclusion in the National Wilderness Preservation System. The primary reasons for this recommendation were that the unit's small size (9,566 acres) would only provide outstanding opportunities for solitude for a limited number of people and the steep terrain's funneling affect would make visitor contacts more likely (USDI 1987). In the BLM's FEIS they stated, "Opportunities for primitive and unconfined recreation are limited because the WSA's small size precludes extensive backcountry travel" (USDI 1987: p 78).

These rationales are faulty in that the BLM did find that the unit provided outstanding opportunities for solitude, but made a purity judgment on how many people would and could use the unit and experience solitude. The Wilderness Act section 2(c) and the BLM's 1978 *Wilderness Inventory Handbook* interpretation of this section only

requires that the unit posses "outstanding opportunities for solitude **or** a primitive and unconfined type of recreation" (USDI 1978; (P.L. 88-577 § 2(c)(2); U.S.C. 16 § 1131 2(c)(2)) (emphasis added).

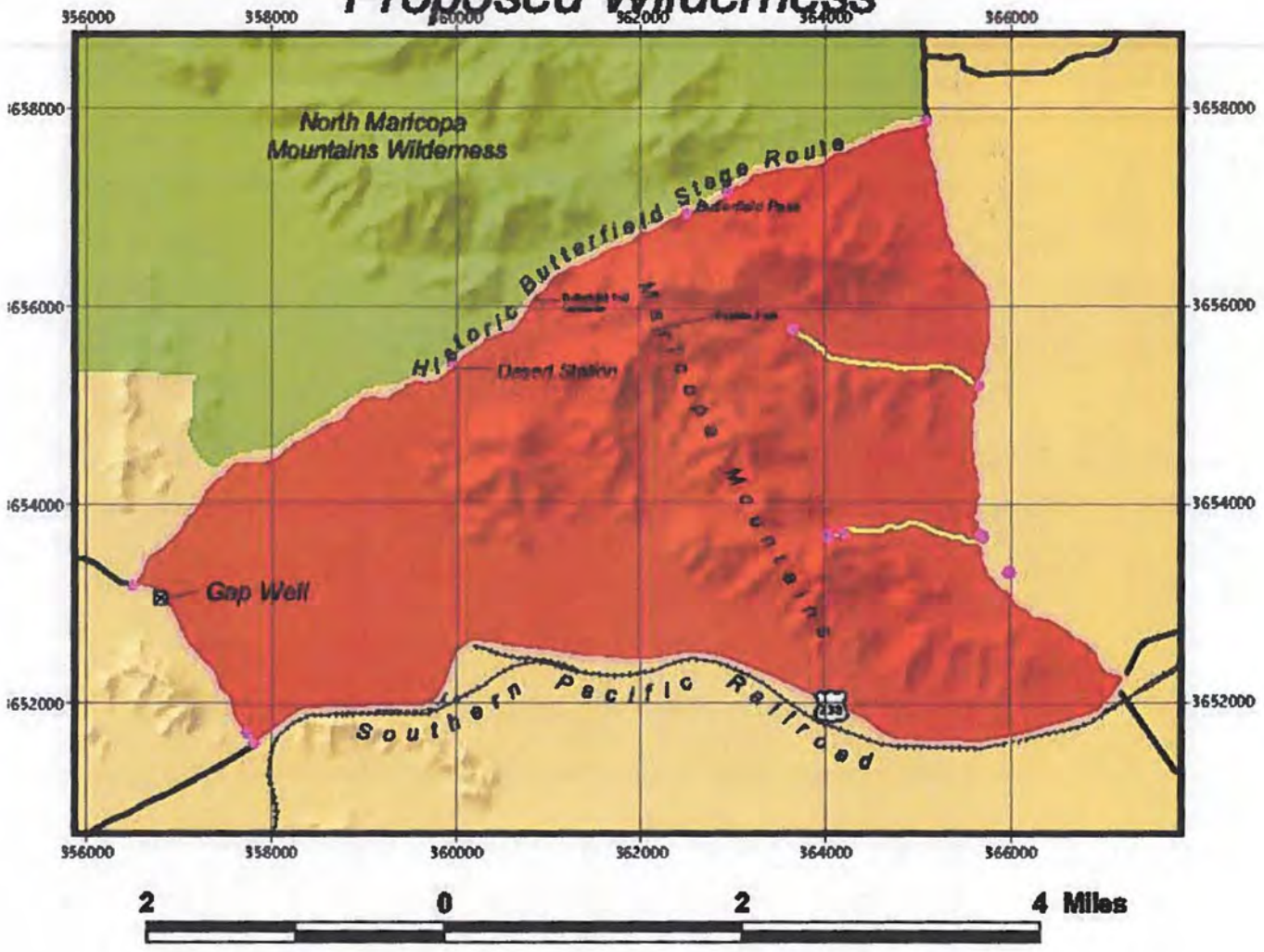
The BLM also incorrectly assessed the opportunities for primitive and unconfined recreation as they only addressed the opportunity for extensive backcountry travel, which is outstanding if considered in relation to the adjacent North Maricopa Mountains. The Butterfield Stage Memorial route only separated the two units. Surely there are opportunities for other types of primitive and unconfined recreation such as day hiking, bird watching, rock hounding, botany, and wildlife viewing in this unit. I have personally hiked in this unit and enjoyed the steep ridges and small canyons. Climbing the ridges to get a view of the surrounding area offers an excellent primitive experience.

The BLM did evaluate the potential impacts to desert tortoise and bighorn sheep in relation to wilderness protection in this unit, but did not evaluate this unit's use and potential as a key corridor for connectivity of bighorn sheep populations between the North and South Maricopa Mountains. The BLM's 1987 FEIS stated, "55 percent of the crucial bighorn sheep habitat and 49 percent of the crucial desert tortoise habitat would be disturbed by mining and recreation activity" (p 144) as a result of non-designation. The BLM also stated that only 3 percent of bighorn sheep habitat and 7 percent of desert tortoise habitat would be disturbed by increased non-motorized recreation with wilderness protection (USDI 1987). Clearly the BLM ignored their own findings in relation to this unit's wilderness values and their multiple use mission to "prevent permanent impairment of the productivity of the land and the quality of the environment" (P.L. 94-579 § 103(c); 43 U.S.C. § 1702(c)).

Conclusion

The Arizona Wilderness Coalition citizen's inventory presented here has documented that the Butterfield Stage Memorial unit still possesses outstanding wilderness characteristics and deserves protection as wilderness. The results of non-designation of this unit will be increased motorized visitation, proliferation of illegal motorized trails, dumping, illegal vegetation cutting for fire wood, and potential poaching because of the proliferation of illegal motorized routes. The human population of nearby Maricopa is about to expand by over 150,000 people (Burrough 2003). The Sonoran Desert National Monument will become these new residents' backyard playground and without restrictive land-use decisions it will likely become devoid of the objects for which it was created, such as bighorn sheep, large stands of saguaros, and the untrammeled landscape. Protecting the Butterfield Stage Memorial unit for its wilderness characteristics will above all other uses, effectively protect these characteristics and in turn protect the objects of the monument.

Butterfield Stage Memorial Proposed Wilderness



Legend

- Photo Points

Inventoried Routes

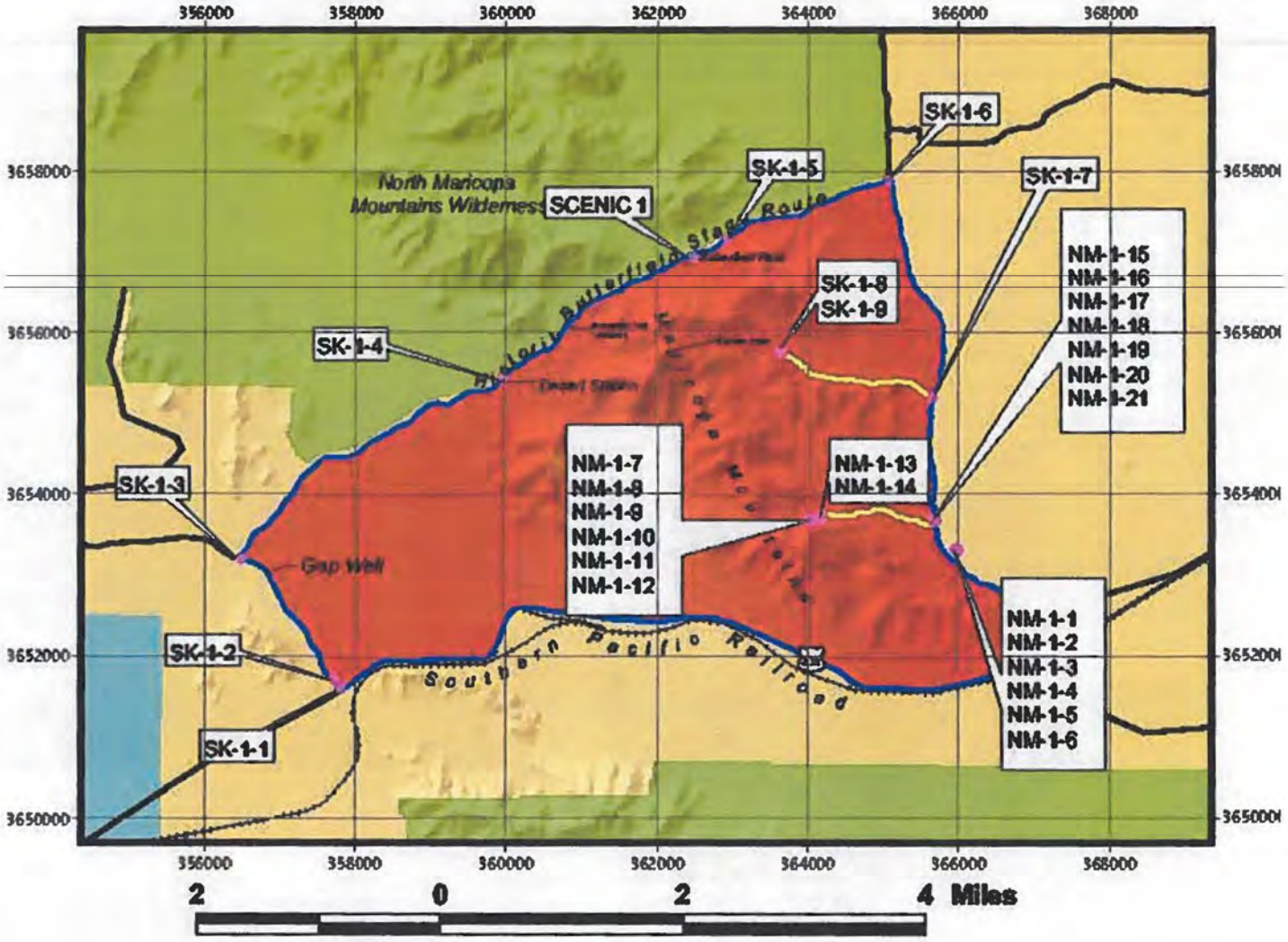
- Recommended Closed Routes
- Recommended Open Routes

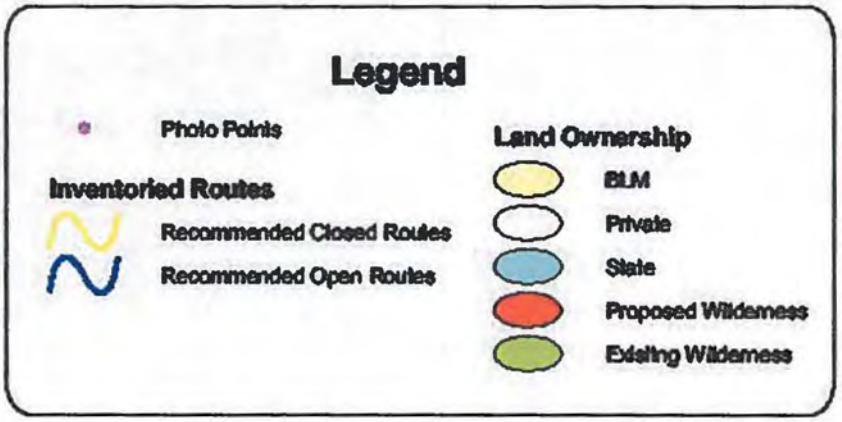
Land Ownership

- BLM
- Private
- State
- Proposed Wilderness
- Existing Wilderness

N
W
E
S

Butterfield Stage Memorial
Inventoried Routes and Photo Points

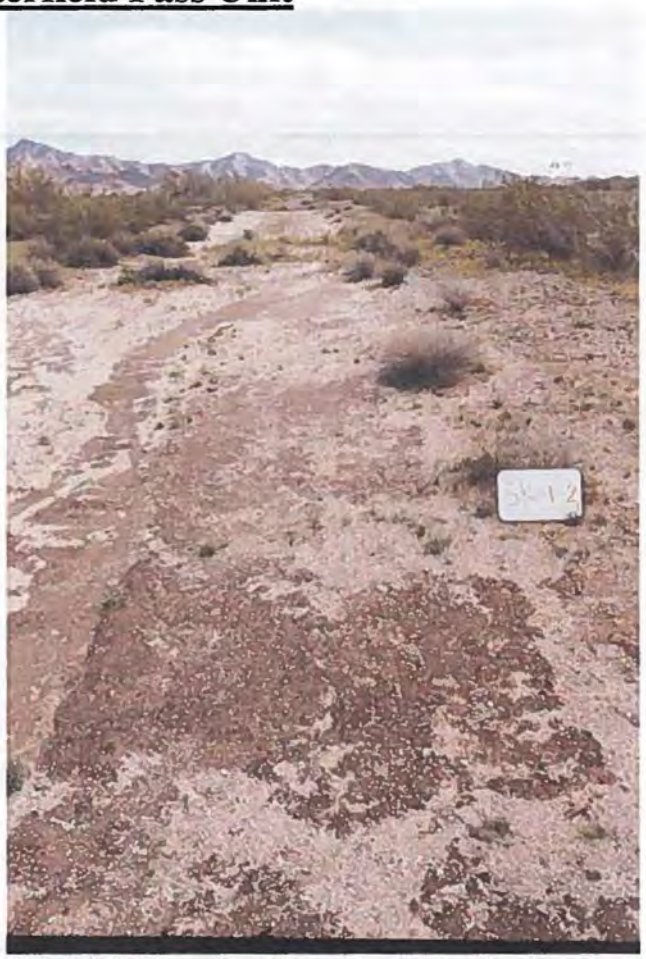




Route Analysis for Butterfield Pass Unit

Route #: 1
Photos: SK-1-1 thru SK-1-3
Length: 1.44 miles
Construction Type: Bladed and regularly maintained
FLPMA Road Definition: Yes
Campsites: 2
Vehicle Type: 2WD
Erosion: N/A
Vegetation Present: primarily bare soil (bare soil is >50% of surface
Other Impacts: some trash on side of road
Proposed Action: open
Notes: This route is used for access to the Butterfield Pass Stage Line

SK-1-1 Begin Route # 1 west of Butterfield Pass WSA proposal boundary. Direction: NW



SK-1-2 Old road grade appears naturalized surface covered in crypto biotic soil. Direction: NE

SK-1-3 Old fence line at junction on NW corner of proposal area. End route #1 Direction: NW

Route #: 2
Photos: SK-1-3 thru SK-1-6
Length: 6.53 miles
Construction Type: user created/historic stage line route
FLPMA Road Definition: No
Campsites: 1
Vehicle Type: HC 4WD
Erosion: ruts ≥ 12" in depth
Vegetation Present: primarily bare soil (bare soil is >50% of surface
Other Impacts: some vehicles travel in washes, trash along route
Proposed Action: open
Notes: This route is used for access to the Butterfield Pass Stage Line, many wash crossings > 36" width, steep grades, loose sand, excellent access to wilderness, beautiful views of Sonoran Desert plant communities, Wilderness Characteristics abound in this area. North Maricopa Mtn Wilderness borders north side of route. Well-signed wilderness boundary to North. Interpretive signs along route.

SK-1-4 Interpretive sign along Historic Butterfield Stage Line route. Direction: SW

SK-1-5 Gate at Butterfield Pass. Direction: SW

SK-1-6 End Route 2. NE corner of Butterfield Pass WSA proposal. Direction: SW

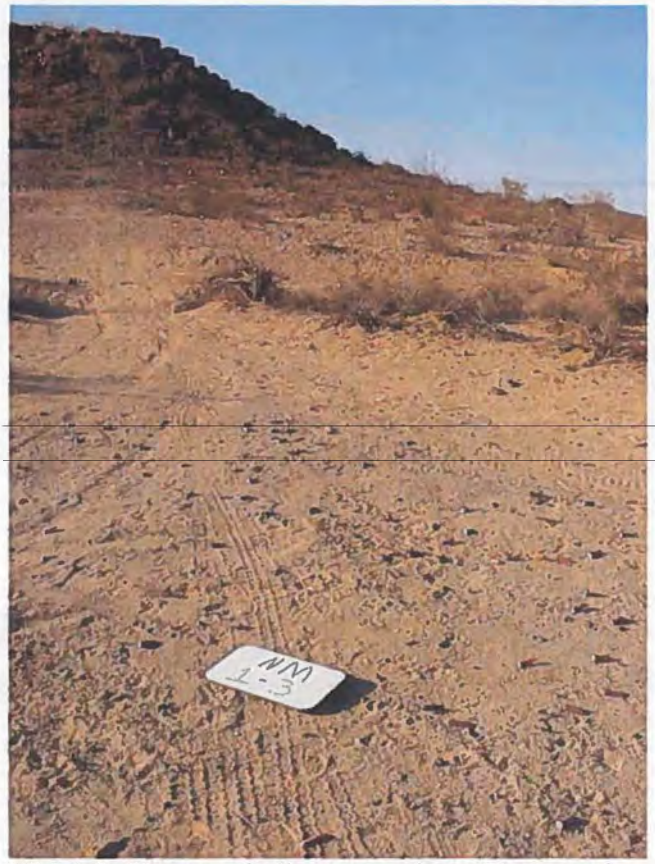
Route #: 3
Photos: SDNM-2-4, SK-1-7, NM-1-1,2-6
Length: 4.46 miles
Construction Type: User Created
FLPMA Road Definition: No
Campsites: Numerous
Vehicle Type: HC 2WD
Erosion: ruts ≥ 12" in depth
Vegetation Present: primarily bare soil (bare soil is >50% of surface
Other Impacts: vehicle travel in washes, trash along route, ORV use in creosote flats, target shooting, illegal cutting of saguaro, illegal dumping along side route
Proposed Action: open, suggest monitoring use in this area
Notes: This route is used for access to the Butterfield Pass Stage Line, many wash crossings > 36" width, steep grades, loose sand, excellent access to wilderness, beautiful views of Sonoran Desert plant communities, Wilderness Characteristics abound in this area. North Maricopa Mtn Wilderness access is from north end of route.

SDNM-2-4 View to North Begin route # 3. NW Corner of Butterfield Pass WSA proposal Area.

SK-1-7 ORV donuts at route junction of route # 4. Direction: W

NM-1-1 Numerous tracks, target shooting. Damage to creosote, ocotillo, shot-up saguaro. Direction: N

NM-1-2 Spent ammunition shells, destroyed creosote. Direction: W



NM-1-3 Shotgun shells strewn about. Destroyed ocotillo in background. Direction: NE

NM-1-4 No white board. Saguaro has been shot several times Direction: NE

NM-1-5 Target practice. Direction: NW

NM-1-6 Propane canisters, dead ocotillo, trash Direction: E

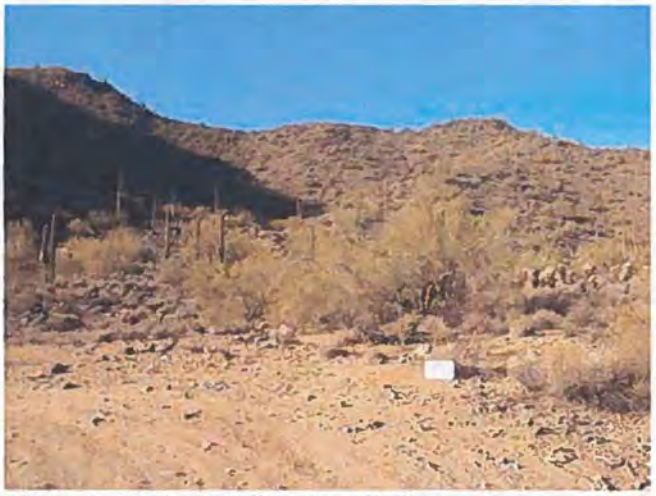
Route #: 4
Photos: SK-1-7, 8,9
Length: 1.39 miles
Construction Type: User Created
FLPMA Road Definition: No
Campsites: 3
Vehicle Type: HC 2WD
Erosion: negligible
Vegetation Present: primarily grass (<25% bare soil exposed
Other Impacts: vehicle travel in washes, trash along route, ORV use in creosote flats, target shooting, illegal cutting of saguaro, illegal dumping along side route
Proposed Action: close and restore
Notes: This route is used for access to the upper parts of this canyon, camping. Users have pushed this route well beyond what is recorded on the map. The route sees little use. Old camps have been reclaimed and are over grown with vegetation. Much of the route is crowded with vegetation as it winds through and between plants of an east-facing bajada community.

SK-1-7 Begin route # 4 Direction: W

SK-1-8 End route # 4 at campsite Direction: NW

SK-1-9 Average tread conditions route # 4 Direction: E

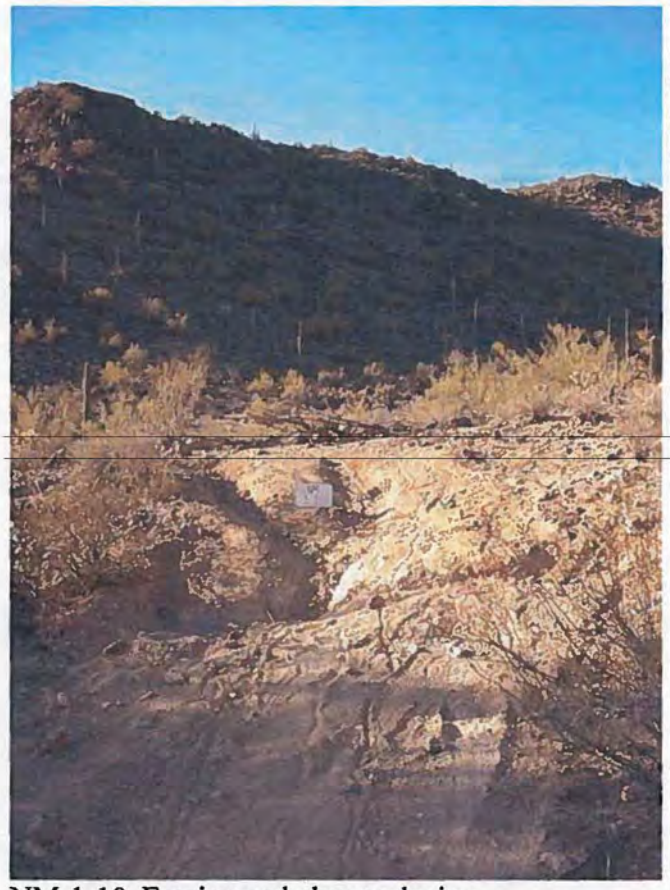
Route #: 5
Photos: NM-1-7 thru NM-1-21
Length: 1.11 miles
Construction Type: User Created
FLPMA Road Definition: No
Campsites: 2
Vehicle Type: HC 2WD
Erosion: n/a
Vegetation Present: grass/forbes intermittent with bare soil (bare soil is between 25-50%)
Other Impacts: vehicle travel in washes, trash along route, extensive ORV resource damage, target shooting, illegal dumping along side route, and archeological site disturbance
Proposed Action: close and restore to facilitate natural processes.
Notes: This route is used for access to camping at the base of the hills. There is use by target shooters, campers, and extensive ORV and user damage. Vegetation has been damaged along side of route.



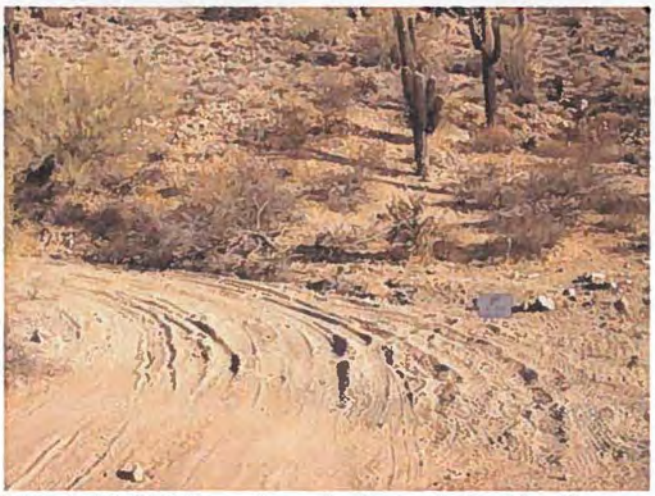
NM-1-7 End route # 5. Small fire ring. Direction: SE

NM-1-8 End route # 5

NM-1-9 Wildcat road. Evidence someone has attempted to close it. Direction: W



NM-1-10 Erosion and closure device.
Direction: SE



NM-1-11 ORV/ truck tracks in wash for ¼ mile.
Direction: NW

NM-1-12 Shot-up saguaro.

NM-1-13 Average Conditions route # 5
Direction: NE

NM-1-14 Begin route # 5 at junction of route # 3
Direction: W

NM-1-16 Trashed campsite Direction: SE

NM-1-17 ORV Damage Direction: SW

NM-1-18 ORV Damage Direction: NE

NM-1-19 Archeological site

NM-1-20 Shells

Route #: 6
Photos: n/a
Length: 6.47 miles
Construction Type: Paved/Maintained
FLPMA Road Definition: Yes
Campsites: n/a
Vehicle Type: standard 2WD passenger vehicle
Erosion: n/a
Vegetation Present: n/a
Other Impacts: trash along road
Proposed Action: open, clean up roadside
Notes: This route is Hwy 238.

ATTACHMENT 4

Hack Lake Special Recreation Management Area

(Alternative B)

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SRMA/RMZ Outcome Objective

Participants in visitor assessments report an average 4.0 realization of the targeted experience and benefit outcomes listed below. (4.0 on a probability scale where: 1 = Not at all realized to 5 = totally realized).

Activities

- Hiking
- Horseback Riding
- Hunting
- Camping

Experiences

- Enjoying an escape from crowds of people
- Releasing or reducing some built-up mental tensions
- Getting some needed physical exercise
- Enjoying the area's wildlife, scenery, views and aesthetics.

Benefits

Personal:
- Greater outdoor self-reliance, knowledge and self-confidence
- Improved physical fitness and health maintenance
- Improved mental well-being
- Greater environmental awareness and sensitivity

Community/Social:
- Strengthing relationships with family and friends

Environmental:
- Increased awareness and protection of natural landscapes

Economic:
- Increased desirability as a place to live or retire

Proposed Recreation Setting Characteristics (RSCs)

Proposed Physical RSCs:

Remoteness:
- The current remoteness from motorized vehicles exists.

Naturalness:
- The existing natural landscape is retained. Any new, non-recreational modifications (e.g., ROWs, fences, ponds) are not visually obvious or evident.

Visitor Facilities:
- Simple/basic recreation developments at trailheads along with maintained/signed trails are found on-site.

Proposed Social RSCs:

Contacts (avg.):
- Participants encounter a season average of up to 6 encounters per day.

Group Size (avg.):
- Participants encounter a season average of up to 8 people per group.

Evidence of Use:
- Sounds of other people rarely heard. A few small localized areas of vegetation alteration and compacted/bare soils are acceptable near the trailhead and at campsites. Inappropriate recreation use is rehabilitated.

Proposed Operational RSCs:

Access (types of travel):
- All public recreational access is non-motorized/mechanized.

Visitor Services/Info:

- A simple brochure/map assists visitors. Minimum directional signage is installed on routes. Rules, regulations and ethics clearly posted at trailheads.

Management Controls:

- A moderate degree of visitor and land use controls exercised. BLM on-site presence is low away from trailheads.

Supporting Management Action and Allowable Use Decisions

Camping Restrictions:

- In areas open to camping and overnight use, apply a 14-day camping limit on BLM lands from September 1 to March 31. From April 1 to August 31, apply a 7-day camping limit. Campers must relocate at least a 30-mile radius away and may not return within 30 days to a previous campsite.

Comprehensive Trails and Travel Management:

- The area is classified as closed to motorized vehicle use.
- Over-snow travel is prohibited.
- Cross-country motorized/mechanized travel for big game retrieval is prohibited. Hand-held, wheeled carts are allowed for the direct retrieval of big game.

Firearm Use Restriction:

- The discharge of firearms for recreational target shooting is prohibited in developed recreation sites.

Forestry:

- The SRMA is closed to timber harvest, firewood cutting and special forest product harvest.

Lands and Realty:

- ROW avoidance areas are applied to the SRMA.
- ROW avoidance areas are applied to developed recreation sites.
- The SRMA is retained for long-term management.
- Developed recreation sites are retained for long-term management.

Mineral Material (salable) Disposal:

- The SRMA is closed to mineral material (salable such as moss rock, top soil, sand and gravel, scoria, fill dirt) disposal.

Mineral Withdrawal:

- Petition for withdrawal to the Secretary of the Interior developed recreation sites for closure to the mining laws for locatable exploration or development (locatable minerals).

Non-energy Solid Mineral Leasing:

- All federal mineral estate within SRMAs would be closed to non-energy solid mineral leasing.

Special Recreation Permits:

- Only issue special recreation permits if the proposed activity or event is beneficial to the realization of values associated with primitive and unconfined recreation opportunities.
- No special recreation permits for competitive events would be issued.
- Downhill biking shuttle services and downhill mountain biking events would not be authorized.

Stipulations for Fluid Mineral Leasing and Other Surface-Disturbing Activities:

- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in the SRMA for the protection of the recreation activities, recreation outcomes and the RSCs.
- Apply a controlled surface use stipulation on surface occupancy and surface-disturbing activities to minimize conflicts with developed (and future) recreation sites and to mapped (and future) national/regional trails, local system trails that connect communities, and trailheads and interpretive sites with exceptional recreation values or significant public interest.

Visual Resource Management (VRM):

- The SRMA would be classified as VRM Class II and managed under VRM Class II objectives.
- Apply a controlled surface use stipulation on VRM Class II to retain the existing character of the landscape.

- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in VRM Class II areas with slopes over 30 percent and high visual sensitivity to preserve the visual setting and visual integrity. Lands with high visual sensitivity are those lands within five miles of the sensitive viewshed corridors of moderate to high visual exposure, where details of vegetation and landform are readily discernible, and changes in visual contrast can be easily noticed by the casual observer.

Implementation-level Decisions Included in this RMP Revision.

Comprehensive Trails and Travel Management:

- A site-specific travel network of roads and trails available for public use and any limitations placed on that use would be included in the land use plan to the extent practical. In some areas the final travel management network of trails would be determined, at the implementation level (on-the-ground) due to the complexity of the area and incomplete data.

Special Recreation Permits:

- Vending permits would not be issued.

Best Management Practices to Guide Implementation-level Management

Management:

- Maintain the existing trail system, install minimal signage on trails and construct new trails only to connect to new access points.
- Reroute trails that that create resource damage or trespass on private property.
- Downhill bikes are primarily intended for high speed descent. Downhill biking trails would not be constructed.
- With stakeholder involvement, apply adaptive management (e.g., Limits of Acceptable Change) which focuses on a cycle of *designing-implementing-monitoring-evaluating-adjusting* implementation actions to respond to future recreation issues and the results of monitoring.

Administration:

- Administrative use authorizations for motorized access would be granted on a case-by-case basis.
- As one part of a comprehensive funding strategy to support recreation sites and services, the BLM (with partner support) may charge fees for standard or expanded amenity recreation sites and services.
- Unless otherwise specified, SRPs would be issued as a discretionary action. Analyze applications through the SRP Permit Evaluation Criteria for the issuance of Class I, II, III special recreation permits that are consistent with RMP objectives.
- Collaborate with the White River National Forest regarding visitor information that complements USFS management of the adjacent Flat Tops Wilderness.
- Collaborate with White River National Forest and private entities to provide a better trailhead and facilities at Sweetwater Lake.

Information and Education:

- Create a basic, simple SRMA brochure/map including information on: targeted outcomes, RSCs, estimated times, ethics, wildlife protection, private-public land ownership and stewardship information; to help preserve the recreation opportunities and the special landscape character of this place.
- Market the area locally. Local marketing involves tailoring information and maps to the needs and wants of local customers and providing information at local outlets and on-site locations only.

Monitoring:

- Monitor outcome attainment and preferences through customer assessments (e.g., focus group interviews or visitor studies) on five year intervals or as funding allows. Monitor activity participation and RSCs annually during the primary use season of June through November.

- If future monitoring indicates that social RSCs are not being achieved, resource damage is occurring or user conflicts need to be addressed, the CRVFO may create an allocation system or apply group size limits for private and commercial recreation use.

Red Hill Special Recreation Management Area

(Alternatives B, C, D)

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SRMA/RMZ Outcome Objective

Participants in visitor assessments report an average 4.0 realization of the targeted experience and benefit outcomes listed below. (4.0 on a probability scale where: 1 = Not at all realized to 5 = totally realized).

Activities

- Mountain Biking
- Hiking

Experiences

- Releasing or reducing some built up mental tensions
- Enjoying frequent access to outdoor physical activity
- Developing your skills and abilities
- For the challenge or sport
- Enjoying the areas wildlife, scenery, views and aesthetics

Benefits

Personal:

- Improved physical fitness/ better health maintenance
- Restored mind from stress/tension/anxiety
- Improved outdoor recreation skills
- Living a more outdoor-oriented lifestyle.
- Improved balance of work and play in my life
- Greater awareness of this area as a special place

Community/Social:

- Lifestyle improvement or maintenance

Environmental:

- Preserve the special landscape character of this place

Economic:

- Maintain local tourism revenue ***Alternative D only***
- Greater value-added local services
- Increased desirability as a place to live or retire

Proposed Recreation Setting Characteristics (RSCs)

Proposed Physical RSCs:

Remoteness:

- Remoteness from motorized vehicles exists.

Naturalness:

- The existing natural landscape is retained. Any new, non-recreational modifications (e.g., ROWs, fences, ponds) are not visually obvious or evident.

Visitor Facilities:

- Simple/basic recreation developments at trailheads along with maintained and signed single-track trails are found on-site.

Proposed Social RSCs:

Contacts (avg.):

- Participants would encounter a season average of up to 8 encounters per day.

Group Size (avg.):

- Participants would encounter a season average of up to 6 people per group.

Evidence of Use:

- Sounds of other people occasionally heard. A few small localized areas of vegetation alteration and compacted/bare soils are acceptable. Inappropriate recreation use is rehabilitated

Proposed Operational RSCs:

Access (types of travel):

- Mountain bike single-track trails and use are predominant all recreational use is non-motorized.

Visitor Services/Info:

- A simple brochure/map assists visitors. Minimum directional signage is installed on routes. Rules, regulations and ethics clearly posted at trailheads.

Management Controls:

- A moderate degree of visitor and land use controls exercised. BLM on-site presence is low away from trailheads.

Supporting Management Action and Allowable Use Decisions

Camping:

- The SRMA is closed to camping and overnight use.

Comprehensive Trails and Travel Management:

- The area is classified as closed to motorized vehicle use and limited to designated routes for mountain bikes.
- Except for the Mushroom Rock area, the SRMA is closed to motorized and mechanized travel from December 1 to April 15 to protect wintering big game species.
- Over-snow travel is prohibited.
- Hand-held, wheeled carts are allowed for the direct retrieval of big game.

Firearm Use Restriction:

- The discharge of firearms for recreational target shooting is prohibited in developed recreation sites.

Forestry:

- The SRMA is closed to timber harvest, firewood cutting and special forest product harvest.

Lands and Realty:

- ROW avoidance areas are applied to the SRMA. ***Alternatives B & C only***
- ROW avoidance areas are applied to developed recreation sites.
- The SRMA is retained for long-term management.
- Developed recreation sites are retained for long-term management.

Mineral Material (salable) Disposal:

- The SRMA is closed to mineral material (salable such as moss rock, top soil, sand and gravel, scoria, fill dirt) disposal. ***Alternatives B & C only***

Mineral Withdrawal:

- Petition for withdrawal to the Secretary of the Interior developed recreation sites for closure to the mining laws for locatable exploration or development (locatable minerals).

Non-energy Solid Mineral Leasing:

- All federal mineral estate within SRMAs would be closed to non-energy solid mineral leasing.

Special Recreation Permits:

- No competitive events, group use or new commercial special recreation permits would be issued.
- Downhill biking shuttle services and downhill mountain biking events would not be issued.

Stipulations for Fluid Mineral Leasing and Other Surface-Disturbing Activities:

- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in the SRMA for the protection of the recreation activities, recreation outcomes and the RSCs.
- Apply a controlled surface use stipulation on surface occupancy and surface-disturbing activities to minimize conflicts with developed (and future) recreation sites and to mapped (and future) national/regional trails, local system trails that connect communities, and trailheads and interpretive sites with exceptional recreation values or significant public interest.

Visual Resource Management (VRM):

- The SRMA would be classified as VRM Class II and managed under VRM Class II objectives.
- Apply a controlled surface use stipulation on VRM Class II to retain the existing character of the landscape.
- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in VRM Class II areas with slopes over 30 percent and high visual sensitivity to preserve the visual setting and visual integrity. Lands with high visual sensitivity are those lands within five miles of the sensitive viewshed corridors of moderate to high visual exposure, where details of vegetation and landform are readily discernible, and changes in visual contrast can be easily noticed by the casual observer.

Implementation-level Decisions Included in this RMP Revision.

Comprehensive Trails and Travel Management:

- A site-specific travel network of roads and trails available for public use and any limitations placed on that use would be included in the land use plan to the extent practical.
- Maintain the existing trail system and construct new trails only to connect to new access points. ***Alternative C only***
- Construct new mountain bike trails on the northside to create a few more loop trails and make trail connections to new access points. ***Alternatives B and D only***

Special Recreation Permits:

- No vending permits outside of special events would be issued.
- Limited small (< 75 person) competitive and group use events would be allowed. ***Alternative D only***

Best Management Practices to Guide Implementation-level Management

Management:

- Reroute trails that that create resource damage and trespass on private property.
- Develop additional access (e.g., Aspen Glen and/or Cattle Creek/Crystal Springs Road).
- Downhill bikes are primarily intended for high speed descent. Downhill biking trails would not be constructed.
- With stakeholder involvement, apply adaptive management (e.g., Limits of Acceptable Change) which focuses on a cycle of *designing-implementing-monitoring-evaluating-adjusting* implementation actions to respond to future recreation issues and the results of monitoring.

Administration:

- Administer the SRMA under a Memorandum of Understanding between the Red Hill Council and the BLM CRVFO that outlines administrative roles and responsibilities.
- Administrative use authorizations for motorized access would be granted on a case-by-case basis.
- As one part of a comprehensive funding strategy to support recreation sites and services, the BLM (with partner support) may charge fees for standard or expanded amenity recreation sites and services.

Information and Education:

- Continue to provide a basic, simple SRMA brochure/map including information on: targeted outcomes, RSCs, estimated times, ethics, wildlife protection, private-public land ownership and stewardship information; to help preserve the recreation opportunities and the special landscape character of this place.
- Work with local tourism groups, local businesses and the Red Hill Council to tailor information and maps to the needs and wants of local customers. Provide information at local outlets and on-site locations only. ***Alternatives B and C only***

- Work with local tourism groups, local businesses and the Red Hill Council regarding tourism in an effort to promote mountain biking opportunities in the Roaring Fork Valley. ***Alternative D only***

Monitoring:

- Monitor outcome attainment and preferences through customer assessments (e.g., focus group interviews or visitor studies) on five year intervals or as funding allows. Monitor activity participation and RSCs annually during the primary use season of mid-April through October.
- If future monitoring indicates that social RSCs are not being achieved, resource damage is occurring or user conflicts need to be addressed, the CRVFO may create an allocation system or apply group size limits for private and commercial recreation use.

Fisher Creek Extensive Recreation Management Area

(Alternatives B and C)

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ERMA Objective

In the Fisher Creek ERMA the R&VS focus on interdisciplinary travel management and providing basic visitor services that maintains a naturally-appearing landscape that supports participation in a variety of non-motorized recreation activities (e.g., mountain biking, hiking, and hunting).

Supporting Management Action and Allowable Use Decisions

Camping Restrictions:

- Camping and overnight use is prohibited on BLM lands within ¼ mile of the Fisher Creek Cemetery Road.
- In areas open to camping and overnight use, apply a 14-day camping limit on BLM lands from September 1 to March 31. From April 1 to August 31, apply a 7-day camping limit. Campers must relocate at least a 30-mile radius away and may not return within 30 days to a previous campsite.

Comprehensive Trails and Travel Management:

- The Haff Pasture (northern) portion is closed to motorized vehicle except on the Fisher Creek Cemetery Road. Outside of the Haff Pasture, the area is classified as limited to designated routes (All modes and types of over-land public travel, except foot and horse travel would be limited to designated routes).
- Over-snow travel is prohibited.
- The northern part of the ERMA (Haff Ranch) is closed to motorized and mechanized travel from December 1 to April 15 to protect wintering big game species. ***Alternative B only***
- The entire ERMA (Haff Ranch and the Cattle Creek area) is closed to motorized and mechanized travel from December 1 to April 15 to protect wintering big game species. ***Alternative C only***
- In areas with limited travel designations, allow motorized/mechanized travel up to 300 feet from designated motorized/mechanized routes for direct access to dispersed campsites provided that: 1) no resource damage occurs; 2) no new routes are created; and 3) such access is not otherwise prohibited.
- Cross-country motorized/mechanized travel for big game retrieval is prohibited. Hand-held, wheeled carts are allowed for the direct retrieval of big game.

Cross-country Skiing/Snowshoeing/Snowboarding:

- Cross country skiing/snowshoeing/snowboarding is prohibited.

Dogs:

- Non-working dogs are not allowed in the ERMA from December 1 to April 15. ***Alternative C only***

Firearm Use Restriction:

- The discharge of firearms for recreational target shooting is prohibited in developed recreation sites.

Forestry:

- The ERMA is closed to timber harvest, firewood cutting and special forest product harvest.

Lands and Realty:

- ROW avoidance areas are applied to developed recreation sites.
- The ERMA is retained for long-term management.
- Developed recreation sites are retained for long-term management.

Mineral Withdrawal:

- Petition for withdrawal to the Secretary of the Interior developed recreation sites for closure to the mining laws for locatable exploration or development (locatable minerals).

Special Recreation Permits:

- Downhill biking shuttle services and downhill mountain biking events would not be issued

Stipulations for Fluid Mineral Leasing and Other Surface-Disturbing Activities:

- Apply a controlled surface use (CSU) stipulation within the ERMA. ***Alternative B only***
- Apply a controlled surface use stipulation on surface occupancy and surface-disturbing activities to minimize conflicts with developed (and future) recreation sites and to mapped (and future) national/regional trails, local system trails that connect communities, and trailheads and interpretive sites with exceptional recreation values or significant public interest.

Visual Resource Management (VRM):

- Apply a controlled surface use stipulation on VRM Class II areas to retain the existing character of the landscape.
- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in VRM Class II areas with slopes over 30 percent and high visual sensitivity to preserve the visual setting and visual integrity. Lands with high visual sensitivity are those lands within five miles of the sensitive viewshed corridors of moderate to high visual exposure, where details of vegetation and landform are readily discernible, and changes in visual contrast can be easily noticed by the casual observer.

Implementation-level Decisions Included in this RMP Revision.

Comprehensive Trails and Travel Management:

- A site-specific travel network of roads and trails available for public use and any limitations placed on that use would be included in the land use plan to the extent practical. In some areas the final travel management network of trails would be determined, at the implementation level (on-the-ground) due to the complexity of the area and incomplete data.

Special Recreation Permits:

- Limited small (< 75 person) competitive and group use events would be allowed. ***Alternative B only***
- No vending permits would be issued.

Best Management Practices to Guide Implementation-level Management

Management:

- Install minimal directional signing and no new trails would be constructed, only necessary reroutes of existing trails that create resource damage.
- Construct new routes on an interdisciplinary-basis in concert with other resources/resource programs. The focus of new routes should be to: form loop routes, link existing routes, create route connections to new access points and reduce conflicts (e.g., recreation, trespass on private property, resource).
- Downhill bikes are primarily intended for high speed descent. Downhill biking trails would not be constructed.
- Develop new recreation developments (e.g., trails, trailheads, restrooms) to effectively address recreation activity demand created by growing communities and recreation-tourism if: 1) the proposal is consistent with interdisciplinary land use plan objectives; and 2) sufficient funding and long-term management commitments are secured from managing partners.
- BLM funding (sometimes substantial when circumstances require it) and staff would be directed toward effectively addressing visitor health and safety, use/user conflict and resource protection issues created by recreation activities.
- Protect water resources and historical features of the area.

Administration:

- Administrative use authorizations for motorized access would be granted on a case-by-case basis.

- Unless otherwise specified, SRPs would be issued as a discretionary action for a wide variety of uses that are consistent with resource/program objectives and within budgetary/workload constraints.

Information and Education:

- Work with local chambers of commerce, tourism groups and businesses to provide definitive recreation information (i.e, accurate recreation information, user ethics, and use/user expectations) as opposed to promotional marketing.
- Provide visitor services and information (e.g., basic visitor brochures/maps, web-based materials, directional and informational signage, facilities, on-the-ground staff presence) sufficient to maintain activity participation, achieve ERMA objectives and reach resource stewardship goals.

Monitoring:

- Monitor: visitor use, visitor health and safety, resource conditions, and the physical qualities of the landscape with the help of recreation-tourism partnerships (e.g., towns, user groups, recreation-tourism organizations, outfitters, CDOW).

Thompson Creek Extensive Recreation Management Area (ERMA)

(Alternatives B and C)

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ERMA Objective

In the Thompson Creek ERMA the R&VS focus on interdisciplinary travel management and basic visitor services maintains a predominately natural landscape that supports participation in a variety of established recreation activities (e.g., mountain biking, sport climbing, hiking, horseback riding and hunting). ***Alternative B.***

In the Thompson Creek ERMA the R&VS focus on providing basic visitor services and information maintains a undisturbed natural landscape that supports participation in a variety of primitive recreation activities (e.g., traditional climbing, hiking, hunting and horseback riding). ***Alternative C.***

Supporting Management Action and Allowable Use Decisions

Camping Restrictions:
- Camping and overnight use is prohibited on BLM lands in the Thompson Creek area within ¼ mile of USFS Road 305.
- In areas open to camping and overnight use, apply a 14-day camping limit on BLM lands from September 1 to March 31. From April 1 to August 31, apply a 7-day camping limit. Campers must relocate at least a 30-mile radius away and may not return within 30 days to a previous campsite.

Comprehensive Trails and Travel Management:
- The parts that overlap with the Thompson Creek ACEC are closed to motorized and mechanized use. Outside of the ACEC the area is classified as limited to designated routes (All modes and types of over-land public travel, except foot and horse travel would be limited to designated routes).
- Over-snow travel is prohibited.
- The ERMA is closed to motorized and mechanized travel from December 1 to April 15 to protect wintering big game species.
- In areas with limited travel designations, allow motorized/mechanized travel up to 300 feet from designated motorized/mechanized routes for direct access to dispersed campsites provided that: 1) no resource damage occurs; 2) no new routes are created; and 3) such access is not otherwise prohibited.
- Cross-country motorized/mechanized travel for big game retrieval is prohibited. Hand-held, wheeled carts are allowed for the direct retrieval of big game.

Firearm Use Restriction:
- The discharge of firearms for recreational target shooting is prohibited in developed recreation sites.

Forestry:
- The ERMA is closed to timber harvest, firewood cutting and special forest product harvest.

Lands and Realty:
- ROW avoidance areas are applied to areas determined to contain wilderness characteristics. ***Alternative C only***
- ROW avoidance areas are applied to developed recreation sites.
- The ERMA is retained for long-term management.
- Developed recreation sites are retained for long-term management.

Mineral Withdrawal:
- Petition for withdrawal to the Secretary of the Interior developed recreation sites for closure to the mining laws for locatable exploration or development (locatable minerals).

Special Recreation Permits:
- No new special recreation permits would be issued.

- No competitive or group use special recreation permits would be issued.
- Downhill biking shuttle services and downhill mountain biking events would not be issued.

Stipulations for Fluid Mineral Leasing and Other Surface-Disturbing Activities:

- Apply a no surface occupancy (NSO) stipulation that prohibits surface occupancy and surface disturbing activities on public lands managed for wilderness characteristics (primitive and unconfined recreation) which includes the ERMA. ***Alternative C only***
- Apply a no surface occupancy stipulation within 0.25-mile of either side of the active river channel of the Colorado River that prohibits surface occupancy and surface disturbing activities on public lands managed to protect the outstanding remarkable values, water quality, and free flowing nature of suitable stream segments classified as "Wild" under the Wild and Scenic Rivers Act. ***Alternative C only***
- Apply a controlled surface use (CSU) stipulation within the ERMA. ***Alternative B only***
- Apply a controlled surface use stipulation on surface occupancy and surface-disturbing activities to minimize conflicts with developed (and future) recreation sites and to mapped (and future) national/regional trails, local system trails that connect communities, and trailheads and interpretive sites with exceptional recreation values or significant public interest.

Visual Resource Management (VRM):

- The Thompson Creek area would be managed for wilderness characteristics (primitive and unconfined recreation) and would be designated VRM Class II areas. ***Alternative C only***
- Apply a controlled surface use stipulation on VRM Class II areas to retain the existing character of the landscape.
- Apply a no surface occupancy stipulation on surface occupancy and surface-disturbing activities in VRM Class II areas with slopes over 30 percent and high visual sensitivity to preserve the visual setting and visual integrity. Lands with high visual sensitivity are those lands within five miles of the sensitive viewshed corridors of moderate to high visual exposure, where details of vegetation and landform are readily discernible, and changes in visual contrast can be easily noticed by the casual observer.

Wilderness Characteristics Management and Setting Prescriptions:

- Recreation use and management would comply with setting and management prescriptions intended to protect the values associated with wilderness character along with primitive and unconfined recreation opportunities. ***Alternative C only***

Implementation-level Decisions Included in this RMP Revision.

Climbing:

Alternative A only

- Climbing is permitted on designated bolted routes at the current climbing area (rock crag) only.
- No additional development of bolted routes within the area would be permitted. .
- Mechanical devices (e.g., power drills) may not be used at the current climbing area (rock fin) only.

Alternative B only

- Re-establishment of old routes and permanent fixed anchors (bolts and pitons) are permitted at the current climbing area (rock crag) only.
- No additional development of bolted routes within the area would be permitted.
- Mechanical devices (e.g., power drills) may be used at the current climbing area (rock fin) only.

Alternative C only

- The establishment of new routes and reestablishment of old routes using fixed anchors are not permitted. All climbing must be done without fixed anchors or other human installations.
- All existing fixed anchors (bolts, hangers and pitons) would be removed.
- Mechanical devices (e.g., power drills) would not be permitted.

Alternative D only

- The establishment of new routes and reestablishment of old routes using fixed anchors are permitted.

- Mechanical devices (e.g., power drills) would be permitted.

Comprehensive Trails and Travel Management:

- A site-specific travel network of roads and trails available for public use and any limitations placed on that use would be included in the land use plan to the extent practical. In some areas the final travel management network of trails would be determined, at the implementation level (on-the-ground) due to the complexity of the area and incomplete data.

Special Recreation Permits:

- No vending permits would be issued.
- Commercial/educational climbing use is limited to one 4 person group per day including staff. ***Alternative C only.***

Best Management Practices to Guide Implementation-level Management

Management:

- Construct new routes on an interdisciplinary-basis in concert with other resources/resource programs. The focus of new routes should be to: reduce the amount biking on roads, form loop routes, link existing routes, create route connections to new access points and reduce conflicts (e.g., recreation, trespass on private property, resource).
- Install minimal directional signing, construct only a few (< 8 miles) of new trails (i.e, mountain bike, foot and horseback), and reroute existing mountain bike trails when necessary. ***Alternative B only.***
- Downhill bikes are primarily intended for high speed descent. Downhill biking trails would not be constructed. ***Alternative B only.***
- Develop new recreation developments (e.g., trails, trailheads, restrooms) to effectively address recreation activity demand created by growing communities and recreation-tourism if: 1) the proposal is consistent with interdisciplinary land use plan objectives; and 2) sufficient funding and long-term management commitments are secured from managing partners.
- BLM funding (sometimes substantial when circumstances require it) and staff would be directed toward effectively addressing visitor health and safety, use/user conflict and resource protection issues created by recreation activities.

Administration:

- Administrative use authorizations for motorized access would be granted on a case-by-case basis.
- Unless otherwise specified, SRPs would be issued as a discretionary action for a wide variety of uses that are consistent with resource/program objectives and within budgetary/workload constraints. Prohibit vending permits outside of special events on BLM lands.
- No initial limitations on number of users/groups or group size for non-commercial use.

Information and Education:

- The community, local businesses and the Roaring Fork Climbing Coalition would not post information about the area on the world-wide web or other media outlets.
- The BLM would employ the principles of Leave No Trace to minimize the impact of climbing, including the removal of ropes and slings from permanent fixed anchors (IA).
- The community, local businesses and the RFCC would not post information about the area on the web or other media outlets.
- The BLM would encourage the use of bolt hangers painted in colors similar to the surrounding rock.
- Work with local chambers of commerce, tourism groups and businesses to provide definitive recreation information (i.e, accurate recreation information, user ethics, and use/user expectations) as opposed to promotional marketing.
- Provide visitor services and information (e.g., basic visitor brochures/maps, web-based materials, directional and informational signage, facilities, on-the-ground staff presence) sufficient to maintain activity participation, achieve ERMA objectives and reach resource stewardship goals.

Monitoring:

- Monitor: visitor use, visitor health and safety, resource conditions, and the physical qualities of the landscape with the help of recreation-tourism partnerships (e.g., towns, user groups, recreation-tourism organizations, outfitters, CDOW).

ATTACHMENT 5

APPENDIX R-10
EVALUATION CRITERIA

EVALUATION FACTORS—COMMERCIAL, COMPETITIVE, AND ORGANIZED GROUP SPECIAL RECREATION PERMITS (SRP) (OUTSIDE OF SPECIAL AREAS[1])

Sensitivity of the Site and Associated Features to Expected Uses and Impacts

Soils and Vegetation

Low–Site and associated features demonstrate resilience and resistance to anticipated impacts

Moderate–Site and associated features demonstrate some ability to resist/recover from impacts

High–Site and associated features demonstrate limited ability to resist/recover from impacts

Associated Features (such as cultural, paleontological, visual, wildlife resources)

None–No associated features

Moderate–Some associated features present, existing protection is adequate

High–Resource conflict exists at the site

Potential Environmental Effects

Low–Effects of a temporary nature and surface disturbance of less than 1 acre

Moderate–Effects lasting less than 1 year, surface disturbance less than 5 acres

High–Effects lasting more than 1 year, surface disturbance more than 5 acres

Size of Area

Small–Less than 5 acres

Medium–5 to 40 acres

Large–More than 40 acres

[1] *Special Areas are areas designated by Congress, the Secretary of the Interior, or BLM State Director where permits and fees may be required for recreational use.*

Exclusive Use Area

No–No exclusive use of any area will be required

Yes–An area of exclusive use will be required to support the permitted activity

Duration of Use

Short–1 day or less

Moderate–2 to 6 days

Long–More than 6 days

Anticipated Number of Participants/Vehicles

Low–Less than 25 people/Less than 25 vehicles

Medium–25 to 100 people/25 to 50 vehicles

High–More than 100 people/More than 50 vehicles

Competitive Event

Y–The event or activity is competitive in nature

N–The event or activity is non-competitive

Mechanical Equipment Required

Y–Vehicles or other mechanized equipment required in support of activity

N–No vehicles or other mechanized equipment required

Bureau of Land Management (BLM) Monitoring and Inspection Requirements

None–No significant pre- or post-permit oversight activities required

Low–Pre- or post-permit activities require less than 8 hours BLM oversight

High–Pre- or post-permit activities require more than 8 hours BLM oversight

Table R10-1. Permit Classification

Evaluation Factors	Permit Class			
	I	II	III*	IV*
Soils and Vegetation	Low	Low/Moderate	Moderate	High
Associated Features	None	None/Moderate	Moderate	High

Evaluation Factors	Permit Class			
	I	II	III*	IV*
Environmental Effects	Low	Low/Moderate	Moderate	High
Size	Small	Medium	Medium	Large
Exclusive Use	No	No	No	Yes
Duration	Short	Short/Moderate	Moderate	Long
Participants	Low	Low/Medium	Medium	High
Competitive	No	No	Yes	Yes
Mech. Equip.	No	Yes or No	Yes	Yes
Monitoring and Inspection	None	None/Low	Low	High
Examples	Group Camping, Guided Hunting, Organized Groups, Scout Camporees	Commercial River Rafting, Fat Tire Bike Fest, Van & Bus Tours on System Roads	Off-Highway Vehicle (OHV) Tours, All Terrain Vehicle (ATV) Jamboree, Non-Motorized Competitive Events	Festivals, Motorized Competitive Events,

* Class III and IV events are more likely to require cost recovery because of the probability of these events requiring more than 50 hours of BLM staff time for permit administration.

Table R 10-2. Permit Types Allowed by Recreation Opportunity Spectrum (ROS) Class

ROS Class or Special Recreation Management Area (SRMA)/Extensive Recreation Management Area (ERMA)	Special Recreation Permit Class Allowed			
	I	II	III	IV
Primitive	Yes	Yes or No	No	No
Semi-Primitive Non-Motorized	Yes	Yes or No	Yes or No	No
Semi-Primitive Motorized (SPM)	Yes	Yes	Yes	No (Exceptions for travel through SPM on linear features)
Roaded Natural	Yes	Yes	Yes	Yes
Rural	Yes	Yes	Yes	Yes

Table R 10-3. Permit Types Allowed by SRMA

(Objectives and prescriptions in the Alternatives further define the allowability of SRPs in each SRMA)

SRMA/ERMA	Special Recreation Permit Class Allowed			
	I	II	III	IV
Desolation Canyon	Yes	Yes	No	No

SRMA/ERMA	Special Recreation Permit Class Allowed			
	I	II	III	IV
Cleveland-Lloyd Dinosaur Quarry	Yes	Yes	No	No
San Rafael Swell	Yes	Yes	Yes	Yes
Labyrinth Canyon	Yes	Yes	Yes	No
Nine Mile Canyon*	Yes	Yes	No	No
Price ERMA	Yes	Yes	Yes	Yes

*Under Alternatives where designated as an SRMA

WHEN IS AN SRP FOR ORGANIZED GROUPS REQUIRED IN THE PRICE FIELD OFFICE?

There are no Bureauwide or statewide thresholds based on group size, dictating whether an organized group permit is required. Such thresholds or other criteria for organized group permits are established through land use planning. Plans should also identify areas or sites where large, organized groups are appropriate and where they are not.

In the Price Field Office, organized groups numbering above the following group size criteria, gathering at a single location for more than 2 hours,[2] are required to contact the BLM before their event to determine if an SRP would be required.

Group Size Criteria

In WSAs–More than 14 people

All other areas–More than 24 people, unless and until an individual SRMA Plan prescribes a different group size

After reviewing the activity and location with the organizers, BLM will determine whether or not a permit is required. If a permit is not required, BLM may document this determination in the form of a Letter of Agreement. The factors BLM will use to determine whether a permit is required are shown in Table J-4.

Table R10-4. Matrix for Determining the Need for an Organized Group SRP

Criteria	Permit Not Required	Permit Required	Deny as Proposed
Is the use appropriate to the site?	Yes. Site very conducive to the proposed use, provided for in planning.	Site is appropriate for group size and activity, not specifically provided for in plan.	No. Site is not appropriate for use as proposed. Does not comport with recreation planning goals, violates ROS class or experience prescriptions.
Does the activity further recreation program goals and objectives?	Yes	Yes	No

[2] *Two-hour/single location criteria conform to Utah State Law definitions for mass gatherings. (R392-400).*

Criteria	Permit Not Required	Permit Required	Deny as Proposed
Is monitoring needed?	Nothing beyond one simple site visit.	Monitoring beyond a one-time site visit required.	Long-term monitoring of one or more resources required.
Health and Safety Concerns?	None	Concerns for event participants or other public land users.	Unmitigated, high risk to human health and safety. Unreasonable risk especially to non-participants.
Bonding desirable to cover reclamation, damage to government property or resources?	No	Bonding desirable or required.	
Insurance desirable to protect the U.S. Government from claims by group participants or third parties?	No. Liability exposure is negligible.	Insurance is desirable because of possible claims for personal injury or property damage.	
Special services required, such as law enforcement, fire protection, exclusive use of public lands, reserved sites?	No	Yes	

USING A LETTER OF AGREEMENT FOR ORGANIZED GROUPS WHERE AN SRP IS NOT REQUIRED

BLM uses significant discretion in determining whether or not an organized group needs an SRP. Such broad discretion often puts BLM in the position of having to decide whether an organized group should be required to have an SRP. An Organized Group SRP should be required if any of the following criteria apply:

- There is a concern for health and safety.
- There is a management concern for cultural or natural resources or facilities on public land.
- The organized group requires services such as law enforcement, fire protection, onsite monitoring of resources or activities, exclusive use, or other specialized management.
- When organized group use is taking place in an area that is appropriate, and there are no major concerns over the activity, BLM may consider preparing a Letter of Agreement for the activity.

A Letter of Agreement is—

- Documentation of BLM's determination that a permit is not required.
- An opportunity for the organized group to better plan its activity in a manner that does not require permit issuance and oversight.
- Documentation that the organized group contacted and worked with BLM to plan its activity.
- An opportunity to obtain information about the activity and obtain visitor use statistics.
- An opportunity to resolve conflicts with other authorized users of the public land.

- An opportunity for the organized group to better understand the agency's concerns for resources and appropriate use of public land.

A Letter of Agreement is not—

- An authorization to use public land.
- An enforceable document. If the group fails to adhere to the agreement, the agency has no recourse. The group would then be a candidate for SRPs in the future because the SRP terms and conditions are binding and enforceable; however law enforcement action may be taken if the group violates law or regulation.
- Below is an example of a Letter of Agreement, which may be modified to account for specific management situations. In no case should this Letter of Agreement be construed as an authorization to use public lands. If an authorization is required, it would be appropriate to use an SRP or a recreation use permit (for developed sites only).

LETTER OF AGREEMENT

FOR ORGANIZED GROUP RECREATION USE

Between

FIELD MANAGER

PRICE FIELD OFFICE

BUREAU OF LAND MANAGEMENT

and

CARBON COUNTY BSA DISTRICT

Welcome to the public lands! We hope you enjoy your visit.

The Bureau of Land Management is responsible for the balanced management of your public lands and resources. Management is based upon the principles of multiple use and sustained yield, a combination of uses that takes into account the long-term needs of future generations for renewable and non-renewable resources. These resources include recreation; range; timber; minerals; watershed; fish and wildlife; wilderness; and natural, scenic, scientific, and cultural values.

SRPs (Special Recreation Permits) may be required for organized groups using public lands. Criteria used to determine if a permit is necessary include concern for health and safety, need to properly manage lands and resources, and need to coordinate with other public land users. Based on our evaluation of your planned activity, such a permit does not appear to be necessary.

Type of Activity: Boy Scouts of America District Camporee. Camping and day loop hikes.

Place: Hidden Splendor

Date and Time: August 23–24, 2004

Number of People: 200

Activity Contact Person: J. Audubon Woodlore Phone: (720) 555-5000

BLM Contact Person: Ira Planner Phone: (435) 636-3600

Certain actions are necessary to have a safe and successful outing with a minimum impact on the environment:

All sites are filled on a "first-come, first-served" basis. Plan ahead to ensure that your group can secure a spot without interfering with other visitors.

Avoid building new fire rings; **USE A FIRE PAN** to eliminate scars on the soil. **GATHERING OF WOOD** for campfires is **PROHIBITED.** Burn wood to ashes and douse with water, making sure that your fire is **DEAD OUT** and that the area is restored to a natural condition before leaving. If you are a vehicle-based camp, haul out all charcoal and ash from your fire pan.

Proper disposal of human waste is critical. At your activity, this will be accomplished by **PROVIDING TEMPORARY TOILET FACILITIES OR USING TOILETS AT THE CAMPGROUND.** One toilet for every 25 persons attending will be required at all sites serviced by vehicle.

Help us clean up public lands. **REMOVE ALL TRASH**. Picking up trash left by less thoughtful people helps maintain the scenic beauty of your public lands.

If any directional signs are erected as part of this activity, they will be removed at the completion of the activity.

Natural hazards and phenomenon could be encountered that present risks to the participants. Participants must be advised of hazards that might be encountered and risks associated with the activity.

Nothing in this agreement shall be construed to imply permission to build any structure or conduct any activity not specifically named.

Disorderly or otherwise objectionable conduct, such as harassment of wildlife, livestock, or other lawful users of public land will not be tolerated and could be the basis for denial of similar agreements in the future.

Precautions must be made to protect natural resource values, cultural or historic objects, aesthetic values, and any facilities on public lands.

If there is any question concerning regulations on public lands, please contact our office immediately.

This agreement is not an authorization to use public lands. Failure to abide by all activity parameters in this agreement may result in permits being required for future activities.

_____ _____

Activity Organizer Signature Date

_____ _____

Field Office Manager Date

ATTACHMENT 6

RECOMMENDED RISK ASSESSMENT AND MANAGEMENT APPROACH FOR ADDRESSING CLIMATE CHANGE IN BLM LAND USE PLANNING

In order to comply with its legal obligations, the BLM should adopt the following approaches to both risk assessment and risk management in connection with climate change as part of this land use planning process.[1]

I. RISK ASSESSMENT: A RECOMMENDED APPROACH

We strongly recommend that the agency use the following "risk assessment" strategy when evaluating impacts to the planning area under NEPA and relevant guidance.

Efforts to manage risk begin with a risk assessment, which characterizes risk in terms of vulnerability, exposure, and uncertainty, or, as Bartell (1998) has written, an inquiry into "What can go wrong?" and "How likely is it to happen?" To these questions, Bartell adds a third, "So what if it does?" as a gauge to determine if action is needed to address the risk. Bartell's rendering is intended to frame the topic of formal, quantitative risk assessment, but the framework applies to less formal assessment of vulnerability, exposure, and uncertainty, as well.

Assessing Vulnerability

The vulnerability of ecosystems and the species and physical elements they comprise depends on their inherent qualities and their ability to change or adapt to address new climatic conditions. A system may be considered vulnerable if it is sensitive to the effects of climate change and has limited ability to adjust to those effects. For example, the rocky intertidal ecosystem may be highly sensitive to the effect of rising sea level (and the inundation of the intertidal zone) but less vulnerable if its species are capable of colonizing new habitat created by the rising seas (i.e., high sensitivity, high adaptive capacity). Conversely, a mountain stream community that is dependent on cold summer water from a melting glacier may be very vulnerable once the glacier has melted away, despite the ability of its constituent species to move great distances (i.e., high sensitivity, low adaptive capacity).

Vulnerability of component species can be affected by the tolerance of individual organisms to the direct effects of climate change, the ability of populations to adapt to those conditions through the expression of genetic variability, and the ability to adjust behaviorally to changes in the ecosystem, such as prey shifts. For example, dandelions (*Taraxacum officinale*), which occupy a broad range of climatic conditions despite possessing essentially no genetic variability in the species, would not seem to be inherently sensitive to climate, whereas pikas (*Ochotona princeps*), which live only in the narrow alpine zone of western mountains, may be highly sensitive (Holtcamp 2010). Some species that are able to move easily may be able to adapt well to climate change even if they are inherently sensitive, provided that they can find the conditions they need to live, and others may be able to remain in place, if the population can produce offspring that are adapted to the new conditions. Pollen records indicate that some species have been able to survive dramatic changes in climate in a given place, even though the individuals making up the current population may themselves be quite sensitive. A vulnerability

[1] This approach is a truncated version from a larger research paper developed by The Wilderness Society during the scoping period for the Forest planning revision in the Sierra Nevada entitled "Managing the Risk of Climate Change to Wildlands of the Sierra Nevada" (2010). This broader paper illustrates the concepts we describe in this document and can be found at: http://wilderness.org/content/managing-risk-climate-change-wildlands-sierra-nevada

assessment would examine the species and physical elements of existing wildland ecosystems and determine which elements are sensitive, which have the ability to adapt, and what the likely consequences would be of anticipated changes in climate.

Because ecosystems are so complex, it is impossible to evaluate the vulnerabilities of every population, species, community, or other element of the system in question. Instead, risk assessment must focus on particular, high-priority elements or "key vulnerabilities." In its 4th Assessment Report, the IPCC (Schneider et al. 2007) suggested the following criteria for identifying key vulnerabilities:

- magnitude of impacts,
- timing of impacts,
- persistence and irreversibility of impacts,
- likelihood of impacts and vulnerabilities,
- potential for adaptation,
- distributional aspects of impacts and vulnerabilities,
- importance of the system(s) at risk.

In other words, key vulnerabilities are likely to occur where the effects of climate change are large and intense, imminent, long-lasting, highly probable, and likely to limit the distribution of highly valued systems or system elements.

The IPCC uses their criteria to select key vulnerabilities across a broad array of systems: infrastructure, health, markets, agriculture, migration and conflict, as well as biological and geophysical systems. Focusing their thinking only on wildland systems, Running and Mills (2009) suggest that the most vulnerable elements of ecosystems are those that are 1) rare; 2) long-lived (with fewer generations in which to evolve); 3) isolated; 4) dependent on special habitats (especially those directly affected by climate, such as deep snow and ephemeral wetlands); and 5) susceptible to the kinds of disturbances likely to result from climate change (fire, floods, extreme drought). In addition to these "highly vulnerable" species, they recommend focusing on a) species with "a high public profile;" b) "data-rich" species; and c) "strongly interacting" species (keystone and dominant species). Species with a high profile are those that are appreciated for their strong contribution to ecosystems services, providing utilitarian, recreational, and aesthetic value. "Data rich" species provide the information necessary to devise potential conservation strategies, and "strongly interacting" species, by definition, control ecosystem function. Running and Mills apply their criteria specifically to species, but similar considerations may apply to features, such as glaciers, rare soils, riparian vegetation, and old growth forests. A vulnerability assessment should explicitly examine species and other ecosystem elements that meet these criteria and explore the factors that make them vulnerable.

Recommendation: The BLM should evaluate the planning area for key vulnerabilities according to the criteria above, and the nature of the climate threat to selected ecosystem elements should be fully examined and presented as part of the plan revision process in order to comply with its legal obligations under NEPA and other relevant laws and regulations. Such an assessment should include careful consideration of species and habitats of conservation concern.

Assessing Exposure

The assessment of exposure to climate change requires both the examination of the probability and timing of future climate change and the likely changes to which ecosystem elements may be vulnerable. Changes in average temperature and precipitation are important first-order effects to which many

species are sensitive, but there are many other effects that constitute exposure. As mentioned, melting glaciers may cause an increase in summer stream temperature. Increased droughts may stress plants and animals, and early onset of spring is already increasing exposure to fire activity (Westerling et al. 2006). More subtle changes are also expected. Plants may be exposed to pollinator shortages, and species range shifts may turn native species into invasive species. A risk assessment should examine the probability of exposure to these and other likely effects.

Assessing exposure probability involves combining information about likely climate change and its effects. Possible climate change can be assessed using predictive models that can be run under a variety of future scenarios. The results of these climate models can then be linked to other models to explore effects on future vegetation, fire regimes, hydrology, etc. (Lenihan et al. 2006). Where models agree with each other and produce similar results under multiple scenarios, the results can be viewed with a high degree of confidence. Where models produce a range of behaviors, prediction is less robust. In general, as the spatial resolution of models increases through the process of "statistical downscaling," agreement, and hence confidence, decreases. Millar et al. (2007) note, "We might feel confident of broad-scale future environmental changes (such as global mean temperature increases), but we cannot routinely predict even the direction of change at local and regional scales (such as increasing or decreasing precipitation)." Nevertheless, models can be used to explore possibilities, "game different scenarios, and gain qualitative insight on the range and direction of possible future changes without committing to them as forecasts" (Millar et al. 2007).

In addition to examining the probability of various changes in climate, an assessment of exposure should examine the consequences of those changes and where they are likely to occur in space and time. For example, sea-level rise is a highly likely and potentially devastating consequence of climate change but one that is limited in extent to coastlines. Increased fire activity is also to be expected, but exposure is likely to be of greater concern near homes than away from them. An exposure assessment should examine where the threat of increased fire activity is likely to be most acute, including how that threat will change with growth of the "wildland-urban interface." Potential future effects are many, and precise quantification of probabilities may be beyond the limits of existing tools and budgets. In these cases, future possibilities can be explored through "scenario planning," in which groups of analysts or stakeholders consider a broad range of possible consequences of climate change (Welling 2008).

Recommendation: A risk assessment conducted as part of the plan revision should identify the direct and indirect modes of exposure to climate change and attempt to quantify them based on the best available science as required by NEPA and other laws and regulations.

Assessing Uncertainty

Because assessing the risks associated with climate change involves predicting future conditions, it is no surprise that it is fraught with uncertainty. Limitations in predictive ability derive not only from uncertainty about future conditions but from limitations of our understanding of current and historical conditions and the factors that drive ecosystem behavior. Table 1 lists only a few of the many sources of uncertainty that plague the assessment of risk from climate change. Each of these sources contributes to risk, and the better they are understood, the more complete the assessment of risk.

The sources in Table 1 are not an exhaustive list but only illustrate the range of unanswered questions. As vulnerabilities and exposure are assessed, many more uncertainties will be revealed. It is critically important that these uncertainties be explicitly documented and incorporated into the risk assessment so that strategies can be developed to reduce uncertainty in the plan.

Table 1. Sources of uncertainty in understanding future climate change and its effects	
Data limitations	♦ Poor records of past climate surfaces ♦ Poor records of species occurrences
Limitations in ecological knowledge	♦ Habitat/range models ("climate envelopes") ♦ Limited understanding of species response to climate change ♦ Mortality rates and thresholds of mortality and recruitment ♦ Dispersal ♦ Species interactions ♦ Behavior of novel ecosystems ♦ Effects of interacting stressors
Model limitations and variability	♦ Limited understanding of the climate system ♦ Intermodel variation in model output ♦ Intramodel variation in model output ♦ Downscaling coarse resolution global output to generate higher resolution future climate (especially in topographically diverse terrain)
Vagaries of human behavior	♦ Future emissions scenarios ♦ Institutional resources ♦ Public support ♦ Planning horizon ♦ Shifting decision processes and loci

Under such an indeterminate future, assessing vulnerability and exposure will be especially difficult, placing added importance on the identification and reduction of uncertainty in land management plans.

Recommendation: Pursuant to NEPA, BLM should identify and document known sources of uncertainty and data needs and initiate action to fill those gaps at the earliest possible point in the RMP revision process. Where data gaps remain, the plan should include strategies to reduce uncertainties.

II. MANAGING THE RISK OF CLIMATE CHANGE: A RECOMMENDED APPROACH

We strongly recommend that the agency use the following "risk management" strategy in conjunction with the "risk assessment" strategy laid out above when developing management prescriptions in the face of climate change.

Adaptation is the management of risk to reduce the adverse effects of climate change on ecosystem services received from wildlands. Actions that reduce the vulnerability to, exposure to, and uncertainty of climate change impacts contribute to adaptation. Each of these aspects of risk can be managed to reduce the negative consequences of climate change to wildlands.

Unfortunately, which techniques will be most effective remains to be determined. Learning will require an experimental approach, tailored as appropriate to the specific lands on which they are applied. Silviculture and other intensive management actions will not be appropriate in lands designated to protect wilderness character, but they may be tested on less-restrictive parts of the landscape. The important thing is that these methods are approached experimentally, with monitoring to facilitate rapid learning (Lawler et al. 2010). Finally, the diversity of administrative designations present in most landscapes can themselves provide a framework for experimentation that can accelerate discovery of approaches to climate change adaptation.

Reducing Vulnerability

Depending on which ecosystem elements are identified as "key vulnerabilities" in the risk assessment, a variety of options are available to decrease vulnerability by reducing the sensitivity to climate change or by enhancing adaptive capacity. One of the simplest and most direct ways to reduce sensitivity is to address the stressors in addition to climate change that make species and ecosystems vulnerable to climate change. Reducing these anthropogenic stressors has been called the "low-hanging fruit" of climate change adaptation (Joyce 2009) and includes increasing the size and number of protected reserves, restoring altered disturbance regimes, halting and repairing the loss and fragmentation of habitat, managing invasive species, cleaning up air and water pollution, and addressing the legacy of past management. According to Galatowitsch et al. (2009), "Key resilience actions include providing buffers for small reserves, expanding reserves that lack adequate environmental heterogeneity, prioritizing protection of likely climate refuges, and managing forests for multi-species and multi-aged stands."

In addition to reducing susceptibility, actions can be taken to enhance the capacity of species and ecosystem elements to remain viable in the face of climate change. Enhancing adaptive capacity consists of actions to facilitate or improve the ability of species (usually) to respond favorably to climate change. The following are several examples of strategies to enhance adaptive capacity derived from the burgeoning literature of "adaptation options" (Noss 2001, Millar et al. 2007, Joyce et al. 2008, Biringer 2003, CNRA 2009, Glick et al. 2009, Running and Mills 2009).

- *Promote connected landscapes.* Restoring and maintaining habitat connectivity provides species with the "room to roam" they need to respond to a changing climate. Without connected habitat, species may not be able to disperse to new locations exhibiting a favorable climate. Providing corridors and habitat connectivity facilitates the innate capacity to disperse in response to climate change.
- *Facllitate migration.* Where movement in response to climate change is blocked by habitat fragmentation or where species lack the dispersal ability to "keep up with" a changing climate, species can be physically moved across barriers. Of course, such decisions must be weighed extremely carefully to avoid the well-known consequences of the arrival of invasive species into novel habitats. McLachlan et al. (2007) offer guidelines for consideration of assisted migration.
- *Provide opportunities for rapid evolution.* The ability of species to adapt to new climates is enhanced where new genotypes are frequently exposed to new conditions. Restoration of disturbance regimes, such as fire, that provide for frequent opportunities for expression of genetic variability can accelerate the process of adaptation.

- *Maintain genetic diversity.* Running and Mills (2009) note, "Contemporary adaptive evolution is facilitated by a medium level of gene flow," suggesting that adaptation may be aided better in the short run by moving genes, rather than species. Maintaining habitat and dispersal connectivity among subpopulations will ensure continued opportunities for interbreeding and cross-pollination and help maintain adaptive capacity in populations. Also, guidelines for replanting following timber harvest currently require seedlings to be derived from local seed sources. Expanding the range from which seedlings are derived could help introduce new, better-adapted genotypes into the population.
- *Promote species diversity.* At the community or ecosystem level, adaptation and the maintenance of ecosystem services is well served by maintaining a rich diversity of species. Different species possess different thresholds of response to climate change. The loss of an individual species due to climate change will have a less dramatic effect on an ecosystem if other species are present that can fill at least part of that species' niche.
- *Manage for "asynchrony".* Populations are more vulnerable when all the individuals are in the same demographic stage. The current mountain pine beetle epidemic exemplifies the consequences of a synchronous population, in this case due to the establishment of a single cohort of lodgepole pine throughout the West following widespread mining and fires in the late 19th century. Restoring disturbance regimes can help maintain a heterogeneous landscape with multiple age classes and help reduce vulnerability to climate change.
- *Enhance seed banks and ex situ conservation.* Owing to the unpredictability of the consequences of climate change, it is not too early to consider enhancing and expanding seed banks and other "off site" conservation efforts. Climate change may lead to localized extinctions, especially of isolated populations, and, in these cases, enhancing adaptive capacity will depend on the artificial reintroduction of stock maintained elsewhere.
- *Allow establishment of "neo-native" ecosystems.* The species that exist today have generally been around far longer than the ecosystems they currently compose, often in locales outside of their current range where the climate was historically suitable. As the climate changes, species can be expected to reoccupy their former range where suitable. Also, where species are to be introduced for purposes other than biodiversity conservation (e.g., timber plantations, pastures), review of the paleoecological record may provide insights into where species may thrive in their historically "native" range under an altered climate. Ecosystems so established may be considered "neo-native" in that they would consist of native species in their historical range, though in combinations that may not currently exist.

Recommendation: BLM has a legal duty to prevent permanent impairment and unnecessary or undue degradation to the resources, and to manage the resources for the long-term needs of future generations. This obligation requires the agency to reduce the vulnerability of the ecosystem to the very real threats posed by climate change. BLM can comply with this duty by adopting several or all of the strategies listed above, depending on the ecological composition and land tenure of the area.

Reducing Exposure

As with vulnerability, the climate adaptation literature indicates several options to manage risk by reducing exposure. Most important, but least directly affected by management, is mitigation of greenhouse gas emissions themselves. More under managers' control is the exposure to the effects, both direct and indirect, of climate change. Last, managers can identify and protect those places that are least likely to be affected by climate change, so called "climate refugia."

Mitigation. While the vast majority of emission reduction must be accomplished in the energy sector, there are several actions that wildland managers can take to prevent unnecessary release of greenhouse gases to the atmosphere. One of the easiest sources to control is the conversion of old growth to young forest. It is well established that when older forest is harvested and regenerated to younger forest, a net release of carbon dioxide results from the decomposition of coarse and fine debris and soil organic matter that occurs in the warm post-harvest environment (Harmon et al. 1990).

Reducing exposure to the effects of climate change. While it is clear that forest management can affect exposure through its influence on greenhouse gas emissions, it is also clear that climate change has become inevitable, and risk management must focus on reducing exposure to its effects. One of the most likely of these effects is drought, due to more rapid melting of snowpack and increased evapotranspiration – even if precipitation does not change (National Research Council 2008). Increased drought will result in lower levels of summer streamflow and warmer water temperatures, with potentially devastating effects on aquatic ecosystems and impacts on the ability of ecosystems to provide water for human use. In addition to drought, extreme flood events are likely to increase as a result of rain-on-snow events where they have not occurred historically. To address these effects, actions will need to be taken to build up the buffering capacity of watersheds and restore riparian ecosystems degraded by grazing, water diversion, and channeling. The U.S. Climate Change Science Program offers a number of adaptation options for managers of Wild and Scenic Rivers that can be applied as well wherever riparian ecosystems are exposed to the effects of climate change (*See,* Palmer et al. 2008).

Among the emerging strategies to buffer the effects of climate change is to restore the water retaining capacity of river systems. Opperman et al. (2009) argue for actively reconnecting rivers to their floodplains. Similarly, Running and Mills (2009) suggest in some cases it may be helpful to construct "pico-dams" in headwater streams, tiny impoundments intended to retain runoff and maintain late-season flows. Such a strategy may be implemented through the restoration of wet meadows that were drained to facilitate livestock grazing and other uses. In any case, actions such as fish stocking or impoundment should be done to sustain ecosystem integrity and functionality, not simply to enhance sport fishing or manage water supply. Closing and rehabilitating roads can also restore subsurface flow and slow the delivery of runoff to channels.

Climate Refugia. In some cases, it may be possible to avoid exposure to many of the effects of climate change by identifying and protecting those places where climate is unlikely to change. Noss (2001) notes that refugia from past unfavorable climates harbored much of the genetic and species diversity from which extant populations and communities derive and are important objects of conservation for the diversity they still harbor. Similarly, we can expect some places to be less prone to change in the future, and these places will be important to protect for their potential to harbor diversity in the face of regional climate change. For example, Noss cites the case of talus slopes in Iowa that occur in cold-air drainages below ice-filled caves that now support dozens of vascular plant species that are disjunct from boreal forests to the north and west and at least eight landsnail taxa that were previously thought to have gone extinct at the end of the Pleistocene. As downscaled climate models continue to improve, it may be possible to use them to identify places that will be less exposed to climate change and can be protected for their conservation value (Loarie et al. 2009), though much work remains to determine the appropriate size, configuration, etc., for such refugia.

Recommendation: BLM has a legal duty to prevent permanent impairment and unnecessary or undue degradation to the resources, and to manage the resources for the long-term needs of future

generations. This obligation requires the agency to reduce exposure of the ecosystem to the very real threats posed by climate change. BLM can comply with this duty by adopting several or all of the options listed above, depending on the ecological composition and land tenure of the area.

Reducing Uncertainty

Uncertainty appears as an obstacle to climate change adaptation in virtually every treatment of the subject; reducing uncertainty may therefore be considered critical to progress in managing risk from climate change. Much uncertainty derives from insufficient knowledge of current conditions and management effects and may be reduced simply through increased emphasis on *monitoring*. Reducing uncertainty about the nature of ecological and social systems and their future behavior requires investment in *research*. Learning can be greatly accelerated by the process of *adaptive management* that combines aspects of both research and monitoring to reduce uncertainty. Where knowledge of the future is especially high and control over the consequences of climate change is low, *scenario planning* may be used to prepare for possible outcomes, thus reducing uncertainty and anxiety over how to respond.

Monitoring. A major impediment to the reduction of uncertainty regarding future impacts of climate change is simply a lack of knowledge of current baseline conditions and the ability to detect change in the future. The U.S. Climate Change Science Program (Kareiva et al. 2008) identifies establishing baseline conditions and monitoring as key elements of impact assessment necessary to support adaptation. In their review of the climate change adaptation literature, Glick et al. (2009) identify increased monitoring as one of five general principles of adaptation. Monitoring is needed not only to detect the effects of climate change but to assess the success of adaptation actions.

Research. Many of the uncertainties associated with climate change can only be addressed through formal research, and research will continue to be essential to climate change adaptation. Accomplishment of much of this research will require cooperation with the agencies managing the land. Reduction of future uncertainty can be greatly accelerated if the managing agencies work closely with scientists to facilitate, advise, and assist in climate change research. If it has not done so already, BLM should invite broad participation from DOI's Landscape Conservation Cooperatives and Regional Science Centers throughout the RMP amendment.

Adaptive management. When aspects of monitoring and research are combined into an approach to management that is explicitly intended to accelerate learning, it is called "adaptive management." According to Innes et al. (2009), "adaptive management can be viewed as a systematic process for continually improving management policies and practices by monitoring and then learning from the outcomes of operational programmes. Within the context of climate change,...adaptive forest management is one tool that could enable managers to adjust the structure and the consequent functioning of the forest ecosystem to resist harmful impacts of climate change, and to utilize the opportunities created by climate change." (p.137). Typically, adaptive management follows a continuous cycle of planning, implementation, monitoring and evaluation (DeLuca et al. in press).

Adaptive management is sometimes described as either "passive", when management is modified simply as a result of observing the consequences of past action, or "active", when management actions are designed explicitly as an experiment to test competing hypotheses (Kareiva et al. 2008). Whatever the case, monitoring is essential to the process of evaluation and modification. Experience has also shown that adaptive management functions best when it involves the public in the identification of the hypotheses to be tested, in the design of the monitoring strategy, and in the implementation of the

monitoring program (Bliss et al. 2001, Innes et al 2009). So important is stakeholder involvement to the development of the "social license" necessary for management action that "the entire concept has been renamed adaptive collaborative management or adaptive co-management" (Innes et al. 2009). In the end, BLM must apply the lessons learned from monitoring and research to amend their decision path as necessary.

Scenario planning. When uncertainty is high and the "controllability" of the outcome is low, there may be little that managers can do to design management strategies "to resist harmful impacts of climate change" as referred to above (Innes et al. 2009). In these cases, uncertainty, or at least anxiety over the uncertainty of climate change, can be reduced by scenario planning. Scenario planning is (usually) a qualitative process "that involves exploration and articulation of a wide set of possible or alternative futures" (Baron et al. 2008). Scenarios are plausible stories or narratives describing what might happen under an uncertain future. Their development can be aided by quantitative data or models, but the idea is to explore a range of possible futures, rather than try to predict a single "most likely" case. When developed in the context of broad stakeholder participation, they can increase understanding of key uncertainties, facilitate the incorporation of alternative perspectives into planning, and improve the capacity for adaptive management (Welling 2008).

Recommendation: Reducing uncertainty of baseline conditions and the impacts of management in the face of climate change should be a major priority of any risk management strategy set forth by the agency to reduce the risk posed by climate change. BLM should build in robust research, monitoring, adaptive management, and scenario planning into the land use plan in order to address this challenging aspect of risk management.

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ATTACHMENT 7

THE WILDERNESS SOCIETY

ECOLOGY AND ECONOMICS RESEARCH DEPARTMENT

SOCIO-ECONOMIC FRAMEWORK FOR PUBLIC LAND MANAGEMENT PLANNING: INDICATORS FOR THE WEST'S ECONOMY

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I. PURPOSE

This brief is submitted as part of the NEPA process for this land use proposal. It is intended to identify issues that must be analyzed in the plan and offer methodologies to assist agencies responsible for analyzing the socio-economic impacts of proposed land use decisions on Western economies.

In making land use decisions, federal agencies have an obligation under the National Environmental Policy Act (NEPA) to take a "hard look" at the environmental consequences of a proposed action, and the requisite analysis "must be appropriate to the action in question." This brief presents a framework and indicators to be used in analyzing the impact of public land management proposals on the economies of Western communities. Federal agencies cannot evaluate the consequences of proposed decisions or determine how best to avoid or mitigate negative impacts without adequate data and analysis. Through the application of the methodology we have provided below, using data collected from identified sources and measuring potential impacts through key indicators, federal agencies can better fulfill their obligations to evaluate the direct, indirect, and cumulative socio-economic impacts of various alternative decisions.

II. INTRODUCTION

We have organized this paper to facilitate the identification of key issues related to the impact of federal public land decisions on Western economies, and to provide key indicators for analyzing the impacts of those decisions on the economy of the West. The first section describes the changing economy of the western region, and how public land management planners should evaluate the economic impacts of land management alternatives. Next, we present key economic indicators with which to measure the vigor of the West's economy and discuss the implications of these indicators for the selection and analysis of land management alternatives.[1] The third section presents sources of data that are readily available at the state and county level, to which land managers should refer when preparing economic analyses for public lands. Next we outline the methodology we recommend agencies use to analyze the economies of western communities, in order to fully account for information that is traditionally absent in public land management assessments. Finally we provide a detailed list of our NEPA scoping questions, including specific recommendations for analyzing economic trends and conditions affected by the proposed management decisions.

These analyses and methods provide a necessary, but by no means sufficient, framework for the evaluation of proposed land management decisions. Socio-economic impacts are only one facet of the total impact of such decisions on communities. Western federal public lands belong to all Americans, and in order to fully evaluate the merits of land management decisions a complete benefit-cost analysis, including non-market values, must be made. While the specific methods for benefit-cost analyses are beyond the scope of this brief, we expect the agency to implement benefit-cost analyses in addition to the requested socio-economic impact analyses outlined here.

III. OVERVIEW OF THE WESTERN ECONOMY

In the last 30 years, the West has evolved from a region largely focused on extractive industries into a much more diverse area with a more diversified economy (Bennett and McBeth 1998, Johnson 2001). Table 1 shows the current proportion of total personal income from resource extraction industries in the Rocky Mountains. Recent research shows that most western counties are not "resource dependent," and have instead developed diversified economies

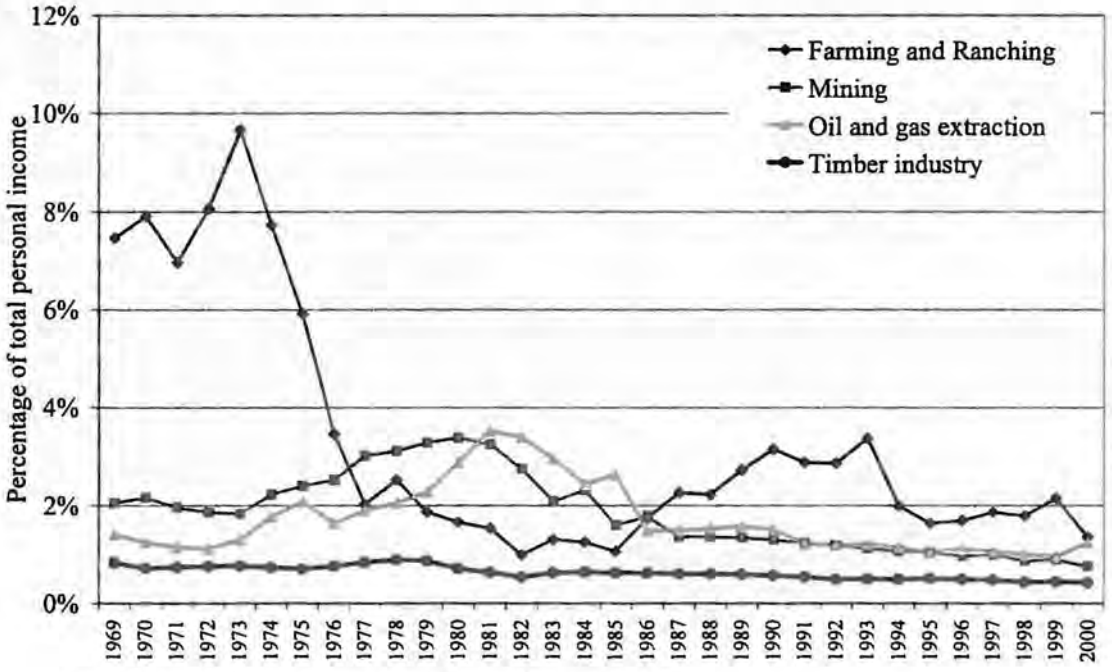
[1] We provide examples of the statistics and data available to analyze each of the key indicators. These examples focus on the five Rocky Mountain states, but the methods and analyses presented apply to other states throughout the region. The states we focus on in this brief are: Colorado, Montana, New Mexico, Utah, and Wyoming. The Western states, especially the Rocky Mountains, are currently facing accelerated development of oil and gas on their federal public lands while at the same time realizing the potential embodied in the amenity-based economy.

based on recreation, tourism, knowledge-based industries and the service sector. A recent study examining the impact of public lands on economic well-being in 11 western states found that only 3 percent of western counties could be classified as resource-extraction dependent (Rasker et al. 2004). Figure 1 shows the 30-year trend in resource extractive industry income in the Rocky Mountain Region. Public land management decisions all too often rely on a misconception of a resource-extraction-dependent rural West. Given the changing nature of the western economy, such assumptions exclude important non-extractive economic drivers and may even harm the economy of the region in the long run by depleting the natural capital responsible for the economic growth of Western communities.

Table 1. Extractive Industry Income as a Percentage of Total Personal Income (2003)

	Colorado	Montana	New Mexico	Utah	Wyoming	Rocky Mountains
Farming and ranching	0.77%	1.19%	2.52%	0.73%	2.11%	1.14%
Mining (excluding oil and gas extraction)	0.47%	1.49%	1.41%	0.71%	6.99%	1.09%
Oil and gas extraction	0.88%	0.44%	1.10%	0.16%	2.79%	0.84%
Timber industry	0.25%	1.40%	0.19%	0.39%	0.23%	0.35%
Total extractive industry income	2.37%	4.52%	5.22%	1.99%	12.11%	3.43%

Source: Regional Economic Information System, Bureau of Economic Analysis (http://www.bea.doc.gov)



Source: Regional Economic Information System, Bureau of Economic Analysis
Farming and Ranching: "Farm proprietors' income," "Farm earnings," "Agricultural services," and "Fishing"
Timber Industry: "Forestry," "Lumber and wood products," and "Paper and allied products"
Mining: Includes all segments of Mining sector except "Oil and gas extraction"
Note: The figure is based on SIC data for 1969-2000 in order to show the long-term trend. While not explicitly compatible, NAICS data for 2001-2003 show similar trends for extractive industry income and illustrate the general downward trend, even during the current oil and gas drilling boom in the Rockies.

Figure 1. Resource Extractive Industry Income in the Rocky Mountain Region

As the economies of rural communities in the West diversify, the framework for making public land management decisions must also evolve. Merely counting jobs in resource extraction is not a sufficient way to measure the economic impact of public land management decisions. Many of these communities have diversified economies that

are no longer solely dependent on the export of fossil fuels or logs. Management plans for public lands need to account for all aspects of the economic and social systems of these communities, including recreation, tourism, and entrepreneurial businesses attracted to scenic locations, when evaluating alternatives.

There is a vast and growing body of research that indicates that the environmental amenities provided by public lands are an important economic driver in the rural West (Rudzitis and Johansen 1989; Johnson and Rasker 1993, 1995; Rasker 1994; Power 1995, 1996; Duffy-Deno 1998; Rudzitis 1999; Rasker et al. 2004; Holmes and Hecox 2004). In a letter to the President and the Governors of the western states, economists from universities and other organizations throughout the United States pointed out that, "The West's natural environment is, arguably, its greatest long-run economic strength" (Whitelaw et al. 2003).

The western United States is growing at a rate faster than any other region (U.S. Census Bureau 2001), and, counter to the norm, population growth has preceded employment growth in the rural West (Vias 1999), indicating that people migrate to the region for its amenity resources. Furthermore, counties with high levels of natural amenities (such as varied topography, access to water bodies, and a pleasant climate) are more likely to experience higher growth than those counties with fewer such amenities (McGranahan 1999). Along with that growth comes demographic change. As Shumway and Otterstrom (2001) point out, "Population change represents more than a simple redistribution of people; it is an indicator and, in many instances an instigator, of a wide range of economic, social, cultural, political/policy, and environmental changes." As more people move from urban areas to rural communities they bring with them expectations about how local public lands ought to be managed. Changing community values must be accounted for in land management planning.

Management plans for the public lands in the West must consider the increasing importance of industries and economic sectors that rely on these public lands, but not necessarily on the extraction of natural resources. As the population of the entire country grows, the presence of undeveloped lands becomes more and more important. Indeed, much recent research has concluded that the presence of protected public lands strengthen western rural economies by meeting growing needs for clean water, wildlife habitat and recreation opportunities (Power 1995, 1996; Rasker 1994; Rasker et al. 2004; Rudzitis 1999; Rudzitis and Johansen 1989; Johnson and Rasker 1993, 1995; Whitelaw et al. 2004).

IV. KEY ECONOMIC INDICATORS OF THE WEST'S ECONOMY

The West's economy is characterized by many indicators that must be considered in the economic analyses performed by land management agencies; we have selected only a few to focus on in this brief. These include the growing importance of non-labor income from investments and retirement; increasing employment in high technology, knowledge-based, and service industries; the important role that recreation and tourism plays in providing jobs and income; and the rise of small businesses and other entrepreneurial endeavors. Other features of the western economy include the decline in extractive industries, the increase in public awareness and appreciation of the environmental and recreation amenities of their home counties, and the diversification of rural economies. This section describes a concise set of indicators that land use planners should examine as part of the description of the socio-economic profile of an area, and presents example data from the Rocky Mountain states for each indicator.

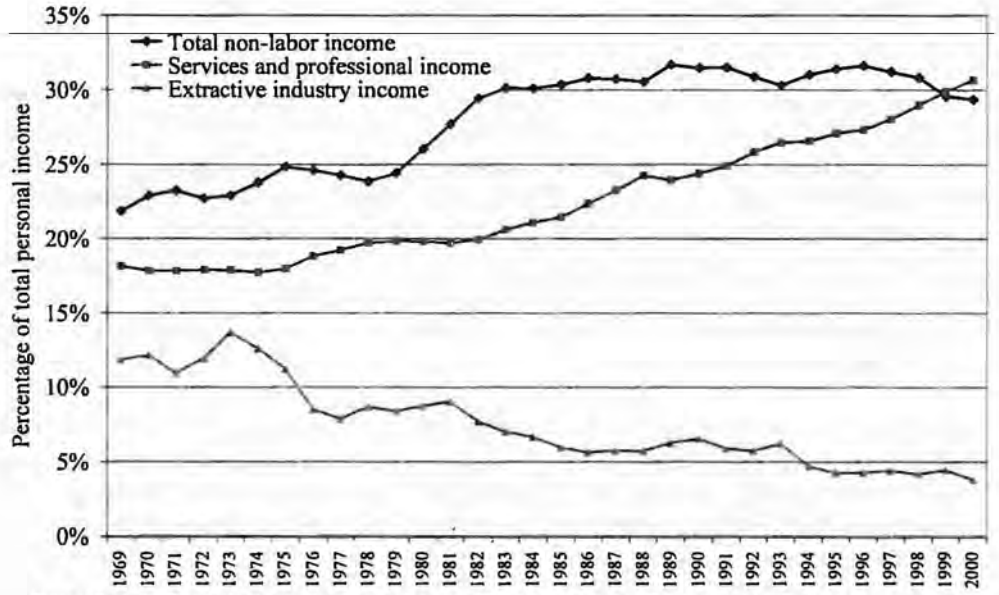
A. Non-labor income

A complete analysis of regional economic trends should include an analysis of total personal income, including all sources of income, rather than relying solely on employment. A full accounting of income is necessary to an understanding of the important role that non-labor income — such as retirement income, interest payments, rents, and profits — plays in the regional economy. Investment and retirement income makes up nearly one-quarter of total personal income in the Rockies, which would make it the top "industry" in the region. An economic impact analysis that excludes this income is inadequate and misleading.

Researchers have found that areas with high levels of natural amenities attract residents, many of whom rely on non-traditional sources of income (Duffy-Deno 1998, Nelson 1999, McGranahan 1999, Rudzitis 1999, Shumway and Otterstrom 2001, Lorah and Southwick 2003). When an investor living in a community receives dividends on his or her investments, that money represents an influx of income for the local community. The same thing is true of a retiree's

income. Due to the high levels of natural amenities in the coastal and mountain regions of the West, these non-labor sources of income are concentrated in those areas (Nelson 1999).

An influx of retirees in those rural communities has been shown to have positive effects on both income and employment (Deller 1995), with non-labor income fueling increases in income and employment for many other sectors including health, financial and real estate services. Figure 2 shows the trend in total personal income for the five-state Rocky Mountain region. Service sector income has been rising in recent years while extractive industry income has fallen. Non-labor income makes up the largest proportion of total personal income.



Source: Regional Economic Information System, Bureau of Economic Analsyis, US Department of Commerce
Extractive industries: "Farm proprietors' income," "Farm earnings," "Agricultural services, forestry, fishing," "Mining," "Lumber and wood products," and "Paper and allied products"
Service and professional: "Services," "Eating and drinking places," and "Finance, insurance, and real estate"
Note: The figure is based on SIC data for 1969-2000 in order to show the long-term trend. While not explicitly compatible, NAICS data for 2001-2003 show similar trends for non-labor, service and professional, and extractive industry income.

Figure 2. Total Personal Income in the Rocky Mountains

Table 2. Non-labor income as a percentage of total personal income (2003)

	Colorado	Montana	New Mexico	Utah	Wyoming	Rocky Mountain Region
Investment income [a]	17%	19%	15%	15%	23%	16%
Retirement income [b]	6%	11%	10%	7%	9%	7%
Income support [c]	3%	4%	7%	3%	3%	4%
Other [d]	0.7%	1.1%	1.4%	1.1%	0.8%	0.9%
All non-labor income	26%	35%	33%	26%	36%	28%

Source: Regional Economic Information System, Bureau of Economic Analysis (http://www.bea.doc.gov)

[a] Dividends, interest, and rent

[b] Includes veterans' benefits, military benefits, and Medicare

[c] Income Maintenance, Supplemental Security Income, Family Assistance, Food Stamps, Medicaid, Unemployment

[d] Includes federal education and training assistance, settlements between individuals and businesses and transfer payments from non-profit institutions

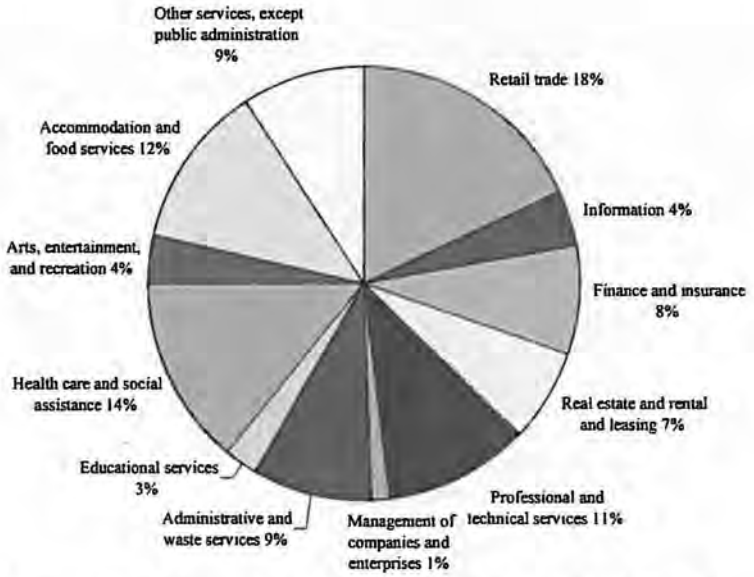
It should be noted that non-labor income also includes income support payments such as Medicaid, welfare and unemployment. However this category is consistently a small portion of total non-labor income and therefore a small portion of total personal income. Income support is less than 4 percent of total personal income and only 14 percent of non-labor income in the Rockies. It is important for a complete analysis of non-labor income to make a distinction between income support and other forms of non-labor income. Table 2 shows non-labor income, broken into its components as a percentage of total personal income for the five Rocky Mountain States. Investment and retirement income is the largest portion of non-labor income for each state, while income support reflects a much smaller portion.

A complete analysis of an area's economy must consider non-labor income, and a thorough evaluation of land management alternatives must consider the impacts of each alternative on non-labor income.

B. Knowledge-Based, Service Sector and Other Non-Recreation Businesses

Bennett and McBeth (1998) cite the emergence of a trend toward increasing western rural populations as early as the 1970s and state that this trend was partly motivated by the high quality of life in these areas. Johnson (2001) points out the importance of technology in this transition. He credits the advancement of technology with both the downward trend in extractive employment (where improved technology results in reduced labor requirements) and the potential (currently being realized in many communities) for economic growth and stability. Johnson points out that improving technology, especially in information and communication, also mitigates the constraints imposed by remoteness and permits employment in knowledge-based and service industries previously unavailable for rural residents.

Many of the counties in the Rocky Mountain West with economies that are characterized by a predominance of service industries have the highest incomes (Shumway and Otterstrom 2001). Over the past quarter-century, the U.S. economy has seen a shift from extractive and primary manufacturing industries to service oriented businesses. A common misconception about the service sector is that it includes only low paying jobs. This is not the case. The service sector in the West includes several high-paying industries, many of which are linked closely with the increase in non-labor income. Employment and income in the health care services increase as the number of retirees in an area increases. As people with investment income move into a region, the demand for financial, insurance, and real-estate service also increases.



Source. Regional Economic Information System. Bureau of Economic Analysis (http://www.bea.doc.gov)

Figure 3. Service and Professional Employment in the Rocky Mountains (2003)

The service sector includes occupations and industries that are classified as "knowledge based," defined by Henderson and Abraham (2004):

> "Knowledge-based activities emerge from an intangible resource that enables workers to use existing facts and understandings to generate new ideas. These ideas produce innovations that lead to increased productivity, new products and services, and economic growth."

Knowledge-based occupations have grown nationwide since 1980, with growth in the Rocky Mountain region being among the highest (Henderson and Abraham 2004). Local amenities that enhance quality of life are among the factors correlated with this growth. Other factors contributing to the growth of knowledge-based occupations are a high quality workforce, colleges and universities, infrastructure in the area, and the size and diversity of the local economy. These factors are likely to be interrelated and in many cases dependent on the quality of the environment and the availability of public lands, as cities and counties in the region leverage scenic amenities to attract high quality workers and knowledge-based industries. Other research confirms the role that amenities, including environmental and recreational amenities, play in attracting businesses to locations in the rural Rocky Mountain West (Whitelaw and Niemi 1989; Johnson and Rasker 1993, 1995). The most recent income data available from the Bureau of Economic Analysis (BEA) include a category called "information," which captures a good deal of the new knowledge-based industry. Land management decision makers should take advantage of these expanded industry classification categories when analyzing the potential impacts of public land management on the diverse economies of western counties.

A complete analysis of an area's economy must take into account the growth in income and employment in the service and professional sectors, and consider the impacts of each alternative on those sectors.

C. Recreation & Tourism

Many rural communities in the Rocky Mountain region have experienced firsthand the surge in demand for recreation experiences outdoors, especially on federal public lands. Moab, Utah is a good example. This town was once a dying mining center and is now a top destination for recreation seekers of all sorts. Other towns around the West have seen an upswing in migration and economic health as they become "discovered" by recreationists (Rasker, et al. 2003, 2004; Holmes and Hecox 2004).

A 2005 report by the Outdoor Industry Association estimates that 159 million Americans participate in outdoor recreation each year. A 2002 study by the same organization estimates annual spending on outdoor recreation at $18 billion. The public lands provide much of the open space that makes this important economic activity possible.

In 2000, the Forest Service estimated the economic impacts of their program areas. These estimates account for the impact a range of activities exerts on both income and employment. Recreation and protection programs account for a much greater economic impact than do extractive programs (Alward et al. 2003).

Table 3. Economic Significance of Forest Service Program Activities (for 1999)

	Percentage of Total Value Added (GDP)	Percentage of Total Income	Percentage of Total Wages	Percentage of Total Jobs
Recreation and Landscape Protection *Recreation, Heritage & Wilderness; Wildlife, Fish & Rare Plants; Watershed & Air Mgt; Ecosystem Mgt. Coord.; Access & Travel Mgt.*	70%	69%	71%	76%
Extraction of Commercial Resources *Range Mgt.; Forest Mgt.; Minerals & Geology Mgt.*	22%	22%	20%	17%
Other *Lands & Realty Mgt.; Fire & Aviation Mgt., Law Enforcement; Facilities Mgt., General Admin.; S&P Forestry; R&D*	9%	9%	8%	7%

Source: Alward et al. 2003.

Quality hunting and fishing opportunities require wildlife habitat, which generally means large areas of open land. As the population grows, these are increasingly found only on the federal and other public lands. Pickton and Sikorowski (2004) estimate that the total economic impact of hunting, fishing, and wildlife-watching in Colorado at over $1.8 billion, with corresponding employment at 33,000 full-time jobs. An April 2004 report from the Center for the Study of Rural America calls wildlife recreation "rural America's newest billion-dollar industry" (Henderson 2004), with wildlife-related activities boosting tourism, spurring business growth and contributing to increased property values. The U.S. Fish and Wildlife Service and the Census Bureau jointly track participation and expenditures on wildlife-related recreation. Nationwide these activities generate $108 billion for local economies. Much of these expenditures are in the Rocky Mountain West, with hunters, anglers, and wildlife watchers spending nearly $6 billion in the five-state region alone in 2001 (U.S. FWS and U.S. Census Bureau 2001). Table 4 presents the participation in and expenditures on wildlife recreation for Colorado, Montana, New Mexico, Utah and Wyoming.

Table 4. Participation and expenditures from hunting, fishing, and wildlife-associated recreation in the Rocky Mountains (2001)

	Participation	Expenditures
Colorado	2.1 million	$2 billion
Montana	871,000	$943 million
New Mexico	884,000	$1 billion
Utah	1.1 million	$1.4 billion
Wyoming	662,000	$634 million

Source: U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2001.

A complete analysis of an area's economy must present data and analysis that fully account for the important role that tourism, recreation, hunting, and fishing play in ensuring a sustainable and diversified economy for rural western communities.

D. Entrepreneurs

All of the indicators previously discussed are related to the increasing entrepreneurial activity being experienced West-wide. Entrepreneurs in high technology and knowledge-based industries can often choose their location, and are likely to choose high-amenity locations (Rasker and Glick 1994, Snepenger et al. 1995, Johnson and Rasker 1995, Beyers and Lindahl 1996, Rasker and Hansen 2000, Low 2004, Henderson and Abraham 2004). Recreation- and tourism-oriented businesses are often founded by footloose entrepreneurs seeking to live and work in places rich in amenities. Retirees and others relying on investment income also choose amenity-rich locations that include certain businesses and services. These new migrants bring with them entrepreneurial opportunities for those who can provide the services they seek.

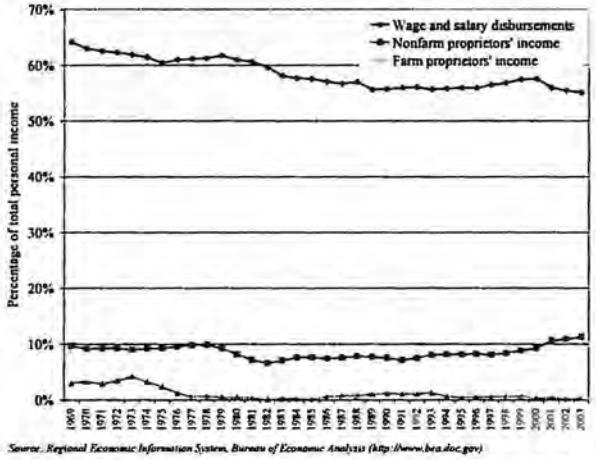


Figure 4. Rocky Mountain Personal Income by Type

Figure 4 shows personal income by type for the Rocky Mountain region. While wage and salary income is still the largest portion of total personal income, non-farm proprietors' income has shown an upturn in recent years.

As the proportion of total personal income from non-farm proprietors grows, implications for rural communities and for management of the public lands that surround them also grows. As Low (2004) points out: "Entrepreneurs create local jobs, wealth, and growth — and are themselves innovative users of other regional assets and resources." Furthermore, Low notes: "Entrepreneurs bolster a region's quality of life while promoting economic prosperity. Research has found a strong correlation between entrepreneurship and long-term regional employment growth."

Beyers and Lindahl (1996) specifically examine businesses which provide "producer services" and find these businesses are expanding rapidly in rural areas, and that most of them conduct much of their business interregionally or even internationally, bringing outside income into the rural region where they are located. These researchers also found that the decision to locate in rural areas is mostly for quality-of-life reasons, providing further evidence of the importance of such factors to local economies and the need to examine public land management activities and the potential impacts on quality of life.

A complete analysis of an area's economy must take into account the growing role of entrepreneurial businesses, and consider the impacts of each alternative on those businesses attracted by the environmental amenities provided by public lands in those communities.

E. The Role of Protected Public Lands

More and more people in the West, and all over the US, are able to choose where they live and work. Technology makes it easier for professionals to "telework" using electronic communications. Many businesses are able to conduct national or international commerce from any location they choose. Other entrepreneurs simple choose to live in a particular place and build a business in response to local needs. Retirees and others who collect non-labor income are not tied by a job to a specific location. All of these people seek an attractive place to live. More and more, as development pressures increase, public lands become a backdrop or setting which contributes to or even creates the amenities on which a community's economy will thrive and grow. Research supports the assertion that protected public lands contribute to rural economic health (Rudzitis and Johansen 1989, Rudzitis and Johnson 2000, Rasker et al. 2004).

Local communities with protected wildlands reap measurable benefits in terms of employment and personal income. For instance, the Sonoran Institute (Sonoran Institute 2004b) has found that protected lands have the greatest influence on economic growth in rural isolated counties that lack easy access to larger markets. From 1970 to 2000, real per capita income in isolated rural counties with protected land grew more than 60 percent faster than isolated counties without any protected lands.

These findings confirm earlier research showing that wilderness is in fact beneficial for local economies. Residents of counties with wilderness cite the presence of that wilderness as an important reason why they moved to the county, and long-term residents cite it as a reason they stay. Recent survey results also indicate that many firms decide to locate or stay in the West because of scenic amenities and wildlife-based recreation, both of which are strongly supported by wilderness areas (Morton 2000).

As noted by Freudenburg and Gramling (1994):

> "...it needs to be recognized as a serious empirical possibility that the future economic hope for resource-dependent communities of...the United States could have less to do with the consumption of natural resources than with their preservation."

This sentiment is reiterated by Deller et al. (2001):

> "Rural areas endowed with key natural resource amenities can manage those resources to capture growth more effectively. This may entail expansion beyond policies that have historically been focused on extraction of the resource base."

Resource managers, economic planners and community leaders must become aware of this potential. We therefore request that the NEPA process fully address the economic importance to local communities of protecting public wildlands from resource extraction.

V. SOURCES OF DATA

This section presents selected sources of economic, demographic, and recreation data.

A. Economic and Demographic Data

Data are available for several economic indicators by county from the U.S. Department of Commerce, Bureau of Economic Analysis and the U.S. Department of Labor, Bureau of Labor Statistics. The U.S. Census Bureau also tracks economic trends along with demographic trends, most by county as well. Economic profiles showing these and other trends by state, county, or groups of counties are available from the Sonoran Institute's Economic Profile System.

Federal economic and demographic data sources:

- Bureau of Economic Analysis (Department of Commerce): http://www.bea.doc.gov
  Date on income, farm income, transfer payments, and employment for states, counties, and regions. Annual data, 1969-2000 (Standard Industry Classification) and 2001-2003 (North American Industry Classification System)
- Bureau of Labor Statistics (Department of Labor): http://www.bls.gov
  Data on income, wage and salary, employment, unemployment rates by industry, for counties, states, and regions. Monthly data, 1990-2005
- Census Bureau (U.S. Department of Commerce): http://www.census.gov
  Data on population, demographics, business, and economics for states and counties
- The Sonoran Institute Economic Profile System: http://www.sonoran.org
  Generates detailed economic profiles, including trends in employment and income, farm income, economic resilience, and demographics for states, counties, or groups of counties. The companion, Economic Profile System — Community, will generate profiles to reflect just the rural or urban areas of a county.
- The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Census Bureau): http://www.census.gov/prod/www/abs/fishing.html
  Data at the state level on participation in and expenditures for wildlife-associated recreation

Selected state economic and demographic data sources:

- Colorado Economic and Demographic Information System: http://www.dola.state.co.us/is/cedishom.htm
- Montana Census and Economic Information Center (CEIC): http://ceic.commerce.state.mt.us/
- New Mexico Labor Market Information: http://www.dol.state.nm.us/dol_lmif.html
- New Mexico Economic Development Data Center: http://ww1.edd.state.nm.us/index.php?/data/C31/
- Utah Governor's Office of Planning and Development, Demographic and Economic Analysis: http://www.governor.utah.gov/dea/
- Wyoming Department of Administration and Information, Economic Analysis Division: http://eadiv.state.wy.us/

B. Recreation Data

Data on recreation use in the area where a land management plan is being developed is critical to making an informed decision. Surveys of users at recreation areas can be utilized to obtain information on the levels and types of

recreation use. Information on users' expenditures in the area is also important to learn the overall impact of public lands recreation. Federal land management agencies collect some data on recreation use of public lands. The Bureau of Land Management's Recreation Information Management System (RIMS) and the USDA Forests Service's National Visitor Use Monitoring System (NVUMS) are two examples.

Other information may be obtained through surveys of local residents, recreation visitors and through using existing data on the recreation and tourism revenues to local businesses, and the value of these activities to participants. The lack of complete visitation data does not justify ignoring the jobs and income from recreation. Furthermore, the Data Quality Act requires use of the best available, reliable data on all impacts and affected sectors of the economy.

The National Survey on Hunting, Fishing and Wildlife-Associated Recreation (noted above) is also a source of state-wide data on participation in wildlife recreation that should be used to supplement more specific studies for the location in question. State agencies are also a source of data on fishing and hunting and other wildlife-associated recreation.

Colorado Division of Wildlife: http://wildlife.state.co.us/index.asp
Montana Fish, Wildlife, and Parks: http://fwp.state.mt.us/default.html
New Mexico Game and Fish: http://www.wildlife.state.nm.us/index.htm
Utah Division of Wildlife Resources: http://wildlife.utah.gov/index.php
Wyoming Game and Fish: http://gf.state.wy.us/

C. Data Gaps and Other Issues

Land managers may encounter gaps in county- or state-level economic data or may notice that data series are not continuous. These are not, however, obstacles to doing a thorough and comprehensive analysis of the trends in the economies of the local area.

1. Disclosure Gaps

Some data gaps are due to disclosure restrictions. The Bureau of Economic Analysis and the Bureau of Labor Statistics will suppress data in cases where disclosing it may reveal private information about individuals. For example, if only one business represents a specific industry in a given area, any data on employment and/or income in that industry will not be publicly disclosed since it may make it possible to identify an individual's or business' private information. Disclosure suppression is more likely to be a problem in counties with small populations. The Sonoran Institute suggests several potential techniques to address the issue of data gaps due to disclosure issues. The Economic Profile System will also automatically estimate the data gaps for major industry categories. These are described in detail in the User's Manual for the EPS (Sonoran Institute 2004b.)

2. Other Data Gaps

BEA and Bureau of Labor Statistics (BLS) data are sometimes not available for certain industries and/or certain years. Other data are suppressed, but are identified as falling within a range of values. Data gaps where an "L" appears instead of a number are described as follows:

Less than 10 jobs, but the estimates for this item are included in the totals, or
Less than $50,000 (for income data), but the estimates for this item are included in the totals

3. Industry Classification Using SIC and NAICS

Income and employment data from the Bureau of Economic Analysis and the Bureau of Labor Statistics for 1969-2000 are classified according to the Standard Industry Classification system (SIC), while the most recent data (2001 and forward) are classified by the North American Industry Classification System (NAICS). NAICS was developed jointly by the U.S., Canada, and Mexico in order to make statistics comparable across all three countries.

The NAICS provides greater detail for the service and professional sectors which are of growing importance in the rural West, and indeed all over the country. This classification scheme also includes some emerging industries such as "information" which includes the growing Internet and information phenomenon. The Bureau of Economic

Analysis' Regional Economic Information System (REIS) uses SIC to classify industries and the Sonoran Institute's EPS system uses SIC data from the REIS in order to show trend analyses, along with NAICS data.

VI. RECOMMENDED METHODS FOR ANALYSIS

In general, it is inappropriate to examine a region's economy solely as a single point in time because economies are dynamic. To the extent that data are available, the economic profile of an area should be developed based on the trends in key economic indicators. This can help guide resource management by showing the likely future situation in an area and can point out periods of economic downturn. It may be instructive to look at other variables during these periods to see if there are correlations between land management activities and economic activity.

Looking at the changes in employment and income (including non-labor income) is important to understanding the overall direction in which an area's economy is moving. Trend analysis will show long-term patterns in income and employment that may be masked when looking at only a point in time. Data on employment and income are available from 1969-2000 from the BEA under the SIC system. The BEA changed to the NAICS in 2001, and reconstructed NAICS data for years prior to 2001 are not yet available. However, one can certainly look at a general picture of the economy over time by using both sets of data. This analysis should be applied to all the segments of the economy to see the long-term trends in both extractive and other industries along with non-labor income.

A lack of data on recreation activities on public lands should not be an excuse to avoid analysis of potential impacts of public land management decisions on the recreation sector. Several examples of research on recreation use, values to participants, and expenditures are available (a very limited sample includes: Fix and Loomis 1997, Chakraborty and Keith 2004, Cordell and Tarrant 2002, Kaval and Loomis 2003). Rosenberger and Loomis (2001) present a detailed bibliography of recreation valuation studies and present methods by which analysts can transfer estimates of the value of recreation in one area to other similar areas. Of course, the best way to truly understand the value of recreation in an area is to conduct a survey specifically focused on that area. At a minimum, such a survey should collect information on recreation visitation and expenditures. An estimate of the economic impacts of recreation can be made by multiplying the total number of recreation visitors in an area by the estimated expenditures per visitor day. These data should be collected and analyzed as part of a comprehensive analysis of the socio-economic impacts of land management.

VII. RECOMMENDED ANALYSES

The preceding sections of this brief have presented the key indicators that must be included in a socio-economic impact analysis, identified data sources for conducting that analysis, and provided methods for completing an analysis that more accurately reflects the West's economy. In making land-use decisions, federal agencies have an obligation under NEPA to take a "hard look" at the environmental consequences of a proposed action, and the requisite analysis "must be appropriate to the action in question."[2] The impacts and effects of a proposed action, such as oil and gas development, that federal agencies are required to assess include: "ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative."[3] Under the Data Quality Act, federal agencies are required to use information that is of high quality and that is objective, useful, and verifiable by others.[4] The agency must also use "sound statistical and research" methods.[5]

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[2] 42 U.S.C. § 4321 et seq.; *Metcalf v. Daley*, 214 F.3d 1135, 1151 (9th Cir. 2000); *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989).

[3] 40 C.F.R. § 1508.8.

[4] Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L.No. 106-554, § 515. *See also*, Office of Management and Budget "Information Quality Guidelines," available at http://www.whitehouse.gov/omb/inforeg/iqg_oct2002.pdf and individual "Agency Information Quality Guidelines," available at http:/www.whitehouse.gov/omb/inforeg/agency_info_quality_links.html.

[5] *Ibid.*

Federal agencies cannot evaluate the consequences of proposed decisions or determine how best to avoid or mitigate negative impacts without adequate data and analysis. NEPA's hard look at environmental consequences must be based on "accurate scientific information" of "high quality."[6] Essentially, NEPA "ensures that the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts."[7] The Data Quality Act and the agencies' interpreting guidance expand on this obligation, requiring that influential information or decision-making input be based on "best available science and supporting studies conducted in accordance with sound and objective scientific practices."[8]

Through the application of the methodology, key indicators and data sources we have provided, federal agencies can better fulfill their obligations to evaluate the direct, indirect, and cumulative impacts of various alternative decisions. In this section, we have provided both general recommendations on the scope of the socio-economic impact analysis that should occur and specific inquiries to be made in this analysis. Again we note that completion of the socio-economic analyses outlined in this brief is necessary but not sufficient to fully evaluate a land management decision. A thorough benefit-cost analysis is also required and expected.

We formally request that the NEPA analysis fully reflect and account for the following scoping comments:

A. The socio-economic analysis should include an analysis, graphs and discussion of historic personal income trends — including non-labor sources of income.

The analysis of regional economic impacts must include an analysis of all sources of income, including non-labor income. A full accounting of all sources of income is necessary to understand the important role that retirement and investment income — as well as other sources of non-labor income, such as interest payments, rents, and profits — play in the regional economy. An economic impact analysis that excludes non-labor income is inadequate and misleading.

- **Specific Requests and Requirements for examining the Total Personal Income and the Importance of Non-Labor Income as Part of the NEPA Process:**

For all counties in the planning area, please show the role of non-labor income in the area's economy.

- Show the percentage of current total personal income that is non-labor income (excluding income support).
  - Analyze and discuss the role that retirement and investment income currently plays in the area's economy, including the spillover effects of non-labor income on businesses in the area.
  - Analyze and discuss the role that amenities, including recreation opportunities and environmental quality, currently play in attracting and retaining non-labor income to the area.
  - Analyze and discuss the potential impacts that public land management alternatives will have on the level and trend of investment and retirement income in the area.
- Show the trend in non-labor income (again excluding income support) as a percentage of total personal income.

[6] 40 C.F.R. § 1500.1(b).
[7] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).
[8] Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L.No. 106-554, § 515. *See also*, Office of Management and Budget "Information Quality Guidelines," available at http://www.whitehouse.gov/omb/inforeg/iqg_oct2002.pdf and individual "Agency Information Quality Guidelines," available at http://www.whitehouse.gov/omb/inforeg/agency_info_quality_links.html.

B. The socio-economic analysis must include an analysis and discussion on the indirect role public lands play in the regional economy in attracting knowledge-based businesses, service sector business, recreation and tourism businesses, and other entrepreneurs.

Public wildlands often define the character of an area and are an important component of the quality of life for local residents and future generations. Their protection enables the customs and culture of western communities to continue. The socio-economic analysis also must account for these economic benefits.

A growing number of economists are recognizing that protecting the quality of the natural environment is key in attracting new residents and businesses, and that therefore the environment is the engine propelling the regional economy. A letter to President Bush from 100 economists concludes, "The West's natural environment is, arguably, its greatest, long-run economic strength... A community's ability to retain and attract workers and firms now drives its prosperity. But if a community's natural environment is degraded, it has greater difficult retaining and attracting workers and firms" (Whitelaw et. al, 2003). Given these findings, we request that, as part of the economic impact analysis of management alternatives, the socio-economic analysis fully consider the indirect role of public lands in attracting and retaining non-recreational businesses and retirees and encouraging entrepreneurial efforts.

- **Specific Requests and Requirements for Examining the Role of Protected Public Lands in the Local Economy as Part of the NEPA Process:**

For all counties in the planning area, please show the role of various industries in the area's economy.

- Show the current distribution of employment and income by industry (for each industry, show employment as a percentage of total jobs and income as a percentage of total personal income).
  - Discuss the relative importance of each industry.
  - Analyze and discuss the impacts that public land management alternatives will have on non-extractive industries if extractive activities are accelerated on public lands in the area.
- Show a complete analysis of the segments of service and professional employment and income for the area.
  - Analyze and discuss the potential impacts of land management alternatives on these sectors of the economy.
- Show trends in employment and income by industry, including a detailed examination of the service and professional sectors.
  - Discuss the level of diversity in the region's economy. Discuss trends in income and employment that have led to the current mix of industries
  - Analyze and discuss the potential impacts of public lands management alternatives on the overall makeup of the economy of the area.
- Show trends in non-farm proprietor's income as a percentage of total personal income for the area.
  - Collect data on the various sectors that make up non-farm proprietors. Analyze the sectors where entrepreneurship is growing.
  - Analyze and discuss the factors that have attracted new businesses to the area.
  - Analyze and discuss the potential impacts that public land management alternatives will have on these sectors and the ability of proprietors to start and grow businesses.

C. The socio-economic analysis must account for the economic importance of the recreation, hunting, and fishing that occurs on public land.

The recreation opportunities provided by wilderness-quality lands also yield direct economic benefits to local communities. The socio-economic analysis must include an analysis of the income and jobs associated with recreation, hunting and fishing from each alternative.

- **Specific Requests and Requirements for Examining the Economic Importance of Recreation, Hunting and Fishing on Public Lands as Part of the NEPA Process:**

For all counties in the planning area, show the role of recreation, hunting and fishing in the area's economy.
Collect data on participation in all recreation activities (hunting, fishing, hiking, camping, backpacking, biking, skiing, wildlife watching, boating, ORV use, etc.)
Collect data on expenditures by recreation visitors in the region.
Analyze the economic impact of hunters' and anglers' expenditures on area businesses and local economies.
Analyze the economic impact of other recreationists' expenditures on area businesses and local economies.
Show the impact of lodging taxes, sales taxes, and property taxes in the local economy.
Analyze and discuss the impact of public land management alternatives on recreation, hunting, and fishing businesses.

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APPENDIX A

ECOLOGY AND ECONOMICS RESEARCH DEPARTMENT

MAY 2006 • Number 2

THE WILDERNESS SOCIETY

Science & Policy Brief

Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard Bureau of Land Management Lands

Key Points

- Habitat fragmentation from roads presents a major threat to the survival of wildlife populations throughout the United States.
- In the United States, the public lands managed by the Bureau of Land Management (BLM) provide much of the remaining intact habitat—untouched by roads and unaffected by fragmentation from human activities—for a wide variety of species, particularly in the West.
- The travel management planning process provides the most logical and effective context within which to evaluate the current level of habitat fragmentation and take steps to reduce it.
- Robust and well-accepted metrics exist to measure habitat fragmentation and help design strategies to protect and improve wildlife habitat.
- Measuring and addressing habitat fragmentation is consistent with the BLM's legal obligations and its duties as a steward of the public lands.
- The BLM can and should use various analytical methods as part of its travel management planning process to ensure that decisions are based on an understanding of existing habitat fragmentation and its impacts on wildlife, and to develop road networks that will minimize future habitat fragmentation.

PHOTO COURTESY SUWA.ORG

One of the greatest threats to biological diversity worldwide is habitat fragmentation from roads, such as this one typical of the extensive road networks on BLM lands throughout the West.

Habitat Fragmentation, Roads, and Wildlife

"Among the most widespread forms of modification of the natural landscape during the past century has been the construction and maintenance of roads."

—S.C. Trombulak and C.A. Frissell, *Conservation Biology*, Vol. 14, 2000.

Habitat fragmentation has been defined as the "creation of a complex mosaic of spatial and successional habitats from formerly contiguous habitat" (Lehmkuhl and Ruggiero 1991). Habitat fragmentation alters the distribution of wildlife species across the landscape and affects many life functions such as feeding, courtship, breeding, and migration. Transportation networks are one of the most significant causes of habitat fragmentation, and negatively affect wildlife well beyond the amount of surface area disturbed by actual roads.[1] In fact, habitat fragmentation from roads and other human infrastructure has been identified as one of the greatest threats to biological diversity worldwide (Wilcove 1987).[2] The adverse effects of roads on wildlife have been well documented in several extensive literature reviews (Trombulak and Frissell 2000, Gucinski et al. 2001, Gaines et al. 2003, Wyoming Game and Fish Department 2004, New Mexico Department of Game and Fish 2005).

In an issue of the journal *Conservation Biology* dedicated to the ecological effects of roads, the opening review article by ecologists Trombulak and Frissell (2000) outlines the following general effects of roads on terrestrial and aquatic wildlife:

- Mortality from road construction
- Mortality from collisions with vehicles
- Modifications of animal behavior
- Disruption of the physical environment
- Alteration of the chemical environment
- Fragmentation of connected habitats
- Spread of exotic species
- Increased alteration and use of habitats by humans

More specific examples of some of these effects include:

- Habitat removal from road construction and loss of large, contiguous blocks of core habitat
- Diminished animal use of habitats because of noise, dust, emissions, and the presence of humans
- Loss of forage for herbivores
- Interference with wildlife life-history functions (courtship, nesting, migration, and others)
- Increased poaching or unethical hunting practices
- Increased dispersion of recreation impacts, particularly by off-road vehicles
- Degradation of aquatic habitats through alteration of stream banks and increased sediment loads

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[1] In this document, we are using the term "road" to refer to defined motorized routes, including roads and designated motorized trails on BLM lands. Nonetheless, many such routes on BLM lands do not meet the legal definition of a "road," because they were illegally created and/or not improved or maintained by mechanical means to ensure regular use. *See* H.R. Rep. No. 94-1163 at 17 (1976). Existing routes that do not meet this definition should not ultimately be considered part of an existing transportation network and should be prioritized for closure and restoration. For purposes of this discussion, however, we are primarily using the term "road" for convenience and because the use of motorized routes, whether legal or not, nonetheless impacts wildlife and contributes to habitat fragmentation.

[2] Habitat fragmentation also occurs naturally in landscapes due to heterogeneity in vegetation types and topography, wildfire, stream channels, and other natural biological and physical features and processes. This document addresses human-caused fragmentation from roads and other routes, which is additive to the landscape's natural heterogeneity.

The New Mexico Department of Game and Fish (NMGF) compiled a report (New Mexico Department of Game and Fish 2005) that focuses on roads as "a **major contributor to habitat fragmentation** because they divide large landscapes into smaller patches and convert interior habitat into edge habitat" (*p. 3, emphasis added*). Similar to Trombulak and Frissell's paper, the NMGF report identifies the adverse effects of habitat fragmentation on wildlife. The report states that habitat fragmentation from roads increases isolation of populations or species, leading to:

- Adverse genetic effects
- Increased potential for extirpation of localized populations or extinction of narrowly distributed species from catastrophic events
- Changes to habitat composition, from weedy and invasive species
- Changes to type and quality of food base
- Changes to microclimates by altering temperature and moisture regimes
- Changes to flows of energy and nutrients
- Changes to availability of cover and increasing edge effect, potentially bringing together species that negatively affect the survival of others
- Increased opportunities for exploitation by humans (*p. 3*)

The Wyoming Game and Fish Department (WGFD) prepared a report containing comprehensive guidelines for wildlife protection in areas of energy development, based on a literature review on the effects of roads, other infrastructure, and activities associated with energy development on Wyoming's sagebrush and grassland habitats and wildlife species (Wyoming Game and Fish Department 2004). Because a substantial portion of the impact of oil and gas development comes from its relatively dense road network, much of the literature cited in the report documents the impacts of roads on wildlife. The report acknowledges the threat to wildlife from fragmentation, identifying fragmentation and diminishing quality of sagebrush ecosystems as "the principal reasons why populations and distributions of wildlife are declining" (*p. 1*). The report demonstrates the likelihood of habitat fragmentation from roads and other disturbances associated with energy development, and emphasizes the range of damage to habitat that occurs from such development:

> Adverse effects of oil and gas development can be divided into 6 general categories: 1) direct loss of habitat; 2) physiological stress to wildlife; 3) disturbance and displacement of wildlife; 4) **habitat fragmentation and isolation**; 5) introduction of competitive and predatory organisms; and 6) secondary effects created by work force assimilation and growth of service industries. The direct loss or removal of habitat is always a con-

PHOTOS ON THIS PAGE: JANICE THOMSON

Views of motorized vehicle impacts on BLM lands. Top to bottom: Well pads and roads in the Little Snake Resource Area in northwestern Colorado; dirt roads crisscross arid lands in Utah; off-road driving damages vegetation and soils, as seen in this picture taken in Utah.

cern, however oil and gas developments are typically configured as point and linear disturbances scattered across broad areas. **Collectively, the amount of disturbance may encompass just 5-10% of the land. However, avoidance and stress responses by wildlife extend the influence of each well pad, road, and facility to surrounding habitats.** (*p. 5, emphasis added*)

The report provides further details about how oil and gas development causes habitat fragmentation:

As densities of wells, roads, and facilities increase, the effectiveness of adjacent habitats can decrease until most animals no longer use the habitat. Although vegetation and other natural features may remain unaltered within areas near oil and gas features, wildlife make proportionately less use of these areas than their availability. Animals attempting to forage inside the affected zones are also subjected to increased physiological stress. The avoidance/stress effect impairs function by reducing the capability of wildlife to use the habitat effectively. In addition, **physical or psychological (i.e., disturbance-related) barriers lead to fragmentation of habitats and further reduce the availability of effective habitat. These impacts can be especially problematic when they occur within limiting habitat components such as crucial winter ranges and reproductive habitats.** (*p. 5, emphasis added*)

The WGFD report further notes that the development, such as roads, associated with oil and gas activities will harm wildlife populations even if there is suitable habitat nearby:

When activities associated with energy development displace animals from otherwise suitable habitats, the animals are either forced into marginal habitats or they compete with animals that already occupy the unaffected habitats. Consequences of such displacement and competition are lower survival, lower reproductive success, lower recruitment, and ultimately lower carrying capacity and reduced populations. (*pp. 6-7*)

As documented by comprehensive literature reviews and the additional conclusions reached by state agencies in their respective reports, the existence of a road can result in habitat fragmentation and, depending on the use of the roads, have impacts extending well into surrounding habitats. Such fragmentation from transportation networks is immediate and can lead to a range of risks to the survival of wildlife. Travel management planning determinations about the existence, closure, placement, and levels and types of use of roads are an ideal context for measuring and addressing habitat fragmentation.

BLM Lands and Transportation Planning

As landscapes become increasingly fragmented by roads and other human infrastructure, protection of the remaining areas of intact habitat becomes increasingly vital to the survival of wildlife—from game species and wide-ranging carnivores to songbirds—and more fundamentally to the natural functioning of ecosystems. In the United States, the public lands managed by the BLM provide much of this remaining intact habitat for a wide variety of species, particularly in the West and Alaska.

For example, Wyoming's Upper Green River Valley is the largest block of publicly owned winter range for big game in the 19-million-acre Greater Yellowstone Ecosystem. Compromising this winter habitat could affect ungulate populations in five surrounding mountain ranges of western Wyoming (Sawyer and Lindzey 2004). Similarly, in its *National Sage-*

Grouse Habitat Conservation Strategy (Bureau of Land Management 2004a), the BLM acknowledges both the amount of habitat under its control and the importance of its management, stating: "As the land manager of almost half of the remaining sagebrush habitat, BLM plays a key role in conserving sage-grouse and sagebrush habitat" (*p.* 3).

The placement, design, and use of roads determine which areas will remain or become intact habitat, and which areas will be fragmented by roads and how. In other words, decisions regarding roads and other motorized routes will determine the degree of modification that occurs to the composition, structure, and function of ecosystems, including water flow and quality, other physical elements, vegetation, and wildlife.

The travel management planning process, which requires agencies such as the BLM to manage motorized and other human travel across the landscape by defining a travel network and determining appropriate uses of various travel routes, provides the most logical and effective context within which to evaluate the current level of habitat fragmentation and take steps to reduce it. The BLM can and should use various analytical methods as part of its travel management planning process to ensure that decisions are based on an understanding of existing habitat fragmentation and its impacts on wildlife, and to develop road networks that will minimize future habitat fragmentation. Because of the importance of BLM lands in providing intact habitat for wildlife species, the decisions made in travel management plans for BLM lands will play an essential role in protecting critical wildlife habitat throughout the West.

Measuring Habitat Fragmentation

Measuring habitat fragmentation from roads is a key means of determining the status of existing wildlife habitats and developing management strategies to safeguard and improve them. There are many ways to measure habitat fragmentation; three of the most useful metrics, due to their ease of calculation and direct connection to biological field research, are road density, number and size of core areas, and distance to a road.

PHOTO BY JOHN FANDEK

PHOTO BY DAVE MENKE/US FISH AND WILDLIFE SERVICE

The BLM's transportation management decisions will play an essential role in protecting critical habitat for many wildlife species, such as the moose (top) and pronghorn (bottom) pictured here, that depend on BLM lands throughout the West.

Road density can be calculated by measuring the length of road divided by the area in a given region, and is often reported as **miles of road per square mile** (mi/mi^2). **Core areas** are defined as land beyond a given distance, or road effect zone, from transportation routes (Forman 1999). The **number and sizes of core areas** can be calculated, as can a region's total **amount of core area**

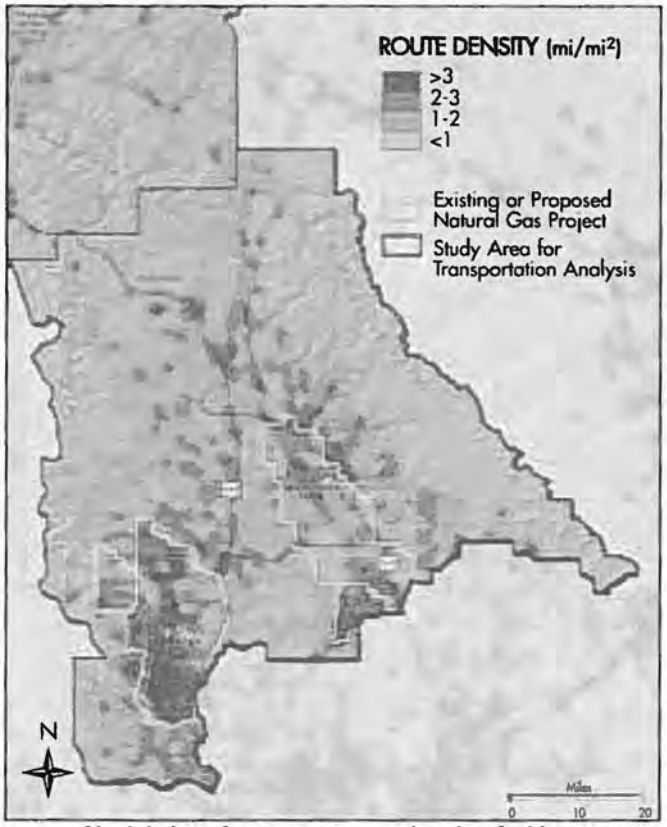
beyond a given distance or effect zone from roads. Because different wildlife species respond to road-related disturbances at varying distances (and depending on the road type and activity level), it is important to determine measures of core area for a range of effect zone widths relevant to particular species found in the area (e.g., 100 feet, 500 feet, 1 mile, 2 miles, etc.). Measuring the amount of **land within a given distance to a road or within an effect zone** is the inverse of measuring the acreage of core areas, and represents a measure of the habitat affected by roads.

Several computer software packages can aid in calculating habitat fragmentation metrics. The BLM maintains the geographic information system (GIS) software ArcGIS, a commercial software package produced by the Environmental Systems Research Institute that can be used to calculate metrics including **road density, core area size, and road effect zone size** (Figure 1). RoadNET (Road Network Evaluation Tool) is a spatially based application developed by The Wilderness Society that enables quantitative assessment of habitat fragmentation due to roads. RoadNET can be used to measure **road density**, in order to identify roadless areas and **assess the degree of fragmentation**, and to measure the **location, size, and number of**

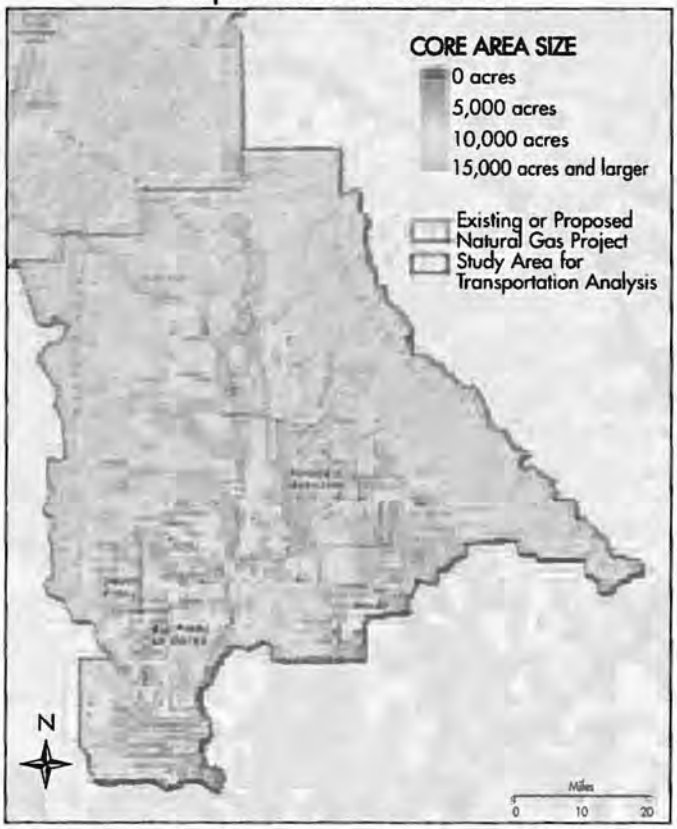
FIGURE 1.

Habitat Fragmentation Metrics

a. Transportation Route Densities



b. Core Habitat Areas Outside a 500-Foot Transportation Route Effect Zone



Areas of high habitat fragmentation may be identified by generating maps of road density (a) and core area size (b). These figures, from the Wilderness Society report *Wildlife at a Crossroads* (Thomson et al. 2005), were produced using ArcGIS and depict the BLM Pinedale Resource Management Area in Wyoming.

core areas, the size of the **road effect zone**, edge density,[3] and other relevant indicators of fragmentation. It was used in some of the Wilderness Society analyses discussed below to evaluate GIS-based road data obtained from the BLM representing existing transportation networks.

Measuring the Effects of Fragmentation on Wildlife

Wildlife literature can be tied directly to habitat fragmentation metrics through field studies measuring the effects of different road densities, the size requirements for core areas, and the widths of road effect zones for particular species (Gucinski et al. 2001, Gaines et al. 2003, Wyoming Game and Fish Department 2004, New Mexico Department of Game and Fish 2005). For instance, a study of grizzly bears in Montana (Kasworm and Manley 1998) showed that the bears used areas within 1,640 feet of a road substantially less than habitat more than 3,281 feet from a road. Field monitoring of bighorn sheep response to vehicle and mountain bike activity on roads (Papouchis et al. 2001) revealed that, on average, bighorn alerted at a distance of 1,190 feet and fled at 433 feet from these road-related disturbances. Meanwhile, an elk field study (Lyon 1983) suggested that road densities of 1 mi/mi^2 in forested landscapes reduce elk habitat effectiveness[4] by 25%. An ongoing study (Sawyer and Lindzey 2001, Sawyer and Lindzey 2004, Sawyer et al. 2005) of global positioning system (GPS)-collared deer in the Pinedale Anticline of Wyoming's Upper Green River Valley demonstrated that deer utilized habitat progressively farther from roads and well pads over three years of increasing gas development in the area, and showed no evidence of acclimating to energy-related infrastructure. Similar data for various species are also summarized in the NMGF and WGFD reports.

The Wilderness Society has evaluated the effects of roads on habitat for a variety of species, using GIS road data, wildlife habitat boundaries from the BLM and state agencies such as WGFD, and available literature on the responses of different species to road-related disturbances. *Protecting Northern Arizona's National Monuments* (Thomson et al. 2004) surveys the effects of road density on the desert tortoise, mountain lion, bighorn sheep, pronghorn, and mule deer. A similar analysis in *Wildlife at a Crossroads* (Thomson et al. 2005) details the effects of energy development (including wells and drill pads, but primarily roads) on mule deer, pronghorn, elk, and sage-grouse in the Upper Green River Valley of Wyoming.

Analyses by The Wilderness Society also show how the ecological effects of roads extend well beyond their physical footprint. For example, *Fragmenting Our Lands* (Weller et al. 2002) shows that roads causing direct disturbance to just four percent of a given landscape can have adverse ecological effects extending over nearly the entire area for species such as proghorn. Similarly, *Ecological Effects of a Transportation Network on Wildlife* (Hartley et al. 2003), an analysis of roads in the Upper Missouri River Breaks National Monument in Montana, showed that more than 86% of the 791-square-mile monument lies within one mile of a transportation

[3] Edge density refers to the length per unit area of edge habitat or the linear break in native habitat that is created along both sides of a road when it is built. Like road density, it can be measured in miles per square mile (mi/mi^2).

[4] Habitat effectiveness refers to a landscape's ability to provide wildlife needs including forage, visual cover, and thermal cover. Habitat effectiveness is reduced by human infrastructure and disturbances such as motorized routes and their associated activities.

feature and that routes potentially reduce elk habitat effectiveness by 25% across 35% of the monument's habitat for this species.

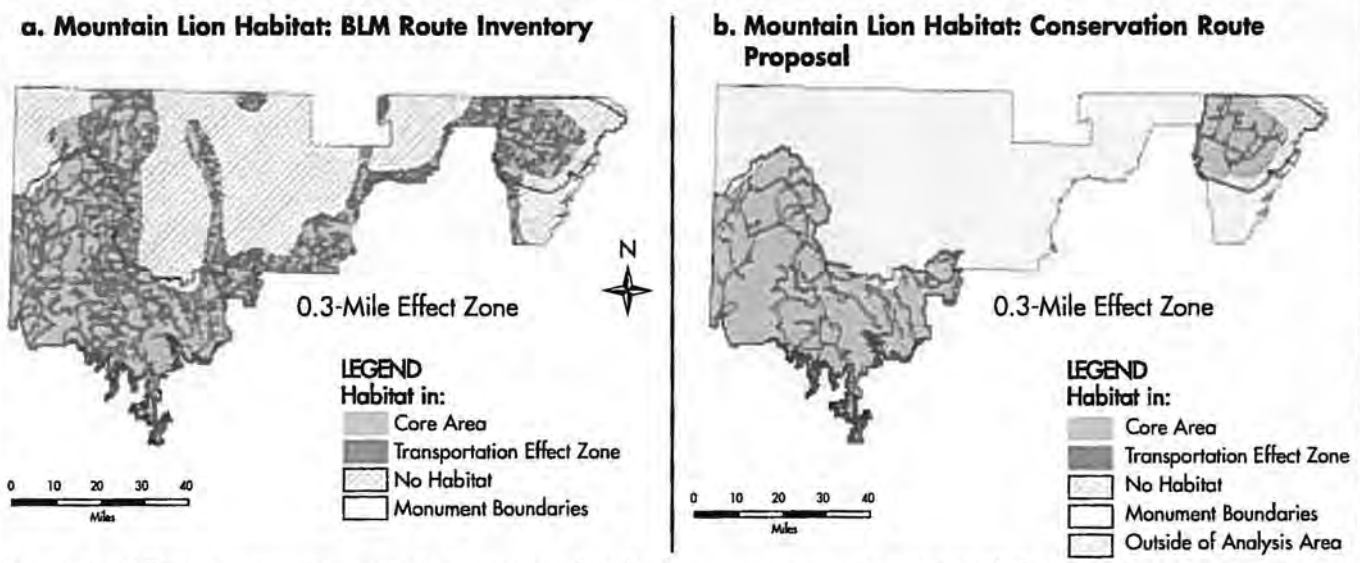
The BLM already has the capacity to measure habitat fragmentation's effects on wildlife. For instance, a recent Draft Resource Management Plan/Environmental Impact Statement for the 5.5 million acres managed by the BLM's Vernal Field Office in Utah included extensive measurement of potential habitat fragmentation using a range of road effect zone sizes and specific impacts to be expected for different species (Bureau of Land Management 2005a, *see*, e.g., Appendix I and Section 3.19.2).

Evaluating Transportation Scenarios

Readily available methodology and software can also help produce informed travel management scenarios that minimize habitat fragmentation. GIS analysis can be used to develop alternative transportation networks to help protect existing core habitat and linkages, as well as create new ones. RoadNET can perform **network tracing**, in order to trace the number of spur routes from a maintained or key access road, identify the miles of spur routes accessible from each junction with the main road, and identify the number of **access points**. Based on this information, an agency can identify the **most valuable location at which to construct a closure** gate or barrier to effectively close access to the greatest mileage of illegal or unwanted routes. The agency can also use this RoadNET information to identify **redundant roads** that grant access to the same place, showing which roads are not necessary to preserve. RoadNET can also show a **buffer** around roads, at various distances, to demonstrate the broader area impacted by roads (such as the differing effect zones discussed above). Further, RoadNET can consider **proximity** of roads to areas identified as in need of

FIGURE 2.

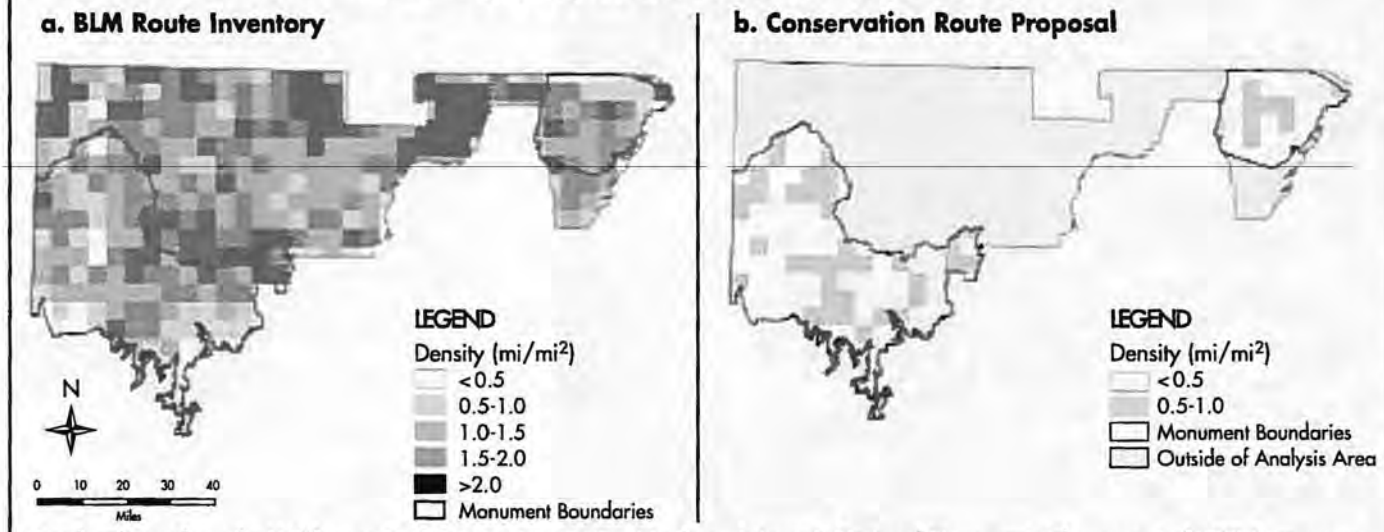
Evaluating Transportation Scenarios: Effect Zones and Core Area



Comparing different transportation network scenarios can help land management agencies minimize habitat fragmentation from roads. This figure, from the Wilderness Society Report *Protecting Northern Arizona's National Monuments* (Thomson et al. 2004), compares the amount of mountain lion habitat (outside a 0.3-mile road effect zone) that would be available under two different route scenarios for the BLM Arizona Strip Planning Area in northwestern Arizona.

FIGURE 3.

Evaluating Tranportation Scenarios: Route Density



Another figure from the Wilderness Society report *Protecting Northern Arizona's National Monuments* (Thomson et al. 2004) compares route density under two different transportation network proposals.

special protection, such as core habitat and linkages that are key to the continued survival of sensitive species.

The Wilderness Society has conducted such an analysis in *Protecting Northern Arizona's National Monuments* (Thomson et al. 2004), comparing the effects of an alternative transportation management plan developed to protect sensitive species with an expected BLM proposal (Figures 2 and 3). In addition to the differences depicted in the figures, the analysis of the BLM's current road inventory showed that only 10% of monument lands were more than one mile from a road, while the Conservation Route Proposal would result in 44% of monument lands more than one mile from a road, leaving substantially greater habitat for wildlife.

Travel management planning can and should seek to identify and reduce fragmentation and its potential effects on wildlife. Incorporating the methods, metrics, and literature discussed above as a vital part of travel planning on BLM lands can help safeguard the remaining intact habitat for a variety of wildlife species found on these lands.

Regulatory Context

Measuring and addressing habitat fragmentation is consistent with the BLM's legal obligations and its duties as a steward of the public lands. Applicable policy and law support the use of habitat fragmentation analysis by the BLM for informed travel management planning.

For example, the agency's *Land Use Planning Handbook* (Bureau of Land Management 2005b, Appendix C, Section II.D) requires that "Comprehensive Trails and Travel Management" address "all resource use aspects." Specifically, at the land use plan level, the BLM must identify: areas for use based on program goals and objectives, primary users, reasons for "allowing travel" in an area, setting character to be maintained (including Visual Resource Management and Recreation Opportunity Spectrum classifications), and primary means of travel appropriate to meet objectives and keep setting character. At the implementation level, the BLM must define a detailed travel management network and "establish a process" to identify roads, trails, etc., with criteria for selection, guidelines

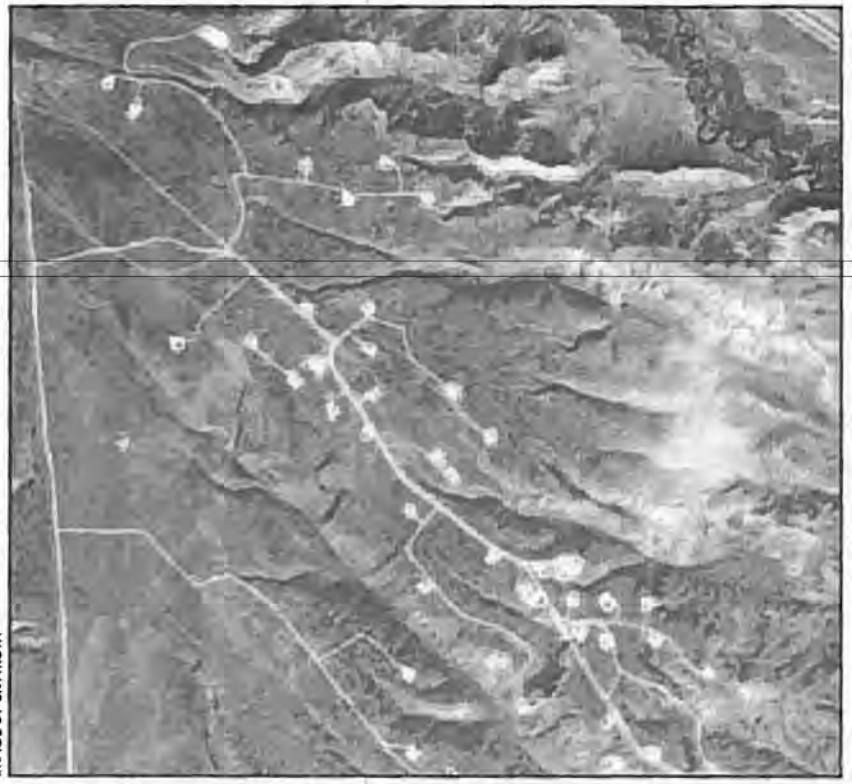


IMAGE BY SKYTRUTH

Roads and drill pads seen in Landsat satellite image of the BLM Pinedale Resource Management Area in Wyoming.

for management, monitoring, and maintenance, and measurable standards for future travel plan revision.

The Federal Land Policy and Management Act (FLPMA) obligates the BLM to manage the public lands based on its inventories of values and its assessment of potential uses, including consideration of how different uses may affect these lands.[5] The BLM can best determine the need and appropriate level of use for roads and other routes in the context of the variety of values and potential uses of the public lands, recognizing that all uses are not necessarily appropriate in all areas.[6]

FLPMA further requires that the BLM "take any action necessary to prevent unnecessary or undue degradation of the lands" and "minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved."[7]

In certain circumstances, the BLM is required by law (in the form of both Presidential Executive Orders and the agency's own implementing regulations) to prioritize particular activities, such as protection of endangered species and archaeological and historic resources, over other potential uses or construction of roads. In general, the BLM is required to ensure that areas and trails for off-road vehicles are located:

- To minimize damage to soil, watersheds, vegetation, or other resources of the public lands
- To minimize harassment of wildlife or significant disruption of wildlife habitats
- To minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands
- Outside officially designated wilderness areas or primitive areas[8]

The Endangered Species Act[9] requires the BLM to take actions to conserve threatened or endangered species, including designating critical habitat essential for conservation of species and developing site-specific recovery plans. Other requirements may apply to additional special-status species designated by federal or state agencies.

The National Environmental Policy Act (NEPA) requires the BLM to take a "hard look" at the potential environmental consequences of a proposed action, such as a travel management plan, so that the BLM must assess potential

5 *See* FLPMA, 43 U.S.C. §§ 1711-1712.

6 *See* FLPMA, 43 U.S.C. 1702(c).

7 43 U.S.C. § 1732(b); §1732(d)(2)(a).

8 43 C.F.R. § 8342.1.

9 16 U.S.C. §§ 1531-1544.

impacts and effects including: "ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative."[10] NEPA's "hard look" at environmental consequences must be based on "accurate scientific information" of "high quality."[11] Essentially, NEPA "ensures that the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts."[12] The Data Quality Act and the BLM's interpreting guidance expand on this obligation, requiring that "influential information" (information that is expected to have a "clear and substantial" change or effect on important public policies and private sector decisions as they relate to federal public lands and resources issues, such as that information contained in or used to develop a resource management or travel management plan) use "best available science and supporting studies conducted in accordance with sound and objective scientific practices."[13]

NEPA also requires that the BLM conduct its environmental impact analysis based upon an adequate and accurate description of the environment that will be affected by the proposed action under consideration—the "affected environment."[14] The affected environment represents the baseline conditions against which impacts are assessed. The importance of accurate baseline data has been emphasized by courts, which have found that "a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process."[15]

The BLM has taken some steps to embrace the policy and legal obligations described above, issuing guidance that prescribes identifying habitat at risk, prioritizing protection and restoration, and using the land use planning process to accomplish these goals. For example, the BLM's *National Sage-Grouse Habitat Conservation Strategy* (Bureau of Land Management 2004a) is based on a preliminary

PHOTO TWS ARCHIVE

Sage-grouse are one of many wildlife species threatened by habitat fragmentation and loss due to roads throughout the West.

10 40 C.F.R. § 1508.8.

11 40 C.F.R. § 1500.1(b).

12 Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989).

13 Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L.No. 106-554, § 515. *See also*, Bureau of Land Management Information Quality Guidelines, available at http://www.blm.gov/nhp/efoia/data_quality/guidelines.pdf.

14 40 C.F.R. § 1502.15.

15 Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci, 857 F.2d 505, 510 (9th Cir. 1988) ("without establishing...baseline conditions...there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA.").

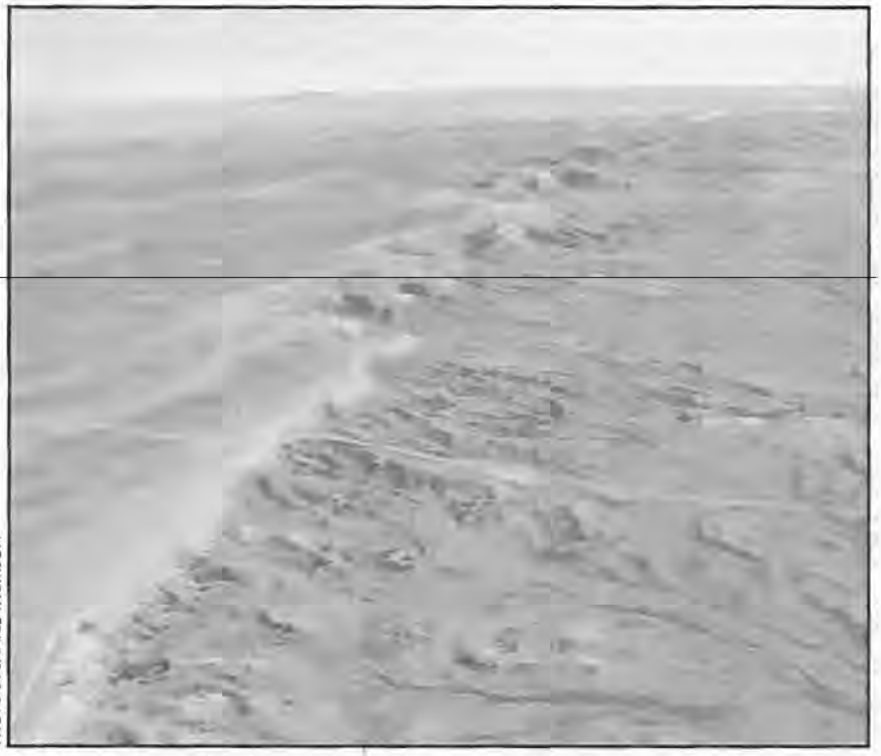


PHOTO BY JANICE THOMSON

Roads crossing sagebrush habitat in the Little Snake Resource Area in northwestern Colorado.

assessment of sage-grouse populations and habitat status, trends, and threats across the 11 contiguous Western states, with a commitment to ongoing information collection and implementation. Based on this evolving information, the agency is to "use the best available science" to develop conservation measures and then make necessary management decisions and implement "on the ground actions to conserve and restore sage-grouse habitats," with land use plans and associated implementation plans, such as travel management plans, serving as "the principal mechanisms" for doing so (*p.* 7). In order to make appropriate decisions for conserving and restoring habitat, the conservation strategy and the related planning guidance (Bureau of Land Management 2004b) prescribe identifying:

- Current condition and extent of habitat for sagebrush-obligate species
- Areas of highest priority for protecting, maintaining, and restoring habitat, taking into account size, condition, and connectivity of habitat areas
- Management opportunities to respond to identified issues or conflicts (*p.* 4)

This approach to measuring the condition of habitat and then taking action through land use planning decisions to both safeguard existing habitat and create additional habitat through restoration can and should be applied to the BLM's travel planning process for all species. Determining the existing degree of habitat fragmentation will provide the BLM with an accurate baseline against which to assess the potential impact of travel management decisions and to develop a travel management plan that can both provide a transportation network and preserve or create sufficient core habitat and linkages to support wildlife.

In this manner, wildlife and wildlife habitat, as well as the other natural, sustainable resources of the public lands such as soil, watersheds, vegetation, and wilderness, can be given the protection that they require and that the BLM is obligated to provide. Using available data and techniques for GIS analysis, the BLM can comply with its obligations to obtain baseline data on habitat fragmentation, consider the effects of various levels of fragmentation on wildlife species present, and develop a travel management plan that will achieve sufficient habitat to fulfill the agency's fundamental obligation: to protect wildlife habitat on the public lands.

What's Needed: A Travel Management Planning Process Incorporating Habitat Fragmentation Analysis

The BLM should collect and analyze the necessary data to make informed management decisions, yielding travel management plans that provide sustainable wildlife habitat. A travel management plan developed through thorough

data collection and the use of fragmentation analysis will be based on a better understanding of the existing threats to wildlife habitat and the opportunities to safeguard and improve it. We recommend that the BLM incorporate this approach into travel management planning as follows:

1. Assemble wildlife habitat use information in compliance with agency obligations to use "accurate scientific information" of "high quality," and in sufficient quantity to perform the requisite thorough analysis. Information on the impacts of roads on wildlife can be collected from the published literature available for threatened and endangered species and other key plant and animal species in the area. The goal is to provide data needed to devise the parameters of fragmentation metrics and interpret the results. The information should include, but not be limited to, distribution of habitat types, the impacts of road density on local species, the distance of road effects to determine the width of effect zones for infrastructure features, and species dispersal distances to evaluate the size of core areas.
2. Generate transportation network scenarios based on the multiple resources the BLM is required to manage using reliable data and high-quality analysis.
   - Generate GIS data layers for all roads in each proposed transportation network alternative in a Draft Environmental Impact Statement.
   - Limit the potential transportation network scenarios to those that achieve long-term protection of a region's many resources for multiple use.
   - Limit roads included in the scenarios in order to: (i) eliminate user-created "wildcat" (illegal) routes in the transportation system; (ii) ensure that each road is justified and managed through an analysis of impacts on resources at the level required by NEPA, taking into account spatial patterns of roads in addition to road length; (iii) ensure that each road is necessary for its specified and defined uses.
3. Calculate landscape fragmentation metrics for all road network alternatives, guided by the best available science and supporting studies conducted in accordance with sound and objective scientific practices. Include, at a minimum, road density, road effect zones, and core areas. Metric parameters and the evaluation of results should be relevant to ecological conditions, species that are present, and human uses of the landscape.
4. Integrate the results of fragmentation analysis into management plan alternatives and use them as the basis for selecting the preferred alternative. Through the application of the metrics to relevant ecological conditions and other uses, evaluate the direct, indirect, and cumulative impacts of the various alternatives. The preferred alternative should be determined and modified based on the metrics with an objective to reduce impacts on wildlife. Include these wildlife impacts with other ecological impact data in the planning documents throughout the land use planning process and subsequent management or land use decisions.
   - To the extent that the BLM intends to rely on mitigation of potential impacts, sufficient support for the success of mitigation must be developed.
   - Include a road closure plan and define necessary mitigation to protect and improve habitat, core areas, and Areas of Critical Environmental Concern. Procedures, protocols, and priorities should be

defined and implemented to close and reclaim roads and routes that are unnecessary, do not meet the legal definition of a road, or are no longer actively used for a specified purpose.

- Establish an adaptive management plan to ensure that the effects of the existing plan are monitored and that additional road closures and other mitigation measures are completed if monitoring and additional data collection indicate that wildlife populations are negatively affected. Adaptive management can help fulfill the obligations to monitor, evaluate, and revise plans, but only so long as the adaptive management approach is actively monitored and enforced. There must be detailed, specific metrics and measurements to be monitored, with defined actions that will be taken if thresholds are met, and a clear mechanism for enacting needed changes to the plan.

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Ecological Effects of a Transportation Network on Wildlife:

A Spatial Analysis of the Upper Missouri River Breaks National Monument

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This science report is one of a series that stems from conservation research studies conducted by The Wilderness Society's Ecology and Economics Research Department. Other recent reports in the series include **"Energy & Western Wildlands: A GIS Analysis of Economically Recoverable Oil and Gas ," "Fragmenting Our Lands: The Ecological Footprint from Oil and Gas Development (A Spatial Analysis of a Wyoming Gas Field) ," and "Roadless Areas: The Missing Link in Conservation (An Analysis of Biodiversity and Landscape Connectivity in the Northern Rockies) ."** The reports are available at The Wilderness Society's website (www.wilderness.org) and from The Wilderness Society, Communications Department, 1615 M Street, NW, Washington, DC 20036 (202-833-2300 or I-800-THE-WILD).

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Preface

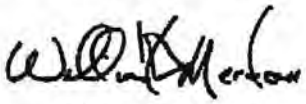
Land conservation took a remarkable leap when President William J. Clinton, using the authority of the Antiquities Act of 1906, established 14 national monuments on public lands managed by the Bureau of Land Management (BLM). Now part of the National Landscape Conservation System, these monuments constitute an amalgam of extraordinary and ecologically valuable areas. Federally designated Wilderness, Wilderness Study Areas, Wild and Scenic Rivers, National Conservation Areas, and National Historic and Scenic Trails are the system's priceless jewels entrusted to the BLM's care.

The presidential proclamations that created the monuments also mandated that the agency complete management plans for each of them. Every plan must also include a transportation plan to minimize the impact of access routes on monument resources. "*Ecological Effects of a Transportation Network on Wildlife: A Spatial Analysis of the Upper Missouri River Breaks National Monument*" presents the results of a Wilderness Society study to identify how roads, vehicle trails, and other routes are affecting the wild lands within Montana's new national monument.

GIS Analyst/Programmer Dawn Hartley and Landscape Scientist Dr. Janice Thomson, at our Center for Landscape Analysis in Seattle, applied state-of-the-art spatial analysis techniques to examine the impact of various transportation features. Denver-based Resource Economist Dr. Pete Morton analyzed their findings and interpreted the results for this report. Erik Schlenker-Goodrich of the Western Environmental Law Center added his insightful legal expertise.

Our findings tell an important story. Compelling evidence exists that the current transportation network has had a significant impact on wildlife populations and other fragile resources across the landscape. What is clear is that any viable transportation plan must include route closures and the restoration of route corridors to sustain populations of elk and Greater Sage-grouse, among other wildlife species — and to safeguard the monument's singular archaeological and historic attributes.

Beyond the Upper Missouri River Breaks National Monument and looking to the future, we urge the BLM to incorporate new and creative methods such as those employed in this study as standard practices in land management planning. For only well-informed, scientifically sound decision-making will protect the treasures that comprise our vast National Landscape Conservation System in perpetuity.



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Report Highlights

The spectacular Upper Missouri River Breaks National Monument in north-central Montana, along the Wild and Scenic Upper Missouri River, was established to preserve the area's outstanding ecological, scientific, and cultural values — from its remote and undeveloped character and archaeological and historic sites to its remarkable wildlife, geologic, and paleontological resources.

Presidential Proclamation 7398, which designated the monument, requires the Bureau of Land Management (BLM) to develop a transportation plan as a component of the resource management planning process. The transportation plan is critical to protection of the monument's unique attributes. Although this monument appears to be a wild, relatively untrammeled place, hundreds of years of human travel and recreation, cattle grazing, mining, and hunting have carved innumerable roads, vehicle trails, and other linear transportation features across the landscape. Given their impacts on habitat quantity and quality, the spread of invasive plants, wildlife mortality, soil erosion, air quality, restoration projects, and archaeological and cultural sites, these transportation features must be carefully managed and minimized in accordance with the monument's preservation purpose. The immediate need to resolve transportation issues in this monument cannot be overstated. It reflects a key management challenge facing the BLM in other national monuments and conservation areas that the agency manages across the country.

Spatial analysis techniques can greatly assist the BLM and the public in the design of a transportation plan that minimizes impacts on the ecological and cultural resources of protected areas, while still allowing adequate access. Spatial analysis is predicated on the recognition that roads, vehicle trails, and other linear transportation features must be managed as a cohesive and interwoven system embedded within a landscape and not as a disjointed aggregation of individual access points.

This report presents three landscape fragmentation analysis methods that the BLM can — and should — use to plan ecologically viable transportation networks. The methods include density analysis of existing transportation network features, buffer analysis to examine the effect zone of the transportation network, and core area analysis to identify habitat that remains unaffected by the transportation network. We applied these analyses to Upper Missouri River Breaks and, in this report, discuss the implications of the results for management of the monument, emphasizing potential impacts on wildlife.

We found that wildlife populations are threatened by landscape fragmentation attributable to existing transportation features. Forty percent of occupied elk habitat in the monument is laced with routes at a density of 0.8 miles/mile^2. Scientific literature indicates that elk habitat is completely lost at this density. Nearly 100 percent of land in the monument is within two miles of a route. It is known that Greater Sage-grouse within two miles of features constructed by people, including routes, have lower nest initiation rates. More than 86 percent of the 791-mile^2 monument lies within one mile of a transportation feature, leaving just 111 miles^2 available as potential habitat for wildlife.

The results of our analyses point out the need for route closures to mitigate current and potential impacts of the transportation network on the monument's resources. This report does not make specific route closure recommendations, but it does present a list of actions to ensure that the transportation plan will enhance, not degrade, the values of the monument. Our recommendations include:

▼
Spatial analysis can greatly assist the BLM and the public in designing a transportation plan that minimizes effects on the monument's ecological and cultural resources.
▲

- The BLM must develop a transportation plan as a key element of the monument's Resource Management Plan, emphasizing protection of the objects of interest articulated in the proclamation and key resources that provide an overall measure of the monument's health and integrity. The transportation plan should consist of two components: (1) a baseline transportation network and (2) an adaptive ecosystem management framework to guide all future transportation management decisions.
- In developing the baseline transportation network, the BLM should conduct a habitat fragmentation analysis that overlays spatial data for objects of scientific and historic interest listed in the monument's proclamation and other key resources with transportation analysis layers similar to those generated for this report. "Wildcat" routes and roads or other transportation features that have adverse impacts on the objects and resources or otherwise cause unnecessary or undue degradation of the landscape must be closed.
- Relevant literature concerning the impacts of routes on wildlife should be used to aid interpretation of the results of the habitat fragmentation analysis.
- All routes designated as open should be geographically distributed in a manner that reduces habitat fragmentation and human contact with sensitive resources to an acceptable minimum threshold.
- Once routes are identified for closure, the Resource Management Plan should include a detailed route closure and restoration strategy. Plan implementation should be consistent with the adaptive ecosystem management framework and include enforceable timelines and a stated commitment to devote a portion of staff time and annual budgets to restoration of closed routes.

Spatial analysis, using mapping software and up-to-date ecological data, is a manageable and essential part of crafting transportation plans that protect wildlife and recreation opportunities and other ecological, scientific, and cultural values. The use of spatial planning analysis in Upper Missouri River Breaks National Monument clearly demonstrates the dramatic impacts of the existing transportation network by illustrating how the network causes fragmentation of critical wildlife habitat. This important information can help guide the BLM and the public in making informed choices for transportation management. We believe it is essential for the BLM to incorporate spatial analysis as a standard step in transportation management planning.

1. Introduction

On January 17, 2001, Presidential Proclamation 7398 designated 149 miles of the Wild and Scenic Upper Missouri River as well as adjacent Breaks country and portions of the Judith River and Arrow and Antelope creeks as the Upper Missouri River Breaks National Monument. The proclamation described the area as "remote and nearly undeveloped" and identified "a spectacular array of biological, geological, and historical objects of interest."

This marvelous backcountry's riverbanks and uplands are habitat for more than 60 mammal species, 233 bird species, 20 different amphibians and reptiles, and 48 species of fish, including the federally endangered pallid sturgeon (*Scaphirhynchus albus*) and five special status fish species. Mammals of particular interest are the black-tailed prairie dog (*Cynomys ludovicianus*) a special status species, and big game animals — elk (*Cervus elaphus*) bighorn sheep (*Ovis canadensis*), mule deer (*Odocoileus hemionus*) whitetail deer (*Odocoileus virginianus*) and pronghorn antelope (*Antilocapra americana*).

Among the bird species, the Bald Eagle (*Haliaeetus leucocephalus*) is listed as threatened under the federal Endangered Species Act, and the Peregrine Falcon (*Falco peregrinus*) and Mountain Plover (*Charadrius montanus*) are considered special status species. Many raptors such as eagles, Prairie Falcons (*Falco mexicanus*) and hawks perch and nest on the monument's cliffs, while four species of upland game birds — Gray Partridge (*Perdix perdix*) Sharp-tailed Grouse (*Tympanuchus phasianellus*) Greater Sage-grouse (*Centrocercus urophasianus*) and Ring-necked Pheasant (*Phasianus colchicus*) — inhabit the grasslands.

Upper Missouri River Breaks is a unique blend of forested coulees and drainages leading down to the Missouri River and its tributaries. The monument's ridge tops and benches support the sagebrush/prairie grassland communities typical of Northern Great Plains/Northern Rockies landscapes. The forested draws harbor ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) with a smaller component of Rocky Mountain juniper (*Juniperus scopulorum*). River communities exhibit a wide variety of vegetative types, including cottonwoods (*Populus deltoides, P. augustifolia, P. trichocarpa*)

PHOTO COURTESY NEBRASKA GAME AND PARKS COMMISSION

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PHOTO COURTESY DEAN BIGGINS, U.S. FISH AND WILDLIFE SERVICE

The monument's backcountry riverbanks and uplands are habitat for more than 60 mammal species, 233 bird species, 20 different amphibians and reptiles, and 48 species of fish, including (top to bottom) the federally endangered pallid sturgeon and the black-tailed prairie dog, Peregrine Falcon, and bighorn sheep.

PHOTO COURTESY RICK AND SUSIE GRAETZ

Three species of cottonwood comprise a portion of the riparian vegetation along the Missouri River. One of the few remaining, fully functioning cottonwood gallery forest ecosystems on the Northern Plains is found in the monument. Arrow Creek, a tributary to the Missouri River and included in the monument, is a critical seed source for cottonwood trees along the Missouri's flood plain.

green ash (*Fraxinus pennsylvanica*) silver sagebrush (*Artemisiacana*), and black greasewood (*Sarcobatus vemiculatus*) (Hansen et al. 1990).

In addition to its richly diverse wildlife habitat and wild nature, the monument is a source of varied recreational opportunities — not the least of which is the chance to experience a western landscape much as it was years ago when Plains Indians held sway, the Lewis and Clark expedition crossed the land, and fur trappers and steamboat captains negotiated the rivers. The monument protects segments of the Lewis and Clark National Historic Trail, which follows the Missouri River, and the Chief Joseph National Historic Trail, which traverses the area from south to north.

The monument's upstream, western boundaries generally conform to those of the Missouri River, while downstream the monument expands both north and south of the river to include six BLM Wilderness Study Areas, the rugged and remote Bullwhacker coulee area, and other wild places. The BLM manages 590 of the 791 miles^2 in the monument, while the remaining 201 miles^2 consist of state lands and private property.[1]

The BLM's primary responsibility, as mandated by the monument's proclamation, is to protect the "objects of interest" identified in the proclamation. As part of this responsibility, the agency must prepare "a transportation plan that addresses the actions, including road closures or travel restrictions, necessary to

[1] All analyses for this report were completed using the monument's administrative boundary and did not address ownership patterns within the monument. Square miles are used for all area measurements in this report for unit consistency (1 mile^2 = 640 acres).

protect the objects identified in this proclamation." Roads and other transportation features are of major concern because they fragment wildlife habitat, pose a threat to historic and archaeological objects, and destroy opportunities for remote wildland recreation. Given the fundamental significance of the transportation network to management and to public use of the monument, in addition to the network's profound environmental impacts, the transportation plan must be developed simultaneously with — and as an integral element of — the Resource Management Plan for the monument.

Historically, the BLM has failed to employ spatial analysis effectively in evaluating the direct, indirect, and cumulative impacts of transportation networks on cultural and natural resources. BLM policies pertaining to transportation management are generally limited to maintenance and design standards for individual routes and provide little or no guidance as to the development and analysis of transportation systems (see, for example, BLM Manual, Section 9113). However, the technology is available and the need is apparent to complete spatial analyses. This report demonstrates the feasibility of using three landscape fragmentation metrics to evaluate the monument's transportation network at two different scales. Use of spatial analysis technology in Upper Missouri River Breaks is particularly important because of the BLM's obligation to protect objects of interest in the monument. Based on the results of our spatial analysis, we prepared this report to discuss the implications of transportation networks on the monument's cultural and natural resources and recommend proactive and necessary management actions to assist the BLM in ensuring that its decisions are reasoned and informed.

Note: Use of the terms "transportation features" and "routes" in this report is intended to encompass all linear features used to access the monument, including "roads." However, it is important to note that the term "roads" holds a precise legal definition with important management implications: within the monument, all motorized and mechanized vehicle use is to be confined to "roads" formally designated in the Resource Management Plan. We briefly discuss the definition of "road" in our conclusions.

▼ The BLM's primary responsibility is to protect the objects of interest identified in the monument's proclamation. ▲

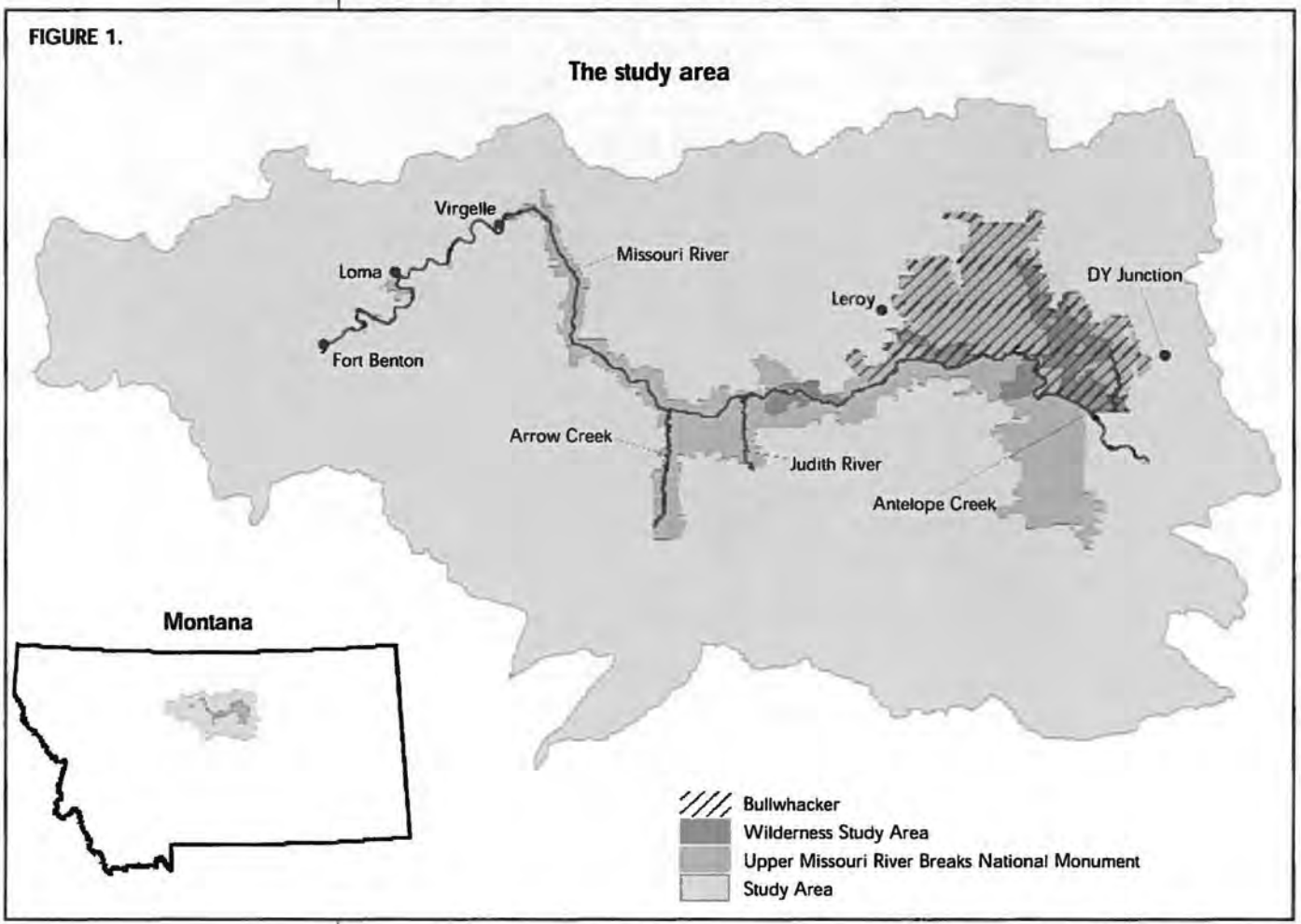
2. Analytical Methods

Data Input

To provide a broader context for our analyses, we defined a study area that encompasses the monument and surrounding landscape. Examination of the monument in a broader context is consistent with the National Environmental Policy Act of 1969, which requires the BLM to analyze the direct, indirect, and cumulative impacts of management actions on the broader landscape, not just the lands within the administrative boundaries of the monument. Figure 1 displays the study area, which, based on watershed-level hydrologic unit boundaries, is 6,739 miles[2] in size.

Geographic data for the transportation network were obtained from the U.S. Geological Survey (USGS) in digital line graph (DLG) format.[2] This dataset contains roads, vehicle trails, and railroads — all features that contribute to landscape fragmentation[3] (Figure 2). Because the BLM has not, to date, com-

FIGURE 1.



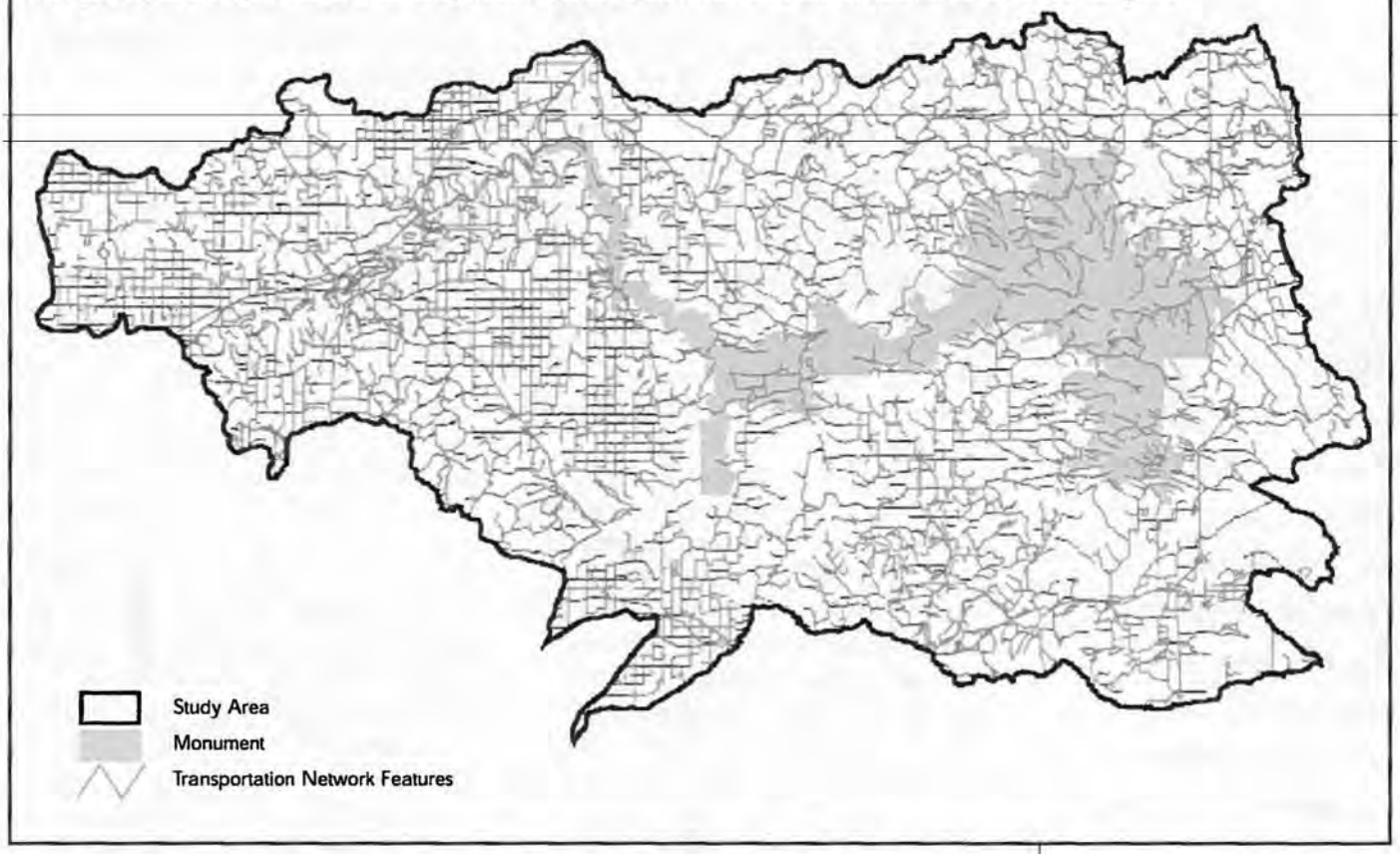
2 Transportation feature files for the full extent of the study area boundary were downloaded in spatial data transfer standard (SDTS) format from www.mapmart.com. The individual files were then combined into a single ESRI shapefile using the GlobalMapper software application, available from www.globalmapper.com.

3 Railroads and other minor transportation features are essentially absent in the monument, where they account for less than one percent of the transportation network. In the larger study area, they comprise a little more than two percent of the transportation network.

FIGURE 2.

The physical footprint of the transportation network in the study area

This figure depicts the 7,692 miles of linear transportation features (roads, vehicle trails, and railroads) in the 6,739-mile^2 study area.



pleted an inventory of roads and trails in the monument, the USGS dataset is the best available.[4] This dataset is likely to underestimate the mileage of "wildcat" routes created by off-road travel allowed before the monument was designated.

Geographic data for the monument's boundary and streams were acquired from the BLM.[5] Species-distribution data layers were obtained from the Montana State Department of Fish, Wildlife and Parks,[6] and watershed boundaries were obtained from the Montana State Library's website.[7]

Methods of Measuring Fragmentation Patterns

Fragmentation has been defined as the "creation of a complex mosaic of spatial and successional habitats from formerly

4 While the road and trail inventories are important, it is equally critical to inventory the monument's objects of interest and key resources that provide an overall measure of the monument's health and integrity.

5 BLM Lewiston Field Office.

6 Species distribution data was downloaded in ESRI export format from the Montana State Department of Fish, Wildlife and Parks website at http://fwp.state.mt.us/insidefwp/fwplibrary/gis/gisdownloads.asp#Wildlife.

7 Montana 5th-Code 11-Digit Watersheds were downloaded in ESRI export format from the Montana State Library's Natural Resource Information System at http://nris.state.mt.us/gis/datatop.html.

contiguous habitat" (Lehmkuhl and Ruggiero 1991). The degree of fragmentation caused by the transportation network and the effects of such fragmentation on the ecological composition, structure, and functions of a landscape are difficult to measure and far from fully understood. But a variety of landscape metrics have been documented in the scientific literature to help measure the condition of a landscape and its level of fragmentation (McGarigal and Marks 1994).

For our study, we selected three landscape metrics: (1) density of roads and other linear features in the transportation network, (2) amount of habitat within the transportation effect zone, and (3) size of core areas. Each of these landscape metrics is important and relevant to any credible environmental analysis and any decision reached pursuant to such analysis. The analytical work was conducted using commercial geographic information systems (GIS) software from ESRI and custom software developed by The Wilderness Society.

Method #1: Density analysis of transportation features. Density is a measure of the number of miles of linear transportation features per unit area and is a common metric in quantitative assessments of ecological impacts from a landscape perspective. Density analysis provides easily obtainable base-level information to help ensure reasoned and informed decisions.

The density of transportation features was calculated as an average across the monument and overall study area. In addition, the landscape was sub-sampled, using a series of 1-mile^2 and 4-mile^2 sampling windows, for both the monument and study area. Measuring density in sampling windows of different sizes provides an understanding of the variability of density across scales. This principle is important to gauge the effects of fragmentation on different species (Urban et al. 1987, Wiens and Milne 1989, Turner et al. 1994). For example, differences in dispersal distances among species cause them to respond to habitat features at different scales.

Method #2: Analysis of the transportation effect zone. Forman (1999) uses the term "road effect zone" to describe the influence of roads beyond the actual physical feature. Extending this concept to include not just roads, but all features of a transportation network, we defined a "transportation effect zone." The width of the zone depends on the effects measured (for example, noise, dust, erosion, human presence, etc.) and the activity that is affected (for example, Greater Sage-grouse breeding, elk calving, or wilderness experience for hikers).

Analysis of transportation effect zones enhances the credibility and viability of environmental analyses and decisions reached in accordance with such analyses by more accurately disclosing the direct, indirect, and cumulative impacts of fragmentation across the landscape. Ignoring or discounting transportation effect zones reduces and, in some cases, fatally compromises the credibility and viability of environmental analyses and associated decisions.

We examined fragmentation patterns associated with the physical footprint alone and the transportation effect zones of four different widths for the monument and overall study area. The physical footprint of the road was estimated by applying a width of 3.5 meters to the road data, which represents the average width of a single lane road (Trombulak and Frissell 2000). Transportation effect zone data layers were generated by applying widths of 1/4 mile, 1/2 mile, 1 mile, and 2 miles to the transportation features. The zone widths were selected to represent a range of other potential impacts, including noise and hunting.

▼

We conducted a spatial analysis of the monument and the surrounding landscape to illustrate impacts of the transportation network on the monument's objects of interest and other key resources.

▲

Method #3: Analysis of core area. Core areas, sometimes called interior habitat or habitat security, exist in natural landscapes as contiguous blocks of uniform habitat away from habitat edges. Free from fragmentation, communities of native species and ecological functions persist uninterrupted in the core areas. For our analysis, core areas are defined as portions of the landscape that are sufficiently far from transportation corridors to be relatively unaffected by them. For each of the transportation effect zone data layers described above, we created a corresponding core area data layer by identifying all lands outside of the transportation effect zone. We also calculated the mean core area size by dividing the total core area by the number of core areas. Generally, the larger the core area, the more viable the wildlife habitat. Analysis of core areas is essential to credible and viable environmental analyses, providing valuable information that increases the prospects for reasoned and informed decisions.

MONTANA WILDLIFE FEDERATION

Vehicle trail across uplands habitat in the monument. Many such trails across the monument's landscape create barriers to wildlife movement and break up important wildlife habitat.

Depending on the width of the transportation effect zone, the transportation network affects between 32 and 99 percent of the monument and between 46 and 99 percent of the overall study area.

3. Results

Density of transportation features

The monument's administrative boundary covers approximately 791 miles^2 and captures 523 miles of linear transportation features. This represents an average transportation feature density of 0.7 miles/mile^2. Within the 6,739-mile^2 study area, there are 7,692 miles of linear transportation features, for a transportation feature density of 1.1 miles/mile^2.

Transportation feature density estimates are scale dependent, however, and vary across any landscape. Densities measured within 1- and 4-mile^2 sampling windows illustrate the spatial variation in feature density across the monument and overall study area (Table 1 and Figure 3).

Results show that in the 1-mile^2 sampling windows, densities range from a high of 9.3 miles/mile^2 to a low of 0.0 miles/mile^2 for the monument and from a high of 9.2 miles/mile^2 to a low of 0.0 miles/mile^2 for the study area. In the 4-mile^2 sampling windows, densities range from a high of 6.8 miles/mile^2 to a low of less than 0.1 miles/mile^2 for the monument and from a high of 6.1 miles/mile^2 to a low of 0.0 miles/mile^2 for the study area.

The transportation feature densities calculated for the 1-mile^2 sampling windows were compared to maps of occupied elk habitat within the monument. Based on this overlay analysis, we found that just over 50 percent of the habitat has transportation feature densities greater than 0.5 miles/mile^2, and 40 percent has feature densities greater than 0.8 miles/mile^2. Furthermore, 35 percent of the monument's occupied elk habitat has transportation feature densities greater than one mile/mile^2, and 6 percent of the habitat contains transportation features at greater than two miles/mile^2. The maximum route density within occupied elk habitat was 4.3 miles/mile^2, based on the 1-mile^2 sampling window.

Analysis of the transportation effect zone

The physical footprint of the transportation network in the monument covers approximately 1 mile^2, or less than one percent of the monument. Within the study area, the physical footprint is 16 miles^2, representing less than one percent of the study area. Beyond this area of direct impact are the different transportation effect zones that affect 32 to 99 percent of the monument (Table 2 and Figure 4). Results for the overall study area, also included in Table 2, show that 46 to 99 percent is affected, depending on the size of the transportation effect zone.

TABLE 1.

Summary of density analysis

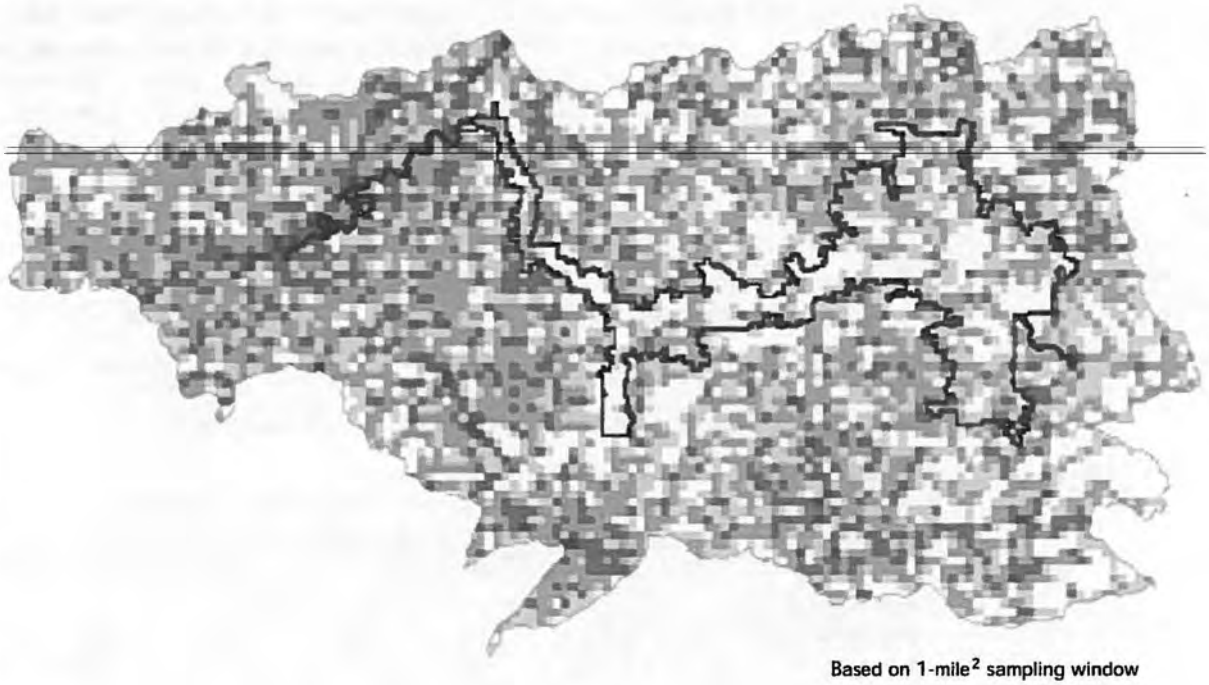
Percent of monument and study area containing different densities of transportation features for two sampling window sizes.

	MONUMENT		STUDY AREA	
Feature Density mile/mile^2	1-mile^2 window (%)	4-mile^2 window (%)	1-mile^2 window (%)	4-mile^2 window (%)
0	34	9	21	5
0-1	30	63	28	48
1-2	28	26	36	39
2-4	7	1	14	7
>4	<1	<1	<1	<1

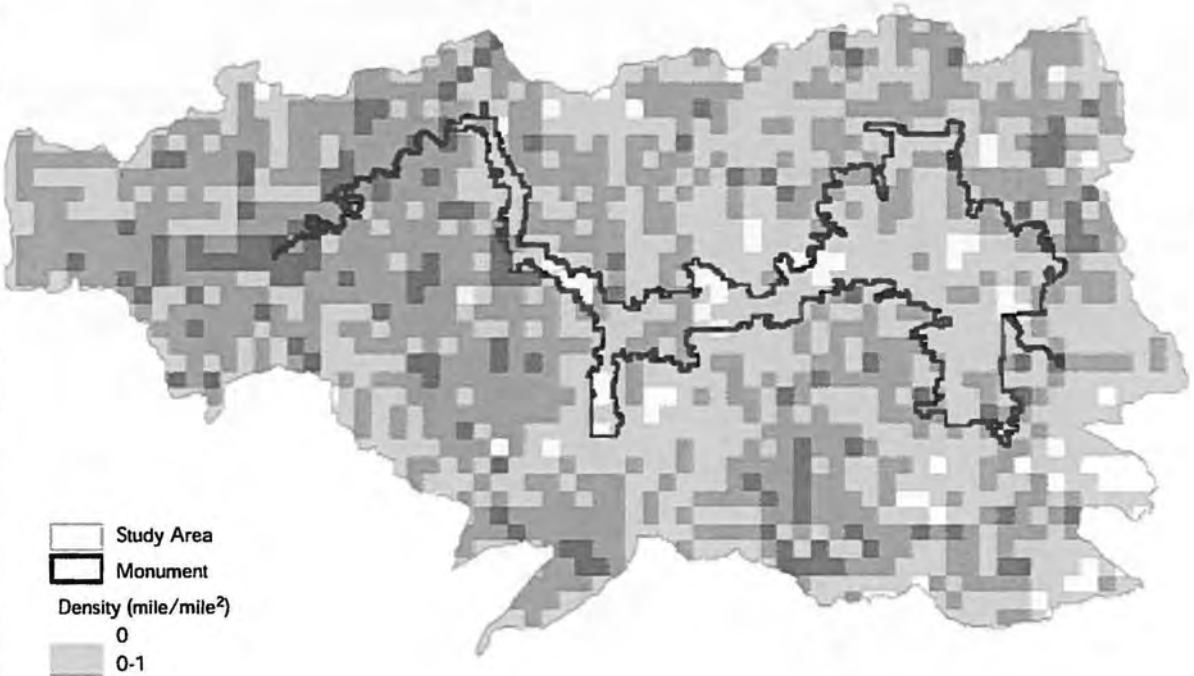
FIGURE 3.

Density of transportation network features in the study area

Calculated for 1-mile^2 and 4-mile^2 sampling windows. The darker the shading, the higher the transportation feature density.



Based on 1-mile^2 sampling window



Based on 4-mile^2 sampling window

Analysis of the core area

The total core area within the monument ranged from a high of 790 miles^2 with no effect zone around the transportation network to a low of 7 miles^2 based on the 2-mile transportation effect zone width. Similarly, core area ranged from 6,722 miles^2 to 28 miles^2 within the overall study area.

The results, summarized in Table 3 and illustrated in Figure 5, show that as the transportation effect zone width increases, the total core area *and* the number and maximum size of core areas decrease. In the monument, the mean size of core areas also decreases. In the study area, this is also generally true except for an apparently anomalous increase for the 2-mile transportation effect zone, likely due to the elimination of smaller core areas as one moves from the 1-mile to the 2-mile zone.

Using the 1-mile effect zone within the monument, the remaining core area lies mostly along the Wild and Scenic Missouri River corridor and the area in the vicinity of Arrow Creek.

TABLE 2.

Summary of transportation effect zone analysis

Transportation effect zones have impacts on widely varying areas of the monument and study area depending on the type of impact and, consequently, the width of the zone being measured.

	Physical footprint	TRANSPORTATION EFFECT ZONE WIDTH ¼ mile	½ mile	1 mile	2 miles
Monument					
Zone area (miles^2)	1	251	458	680	784
% in zone	<1	32	58	86	>99
Study Area					
Zone area (miles^2)	16	3,079	4,956	6,314	6,711
% in zone	<1	46	74	94	>99

TABLE 3.

Summary of core area analyses

As the width of the transportation effect zone increases, the number of core areas, maximum core area size, and total core area decreases. The mean size of core areas decreases throughout the monument and generally in the overall study area.

	Physical footprint	TRANSPORTATION EFFECT ZONE WIDTH ¼ mile	½ mile	1 mile	2 miles
Monument					
# of core areas	151	114	110	44	7
Maximum core size (miles^2)	254	174	49	18	2
Mean core area size (miles^2)	5.2	4.7	3.0	2.5	1.0
Total core area (miles^2)	790	541	334	111	7
% of monument	> 99	68	42	14	< 1
Study Area					
# of core areas	2,191	1,480	1,057	256	15
Maximum core size (miles^2)	353	232	101	40	14
Mean core area size (miles^2)	3.1	2.5	1.7	1.7	1.9
Total core area (miles^2)	6,722	3,659	1,782	424	28
% of study area	> 99	54	26	6	< 1

FIGURE 4.

Transportation network effect zones

Two examples of transportation network effect zones based on zone widths of 1/4 mile and 2 miles. Shading indicates the extent of the study area that is affected by the transportation network.

1/4 -mile-wide effect zone

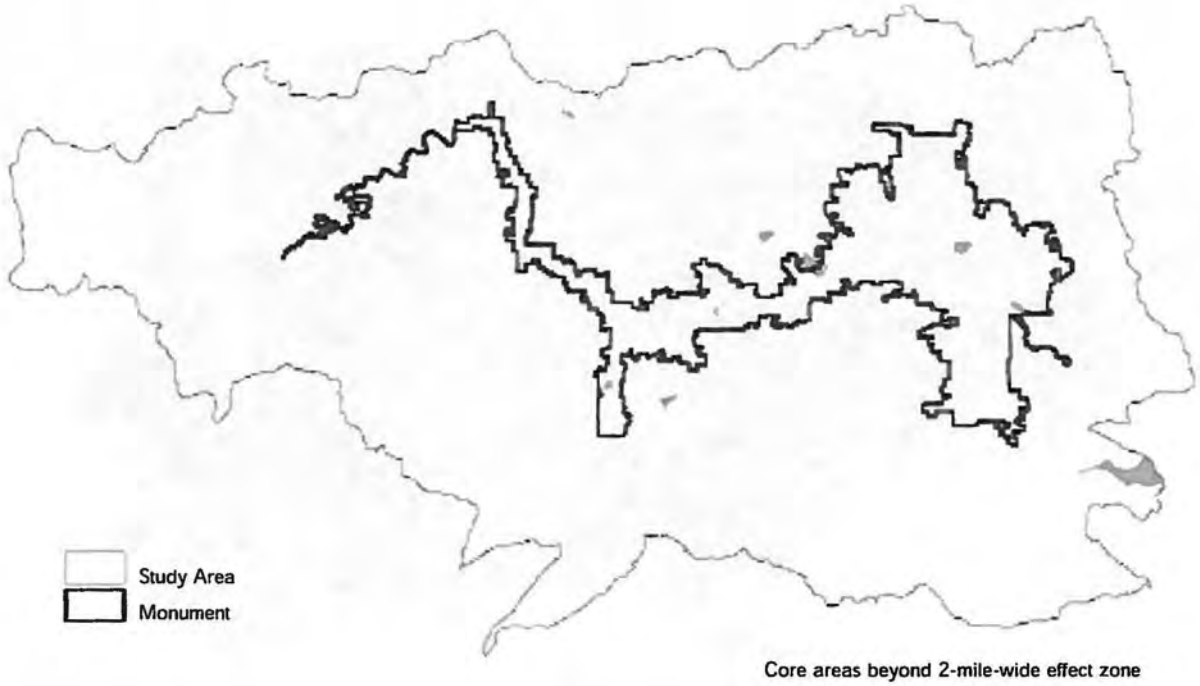
2-mile-wide effect zone

FIGURE 5.

Core areas beyond transportation network effect zone

Two examples of core areas (shading) that lie beyond relatively narrow ($^1/_4$-mile) and wider (2-mile) transportation network effect zones.

Core areas beyond $^1/_4$-mile-wide effect zone



Core areas beyond 2-mile-wide effect zone

4. Implications for Management and Conservation

Transportation planning is one of the most significant challenges facing the BLM in the development of Resource Management Plans for national monuments. Transportation features facilitate legitimate access needs such as recreation and public safety, but these needs must be balanced against the requirement to protect the objects identified in a monument's proclamation and other key resources.

Objects and values identified in the proclamation for Upper Missouri River Breaks National Monument are:

- abundant wildlife (including 233 bird species, more than 60 species of mammals, 20 amphibians and reptiles, and 48 species of fish);
- unique plant life (healthy and diverse riparian zones and one of the few remaining, fully functioning cottonwood gallery forest ecosystems on the Northern Plains);
- remote and undeveloped character (especially the wild Bullwhacker area and six Wilderness Study Areas);
- cultural and historic sites (including the Lewis and Clark National Historic Trail, Nez Perce National Historic Trail, and prehistoric sites of archaeological interest); and
- unique geologic features (cliffs, arches, hoodoos, and breaks).

The effects of transportation features on terrestrial and aquatic wildlife are documented by Trombulak and Frissell (2000) and include mortality from collisions, modification of animal behavior, disruption of the physical environment, alteration of the chemical environment, spread of exotic species, and changes in human use of the lands and water. Specific examples include habitat loss and fragmentation; diminished animal use of habitats because of noise, dust emissions, and the presence of humans; loss of forage for herbivores; interference with wildlife life-history functions (for example, courtship, nesting, and migration); spread of non-native species carried by vehicles; increased poaching or unethical hunting practices; increased recreation, particularly by off-road vehicles; and degradation of aquatic habitats through alteration of stream banks and increased sediment loads. Transportation access also increases vandalism, theft, and damage to archaeological and cultural sites.

Reductions in the number and size of core areas and increased edge habitat created by transportation features lead to a series of potentially intersecting and cumulative adverse effects on species that depend on natural interior landscapes. Included among such effects are greater competition with species that prefer edge habitat or openings in the landscape, nest predation and parasitism, secondary extinctions from the loss of keystone species, progressive loss of patches through edge creep, and changing microclimates such as increased evaporation, temperature, and solar radiation and decreased soil moisture (Franklin and Forman 1987, Lehmkuhl and Ruggiero 1991, Reed et al. 1996).

To protect the objects and values listed in the proclamation and comply with its obligations under the National Environmental Policy Act of 1969, the BLM should conduct spatial analyses of the potential negative effects of transportation features on the objects of interest and other key resources and values that serve as an overall measure of the monument's health and integrity. Spatial analyses provide critical information essential to all reasoned and informed management decisions for the monument.

To illustrate the value of spatial analysis, we first compare the impact of transportation features within the monument to impacts on the larger, surrounding study

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There is much that should be done to reduce fragmentation of the monument's habitat caused by the transportation network and thus increase the monument's value to wildlife.

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PHOTO COURTESY RICK AND SUSIE GRAETZ

Cow Island, an historically important site in the monument. Lewis and Clark passed through this area in 1805; 72 years later, Chief Joseph and the Nez Perce crossed the Missouri River at Cow Island during their epic journey to Canada.

area. Next, we look within the monument to briefly examine the potential impacts of the monument's transportation network on big game species (elk, bighorn sheep, mule deer, whitetail deer, and pronghorn antelope) and the Greater Sage-grouse and black-tailed prairie dog. While these brief analyses provide adequate guidance for some management recommendations, substantially more information is needed for a complete assessment of wildlife in the monument and to make specific recommendations for road closures. We also summarize the potential impacts of transportation features on water resources and wilderness recreation opportunities.

We emphasize that information is sorely lacking in regard to the monument's objects of interest and other key resources. Because such information is essential to reasoned and informed management choices, it is incumbent upon the BLM to collect the information or justify why such data and information were not obtained as part of the resource management planning process.[8] In either case, the burden of proof is on the agency to justify management decisions and, where such information is lacking, to establish a process to collect the information, act cautiously, and defer to the side of conservation.

Context of the Monument

Examination of Figures 3 through 5 reveals the value of the monument in the context of the study area. It is apparent in Figure 3 that transportation feature densities are generally lower in the eastern portion of the study area, where the majority of the monument is located and that the monument contains relatively few higher-density sampling windows compared to the rest of the study area. This is statistically substantiated for both the 1- and 4-mile^2 sampling windows.

The transportation effect zones in Figure 4 and core areas in Figure 5 also show that the transportation network affects the monument less than the surrounding study area. For example, in the 1/4-mile transportation effect zone, 74 percent of the study area is impacted by the transportation network compared to 58 percent in the monument. This corresponds to 26 percent core area in the study area and 42 percent core area in

[8] 40 C.F.R. § 1502.22(b)

the monument. It is also important to note that the mean core size of 3.0 miles^2 is larger in the monument than the 1.7-mile^2 mean core area size in the study area for the $^1/_2$-mile transportation effect zone.

The greater proportion of core area in the monument clearly indicates the monument's high value to wildlife relative to habitat available in the surrounding study area. Still, there is much that should be done to reduce fragmentation of the monument's habitat caused by the transportation network and thus increase its value to wildlife.

In their occupied habitat, pronghorn antelope are known to be affected by a route density of 1 mile/mile^2.

Big Game Wildlife Species. As the density of transportation features increases, big game species suffer from greater hunting pressure and reduced habitat security caused by fragmentation and associated disturbance (Lyon 1983, Hurley 1994, Canfield et al. 1999).

According to Lyon (1983), elk avoid routes and do not fully use habitat adjacent to routes. Lyon found that when route densities are as low as 1 mile/mile^2, which represents approximately 35 percent of the monument's occupied elk habitat, elk habitat effectiveness is reduced by 25 percent. At 2 miles/mile^2, which accounts for approximately 6 percent of the monument's occupied elk habitat, elk are displaced from up to 50 percent of their habitat.

Route avoidance by wildlife is particularly evident in open landscapes with little surrounding vegetation (Perry and Overly 1976, Morgantini and Hudson 1979, Rost and Bailey 1979) such as that found in the monument. In areas with little cover, habitat is completely lost at a route density of just 0.8 miles/mile^2 (Lyon 1979), which accounts for 40 percent of the monument's occupied elk habitat.

The effect on elk from transportation features in the broad, open sagebrush and grassland areas of the monument warrants particular attention. A study on elk habitat effectiveness in north-central Wyoming found that few elk used areas with route densities higher than 0.5 miles/mile^2 (Sawyer et al. 1997). Just over 50 percent of the monument's occupied elk habitat has transportation feature densities greater than 0.5 miles/mile^2.

As the volume of traffic on routes increases, elk tend to occupy habitat further from routes (Johnson et al. 2000). This may be an issue at the monument as visitation rises. Further, human disturbance during the calving season reduces elk calving success rates (Phillips and Alldredge 2000). Ward (1976) discusses the importance of retaining a buffer of trees around a route to minimize the displacement of elk and suggests buffers of 100 meters between a route and elk feeding site.

Antelope, bighorn sheep, and deer are also affected by human disturbances across a landscape. The BLM found that antelope exhibited signs of the impacts of oil and gas projects with "nearly one mile of road per every square mile of occupied habitat" (Bureau of Land Management 1999). Similarly, a study conducted in North Dakota found that mule deer avoided feeding and bedding in areas within 300 feet of well sites, resulting in a 28-percent reduction of

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One study showed that few elk use areas with road densities higher than 0.5 miles/mile^2. We found that more than 50 percent of the monument's occupied elk habitat has transportation feature densities greater than 0.5 miles/mile^2.

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PHOTO COURTESY GARY KRAMER, U.S. FISH AND WILDLIFE SERVICE

The monument provides essential winter habitat for the Greater Sage-grouse. This special status species is affected by routes and other structures for miles beyond the actual physical features.

secure bedding areas (Jensen 1991). The deer avoided routes and other human structures for more than seven years, indicating long-term and chronic loss of habitat. Of the five big game species, Canfield et al. (1999) found that bighorn sheep appear to be the most susceptible to the detrimental effects of human disturbance.

Greater Sage-grouse. The Proclamation states that the monument "contains essential winter range for sage grouse," a special status species whose breeding populations have declined by as much as 47 percent in some areas (Connelly and Braun 1997). Greater Sage-grouse depend on sagebrush habitat (Patterson 1952, Braun et al. 1977, Braun 1987, Connelly et al. 2000), particularly during winter when they feed almost exclusively on sagebrush leaves (Patterson 1952, Wallested 1975).

This bird is affected by human disturbance for miles beyond the actual physical features. A recent study in Wyoming (Lyon 2000) compared the behavior of females captured on leks (strutting or mating grounds) within two miles of human developments to those captured on undisturbed leks more than two miles from any development and found that the hens captured on disturbed leks had lower nest-initiation rates and moved longer distances to nest sites than hens captured on undisturbed leks. Our analysis of the transportation effect zone indicates that 99 percent of the monument is within two miles of a linear transportation feature, suggesting that lek disturbance is potentially significant.

Black-tailed Prairie Dog. The black-tailed prairie dog is recognized as a keystone species in the grassland environment because of its unique and significant influences on the ecosystem (Van Pelt 1999) and is a candidate for listing as threatened under the federal Endangered Species Act of 1974. Monument prairie dog towns serve as important actual and potential habitat for numerous other special status species, including Ferruginous Hawks (*Buteo regalis*), Mountain Plovers, Burrowing Owls (*Athene cunicularia*), and black-footed ferrets (*Mustela nigripes*).

This important animal has long been treated as a varmint and subjected to recreational shooting. High-powered rifles enable consistent accuracy at distances of 400 yards or more, and just one hunter may kill a considerable number of prairie dogs on any given day (Knowles 1995, Van Pelt 1999). Although prairie dog habitat data were not available for this study, the $^1/_4$-mile (approximately 440 yards) transportation effect zone should be compared in future analyses of Upper Missouri River Breaks to the locations of known prairie dog colonies and potential habitat.

Water Resources and Riparian Habitat. Routes running near or through riparian strips can lead to fragmentation of riparian habitat and cause species to avoid riparian areas (Gaines et al. in press). Routes and bridges near streams can change the patterns of surface or subsurface flow, which, in turn, can harm plants or wildlife that depend on natural flow patterns, increase stream sedimenta-

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The black-tailed prairie dog is a candidate for listing as threatened under the federal Endangered Species Act.

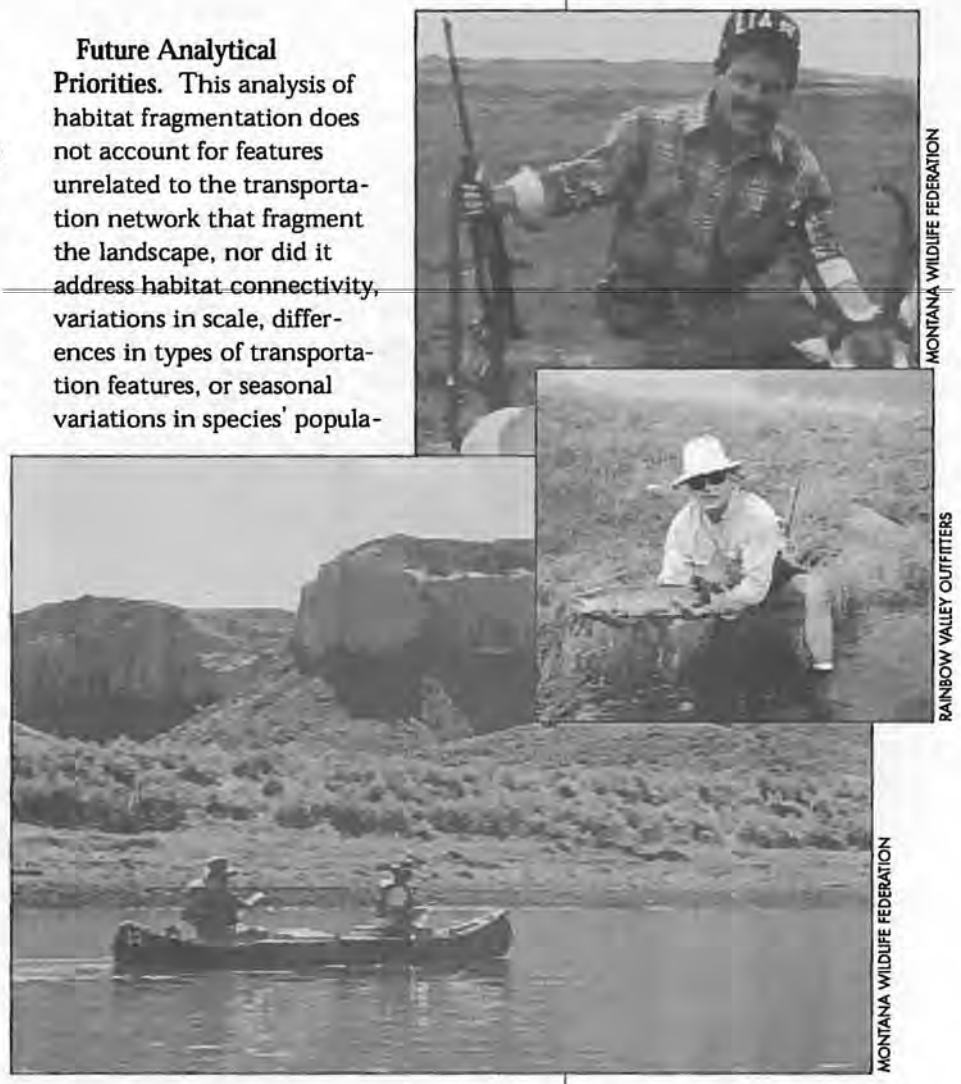
tion and turbidity, and reduce fish productivity. Additional effects include alteration of hydrodynamics and sedimentation with resulting negative impacts on shorelines for miles upstream and downstream, changes in wildlife migration patterns that reduce distribution and productivity, and changes in aquatic plant assemblages because of altered nutrient levels or chemicals introduced by routes (Trombulak and Frissell 2000). Water and riparian habitat are prominent features of the monument, and managers must take care to avoid negative impacts from routes.

Wilderness Recreation Opportunities. Outdoor recreation increased substantially in the United States during the past 50 years (Tempel et al. 2003), and Upper Missouri River Breaks has the potential to provide world-class non-motorized and wilderness recreation experiences. Remote wildlands provide a range of benefits to recreation and outdoor enthusiasts, including "personal development (spiritual growth, improved physical fitness, self-esteem, self-confidence and leadership abilities); social bonding (greater family cohesiveness and higher quality of family life); therapeutic and healing benefits (stress reduction helping to increase worker productivity and reduce illness and absenteeism at work); and social benefits (increased national pride)" (Morton 2000).

Many forms of high-quality non-motorized recreational opportunities, including hiking, camping, rafting, canoeing, horseback riding, wildlife viewing, hunting, and fishing, require core areas well away from motorized access. Currently, just 14 percent of land in the monument is more than a mile from a transportation feature, suggesting a need to consider route closures to improve wilderness recreation opportunities.

Future Analytical Priorities. This analysis of habitat fragmentation does not account for features unrelated to the transportation network that fragment the landscape, nor did it address habitat connectivity, variations in scale, differences in types of transportation features, or seasonal variations in species' populations. Other human constructions and even natural features such as topography contribute to habitat fragmentation and should be assessed along with the transportation network. It is important to consider the connectivity of patches when assessing fragmentation because the size and number of core areas may matter little to a species if it cannot migrate among them.

A multi-scale assessment of spatial pattern change is essential to understand changes in ecosystem functions (Hessburg et al. 1999) and could be accomplished by further varying the sampling window sizes across the landscape to relate to specific wildlife



MONTANA WILDLIFE FEDERATION

RAINBOW VALLEY OUTFITTERS

MONTANA WILDLIFE FEDERATION

Many forms of high-quality recreation require core areas away from motorized access. Just 14 percent of land in the monument is more than a mile from a transportation feature, suggesting a need to consider route closures to improve wilderness recreation opportunities.

activities or ecosystem processes. In this context, we encourage the BLM to make use of its own policies that emphasize the importance of assessing issues at multiple scales to ensure that decisions are properly informed and tailored to specific needs and circumstances (see BLM Land Use Planning Handbook, H-1601-1 (II) (D)).

This study did not account for the different degrees of physical impact on the ecosystem that a road may have compared to, say, a vehicle trail or for variations in use of roads and trails. And this analysis did not address the effect of seasonal use on transportation features, wildlife, or recreation — for example, whether a species' tolerance for and use of habitat changes during different seasonal activities or whether human use of some transportation corridors varies by season.

A more comprehensive assessment of fragmentation metrics should be recalculated for each species (or suite of species) of interest, depending on how close to a transportation feature the species will use habitat (transportation effect zone width) and how large an area of contiguous habitat is required for different life functions (core area size). Such an assessment ensures that the underlying environmental analysis constitutes the "hard look" required by the National Environmental Policy Act of 1969. As one example, if a species prefers to stay 300 feet from routes and/or clear-cuts, a 300-foot transportation effect zone should be used to evaluate the potential core areas. With such species-specific metrics, the measurements can determine the amount of remaining habitat and indicate priority areas to protect and restore wildlife habitat affected by fragmentation.

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There is much to learn about the monument's resources, and it is incumbent upon the BLM to gather needed information for use in resource management and transportation planning.

5. Conclusions

The viability of the Upper Missouri River Breaks National Monument and its ecological, cultural, and scientific resources depends on the management strategy — and in particular, the transportation plan — adopted by the BLM as part of the Resource Management Plan for the monument. Transportation management must address the full range of terrestrial and aquatic impacts across the landscape (Trombulak and Frissell 2000) and impacts on the quality of the recreational experience. Direct, indirect, and cumulative impacts must be disclosed for individual routes *and* for the collective system of routes — in both the monument and its broader regional landscape.

This report demonstrates the importance of using sound science and spatial analysis to guide the transportation plan. In too many cases, transportation decisions are guided by an ill-informed and inadequate understanding of the impacts to the broader landscape. The result is an inefficient and highly damaging aggregation of routes that requires continued expenditures of taxpayer dollars and destroys valuable public resources. To mitigate current and foreseeable impacts to the monument and its ecological, scientific, and cultural resources, our results point to the need for significant route decommissioning and restoration of the landscape's ecological health and integrity.

We strongly recommend that the BLM make aggressive use of the various management tools at its disposal — in conjunction with sound science and the spatial analysis techniques described in this report — to design a protective transportation plan. Distilled to their essence, we recommend that the agency incorporate the following basic principles into the transportation plan (for more information concerning legal provisions governing the BLM that are cited in this report, see Schlenker-Goodrich 2003).

- The transportation plan must advance the protective purposes of the national monument and thus minimize routes to only those necessary for use of and access to the monument and that cause no unnecessary or undue degradation of the monument.
- Any feature identified as a "road" in the transportation plan must meet the legal definition of a road as set forth in the legislative history of the Federal Land Planning and Management Act of 1976.[9] This automatically precludes the inclusion of "wildcat" routes.
- Each road must be justified and managed through the proper level of analysis (centered on the objects of scientific and historic interest and other key resources) required by the National Environmental Policy Act, taking into account the spatial pattern of roads and not just mileage.
- Each road must be deemed in fact necessary for specified and defined uses of the monument.
- Procedures and standards must be incorporated to close and reclaim roads and routes that are not justified, do not meet the definition of a road, or for which specified uses have been completed.

To best realize these principles, we recommend a transportation plan that consists of two interdependent components: (1) an initial, baseline transportation system and (2) an adaptive ecosystem

Incorporating spatial analysis in transportation management planning will help the BLM meet its obligations to protect resources in Upper Missouri River Breaks National Monument and other lands that the agency manages.

[9] The legal definition of road for public lands managed by the BLM is derived from the definition of 'roadless' in the legislative history of FLPMA: "The word 'roadless' refers to the absence of roads which have been improved and maintained by mechanical means to insure relatively regular and continuous use. A way maintained solely by the passage of vehicles does not constitute a road." (H.R. Rep. No. 94-1163 at 17 (1976)).

management framework designed to guide and inform the public and the BLM in all future transportation management decisions. Consistent with the monument's protective purpose, a protective transportation plan provides the best hope of ensuring the monument's long-term health and integrity while providing the public with access to use and experience this splendid, irreplaceable landscape.

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A protective transportation plan is the best hope of ensuring the monument's long-term health while providing public access to this splendid, irreplaceable landscape.

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Establish and Assess a Baseline Transportation System

The first component of the transportation plan consists of a baseline transportation network designed during the resource management planning process. The BLM should take the following sequential steps to create this network:

1. Establish criteria[10] to reflect the monument's protective purpose to identify routes necessary for access and use of the monument. These criteria will guide and inform each stage of the planning process. In general, they should ensure that the BLM protects and restores the objects of interest, key resources, and overall landscape health and integrity by minimizing routes to only those necessary for use of and access to the monument and which cause no unnecessary or undue degradation of the monument.[11] Specifically:
   - Routes should be evaluated in light of ground-truthed digital spatial data obtained for the objects of interest and other key resources that indicate overall land health and integrity or otherwise require heightened legal protection.
   - Designated routes should be geographically distributed in a manner that reduces habitat fragmentation and contact with key resources, in particular the objects of interest identified in the proclamation.
   - Individual routes must in fact be designated, and the Resource Management Plan must identify the allowable uses of the route (as examples, general public, recreation, administrative) and the allowable intensity of that use. As per the proclamation, motorized and mechanized travel must be confined to designated roads; that is, routes meeting the definition of "road" as per the legislative history of the Federal Land Policy and Management Act of 1976. For administrative routes (including rights of way for lessees and private inholdings), use should be limited to the stated administrative purpose, and the route should be automatically closed and scheduled for reclamation once the administrative purpose ends.
   - All unnecessary routes such as redundant routes and routes with little or no use, all "wildcat" routes, and all routes that adversely impact the objects of interest articulated in the proclamation or cause undue degradation to the landscape, even if the route is otherwise necessary, must automatically be closed and scheduled for reclamation.
   - All routes not incorporated into the final transportation system must be closed and scheduled for decommissioning. This requires a detailed route closure and restoration strategy, complete with timelines and a stated commitment to devote staff and a portion of annual budgets to restoration of closed routes. To discourage resource degradation and provide clear information to the public, routes scheduled for decommissioning should not be placed on official monument maps.
2. Aggregate in digital format and ground-truth existing data concerning the objects of interest and key

[10] 43 C.F.R. § 1610.4-2

[11] 43 U.S.C. § 1732(b)

resources.[12] Where existing data for the objects and resources are incomplete or unavailable, the agency should aggressively inventory the monument to obtain such data, in particular where the data are essential to a reasoned choice among alternatives and the overall costs are not exorbitant.[13]

3. In accordance with the established criteria (see 1. above), identify existing individual routes necessary for use and enjoyment of the monument. The BLM should disclose why each route deemed "necessary" is, in fact, necessary.
4. Use habitat fragmentation analysis to evaluate[14] all routes deemed "necessary" to ascertain their direct, indirect, and cumulative impacts on key biological, physical, recreational, and cultural resources. The evaluation should specifically include calculations of, at a minimum, transportation feature density, transportation effect zones, and the size of core areas around each transportation route.
5. Devise several alternative transportation networks[15] based on the evaluation of existing routes and subsequently assess each alternative network through habitat fragmentation analysis. Roads or other transportation features that adversely impact the objects of interest or key resources or otherwise unnecessarily or unduly degrade the landscape must automatically be excluded from each of the alternatives.
6. Interpret the results of the habitat fragmentation analysis for each alternative in light of relevant literature concerning the impacts of roads on wildlife.[16] The BLM should make the results publicly available, subject them to peer review, and summarize them in the Environmental Impact Statement accompanying the Resource Management Plan.
7. Identify and propose a preferred transportation system from the range of alternatives.[17] The BLM's choice should be driven by the agency's paramount duty to advance the protective purposes of the monument.
8. Establish an adaptive ecosystem management framework to implement the transportation system and to guide and inform the public and the BLM with regard to all future transportation-related decisions.

Establish and Implement an Adaptive Ecosystem Management Framework

The second component of the transportation plan consists of an adaptive ecosystem management framework that provides the means to deal with the inherent uncertainty in management of public lands. Adaptive ecosystem management directs the BLM to continuously collect and update information and apply that information to existing and future decisions. The goal is to ensure that environmental considerations are taken into account, along with economic and technical considerations, even when information is incomplete or unavailable.[18] In Upper Missouri River Breaks National

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12 43 C.F.R. § 1610.4-3

13 43 U.S.C. § 1711(a); 40 C.F.R. § 1502.22(a)

14 43 C.F.R. § 1610.4-4

15 43 C.F.R. § 1610.4-5

16 43 C.F.R. § 1610.4-6

17 43 C.F.R. §§ 1610.4-7, 1610.4-8

18 42 U.S.C. § 4332(2)(B); 43 U.S.C. § 1711(a); 40 C.F.R. § 1502.22; 43 C.F.R. § 1610.4-9

Monument, we recommend the following elements for an adaptive ecosystem management framework:

- Aggressive inventories of the various natural and cultural resources of the monument and enforceable monitoring and evaluation requirements to track use and management of the baseline transportation system. All data collection should be standardized and scaleable to facilitate decision-making at multiple geographic and time scales.
- Use of Resource Management Plan-level habitat fragmentation analysis as a living, baseline analysis. Information collected through inventories, monitoring, and evaluation should be routinely incorporated into the analysis to ensure that it is up to date. Implementation-level decision-making should incorporate the Resource Management Plan-level analysis into decisions, refining the analysis within an ecologically defined project area identified for each decision.
- Criteria (within the Resource Management Plan) for all implementation-level decisions, including criteria and timelines for route closures and decommissioning and all route maintenance and construction work. These criteria should be consistent with the initial planning criteria used to identify the baseline transportation system. Quantifiable thresholds should be identified for each landscape metric that, when crossed, trigger or prohibit specific action on the part of the BLM, both at the Resource Management Plan and implementation levels. The thresholds can be used as a floor to allow development of more refined and, if appropriate, more stringent thresholds at an ecologically defined implementation-level scale.
- A prioritized route decommissioning schedule that is implemented through a committed portion of the monument's staff and annual budget. Prioritization of the schedule should be based principally on the direct, indirect, and cumulative harm caused by the identified route. While factors such as budget and staff should be factored into the equation, they must not be used as excuses to evade the decommissioning process.

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EFFECTS OF TRANSPORTATION ROUTES ON WILDLIFE IN THE ARIZONA STRIP

Protecting Northern Arizona's National Monuments:

The Challenge of Transportation Management

Ecological Analysis

SCIENCE FROM

THE WILDERNESS SOCIETY

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Protecting Northern Arizona's National Monuments:

The Challenge of Transportation Management

EFFECTS OF TRANSPORTATION ROUTES ON WILDLIFE IN THE ARIZONA STRIP

By

Janice L. Thomson, Ph.D.
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This science report is one of a series that stems from conservation research studies conducted by The Wilderness Society's Ecology and Economics Research Department. Other reports in the series that relate to issues in this report include:

- **Ecological Effects of a Transportation Network on Wildlife:** A Spatial Analysis of the Upper Missouri River Breaks National Monument
- **A Conservationist's Guide to BLM Planning and Decision-Making:** Using FLPMA and NEPA to Protect Public Lands (by Erik Schlenker-Goodrich for The Wilderness Society)
- **Bureau of Land Management Budget — Let's Fix It:** Emphasis on Conservation and Ecological Restoration
- **Roadless Area Conservation Along Montana's Rocky Mountain Front: Are We Losing Ground?** Effects of Motorized Transportation in the Rocky Mountain Ranger District

The entire series is available on The Wilderness Society's Web site <www.wilderness.org> and from The Wilderness Society, Communications Department, 1615 M Street, NW, Washington, DC 20036 (202-833-2300 or 1-800-THE-WILD).

Also, see **"An Ecological Assessment of the Shivwits Plateau Region"** (1999) and **"Scientific and Historic Resources of Paria Plateau"** (2000) by the Grand Canyon Wildlands Council.

Preface

Sprawling across the stunning canyon country and vast deserts of the Arizona Strip Resource Area in the northwestern corner of Arizona lie two magnificent jewels: the Grand Canyon-Parashant and Vermilion Cliffs national monuments. These enormous landscapes embody the best of America's natural heritage and comprise critical wildlife habitat for a host of imperiled species. Mountain lions, bighorn sheep, and the desert tortoise survive here in the shadow of priceless cultural, historic, and archaeological treasures, which enrich us all with glimpses of our ancient and more recent past.

A spectacularly rugged backcountry landscape, the Arizona Strip exemplifies the many challenges in managing nationally significant habitat, cultural resources, historic sites, and scenic vistas on the public lands. Visitors need access to enjoy, appreciate, and learn from nature. But such access must be tempered with wisdom. The Bureau of Land Management and the National Park Service are preparing a transportation plan for the Arizona Strip that will address these issues head on. The planning process affords us a singular opportunity to protect the "objects of interest," including wildlife habitat and species, that first earned these lands monument status — and to fulfill the mandates of the Presidential proclamations that established them.

This report, *Protecting Northern Arizona's National Monuments: The Challenge of Transportation Management*, examines the relationship between transportation networks and wildlife habitat in the Arizona Strip. A collaborative effort of the Grand Canyon Trust, Grand Canyon Wildlands Council, and The Wilderness Society, our detailed spatial analyses compare the BLM's inventoried transportation network with a proposed citizens' conservation alternative. Reviewing the ecological effects of the BLM proposal and the alternative on five species, the analyses show that the inventoried route network would severely degrade the quality of their habitat. Conversely the conservation proposal, which would reduce the network of transportation routes, would both increase critical habitat options for these species and greatly improve the chances for maintaining healthy populations across the landscape. Our conclusions are clear. A travel plan designed solely on the basis of the BLM's inventory will place many wildlife species at undue risk and could threaten other monument resources as well.

Based on these findings, the authors have devised a detailed set of recommendations for the federal agencies to follow as the planning process moves forward. Their recommendations offer a sound road map for reaching the ultimate destination: monuments that live up to the splendor of their original proclamations and forever safeguard precious pieces of our natural, historic, and cultural heritage for the generations that follow us.

William H. Meadows
President
The Wilderness Society

G. Thomas Bancroft, Ph.D.
Vice President
Ecology and Economics
Research Department

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Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
AGFD	Arizona Game and Fish Department
BLM	Bureau of Land Management
EIS	Environmental Impact Statement
ESRI	Environmental Systems Research Institute
FLPMA	Federal Land Policy and Management Act
GIS	Geographic Information System
NEPA	National Environmental Policy Act
NLCS	National Landscape Conservation System
NPS	National Park Service
RMP	Resource Management Plan
TEZ	Transportation Effect Zone

Report Highlights

Transportation planning is one of the most significant challenges facing the Bureau of Land Management (BLM) and the National Park Service (NPS) as the agencies develop a management plan for the Arizona Strip Resource Area. The plan for this area is especially critical because it will determine the direction of management for the next twenty years at two of the BLM's new national monuments — Grand Canyon-Parashant and Vermilion Cliffs. Transportation features such as roads and other routes ensure access for recreation and public safety. But those activities must be balanced against the responsibility to protect the area's resources — including the wildlife and plant species (many of them imperiled) and geological, archaeological, historic, and cultural attributes that are listed in the proclamations for Grand Canyon-Parashant and Vermilion Cliffs national monuments.

A large body of scientific studies indicates that roads can and do have significant negative effects on resources such as those in the monuments of the Arizona Strip. We completed a spatial analysis of the area to assess the potential effects that two different transportation systems are likely to have on habitat for five wildlife species — the desert tortoise, mountain lion, bighorn sheep, pronghorn, and mule deer. The transportation systems are: (1) the BLM's Route Inventory, which contains an extensive network of existing and reported routes across the Arizona Strip; and (2) the Conservation Route Proposal, which is the network supported by the Arizona conservation community and developed from an on-the-ground survey of Grand Canyon-Parashant and Vermilion Cliffs.

Among the results:

- The BLM Route Inventory includes approximately 7,524 miles of roads across the Arizona Strip at an average route density between 1 and 2 mi/mi^2.
- Under the BLM Route Inventory, only 6 percent of the Arizona Strip and only 10 percent of monument lands are more than 1 mile from a road.
- Findings suggest that the BLM Route Inventory is extensive enough to have substantial negative effects on all five of the selected wildlife species.
    1. At least 62 percent of desert tortoise habitat in Grand Canyon-Parashant National Monument is within 0.5 miles of a route. Tortoise populations tend to decrease within this parameter.
    2. From 53 percent to 75 percent of mountain lion habitat has a route density higher than 1 mi/mi^2 and/or lies within 0.3 miles of a road — conditions documented as detrimental for mountain lions.
    3. Twelve percent to 28 percent of all bighorn sheep habitat lies within 0.09 miles to 0.25 miles of a route. Sheep are disturbed by human activity on routes within these parameters.
    4. At least 55 percent of pronghorn habitat and 41 percent of mule deer habitat are located within 0.25 miles of a route. Pronghorn and deer avoid areas this close to a route and cannot use habitat fully.
- The Conservation Route Proposal, on the other hand, contains 822 miles of routes at an average road density of 0.4 mi/mi^2 in the monuments and desert tortoise Areas of Critical Environmental Concern.
- Even under the Conservation Route Proposal, 44 percent of monument land is more than 1 mile from a road, and only 18 percent is more than 2 miles from a road.
- While considerably smaller in relation to road mileage and density than the BLM Route Inventory, the conservation proposal will not provide sufficient habitat for some of the selected wildlife species, desert tortoise in particular.

The network of existing and reported routes in the Arizona Strip is extensive enough to have significant negative effects on all five wildlife species selected for this study.

Key Recommendations

We urge BLM to model its transportation network on the basic precept of the Conservation Route Proposal: that is, protection of large core areas that will support populations of imperiled and other wildlife species across their range in the Arizona Strip and adjacent lands. Such areas will also serve important purposes in addition to protecting wildlife, such as conserving other resources and wilderness character.

Specifically, the transportation plan should:

- Provide large blocks of core habitat more than a mile from a road within desert tortoise habitat.
- Reduce road mileage in mountain lion habitat to densities less than 1 mi/mi^2. This would require the closure of many routes in the BLM Route Inventory.
- Reduce road mileage in bighorn sheep, pronghorn, and mule deer habitat to levels in the Conservation Route Proposal so that core habitat areas are more than 0.25 miles from a road. Again, this requires substantial reductions in the routes included in the BLM Route Inventory.
- Use our landscape fragmentation metrics to guide management decisions regarding transportation routes for other wildlife species. Goals are to reduce road density and edge effects and increase core areas to provide greater habitat security.
- Establish priorities and adopt best-practice procedures to close and reclaim roads and other routes.

▼
BLM should model its transportation network after the Conservation Route Proposal. This would result in substantial reductions in current road mileage and the protection of large core areas of habitat.
▲

We also recommend that the BLM incorporate the detailed guidance presented at the end of this report as the agency develops its transportation plan. Essential elements include:

1. Generate transportation network scenarios based on directives in the monument proclamations, reliable data, and high-quality analysis.
2. Assemble wildlife habitat use information in compliance with agency obligations to use accurate, high-quality scientific information in analyses.
3. Generate landscape fragmentation metrics to represent the best available science.
4. Integrate the results of analyses into management plan alternatives and use them as the basis for selecting the preferred alternative, as well as for defining a road closure plan, mitigation and adaptive management.

PHOTO BY JULIE SHERMAN

Vermilion Cliffs National Monument is recognized widely for its beauty and scenic vistas. As important, the monument harbors numerous wildlife species, some of them imperiled.

1. Introduction

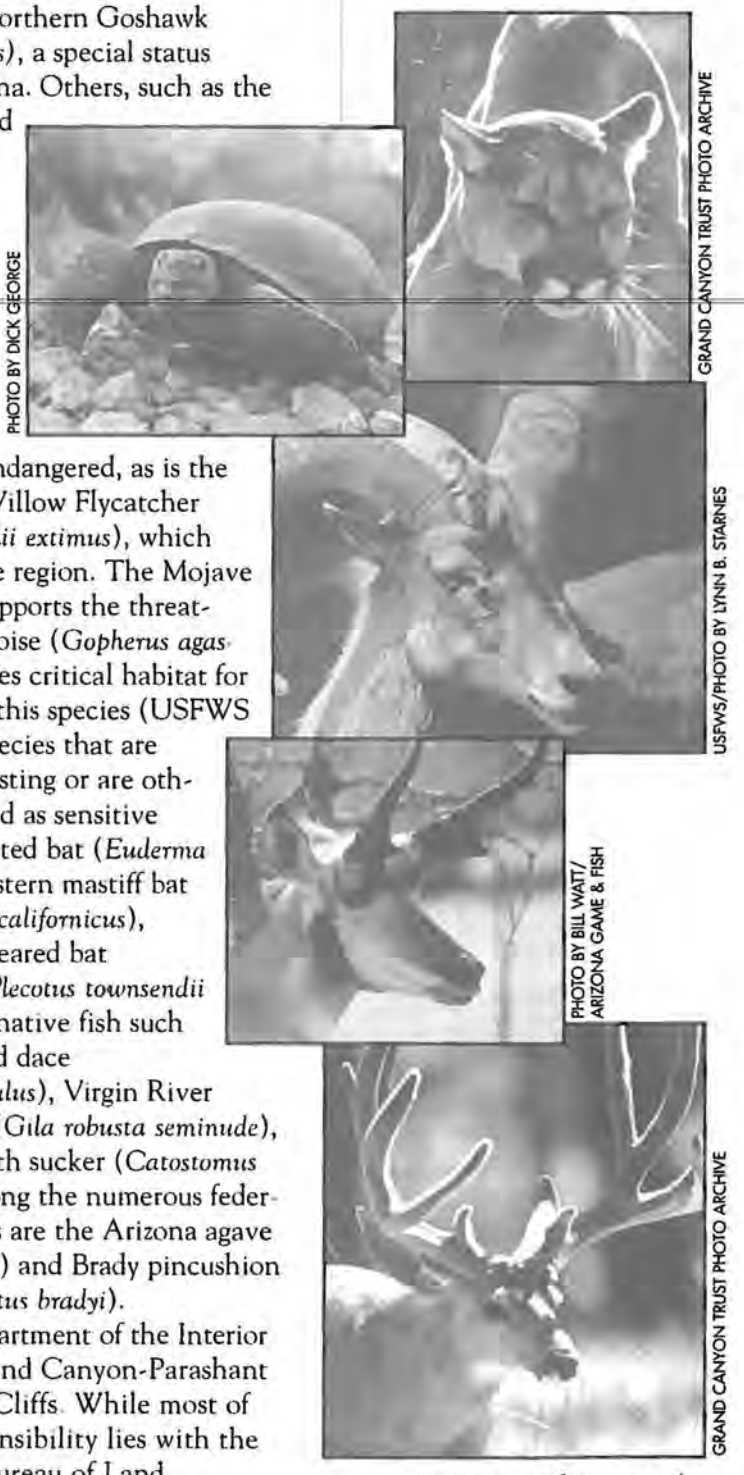
Nearly three million acres of public land comprise the region known as the Arizona Strip in northwestern Arizona. Nestled in the stunning canyon country and high plateaus between the Grand Canyon and Utah-Arizona border, this region contains two of America's most recently designated national monuments — Grand Canyon-Parashant and Vermilion Cliffs, extending across 1.3 million acres. In 2000, under provisions of the Antiquities Act of 1906, President William J. Clinton protected these lands, proclaiming that *"full of natural splendor and a sense of solitude, this area remains remote and unspoiled, qualities that are essential to the protection of the scientific and historic resources it contains."*

The two monuments fall in the midst of other public wildlands that include Grand Staircase-Escalante National Monument, Glen Canyon National Recreation Area, Lake Mead National Recreation Area, Grand Canyon National Park, and Kaibab National Forest. Grand Canyon-Parashant and Vermilion Cliffs are integral to this vast, dramatic landscape where far-ranging wildlife species such as the pronghorn (*Antelocarpa americana*), mountain lion (*Felis concolor*), desert bighorn sheep (*Ovis canadensis*), and mule deer (*Odocoileous hemionus*) can roam freely.

Two landscapes dominate the region: the scenic plateaus, canyons, and tributaries of the Colorado Plateau and the daunting landforms of the Mojave Desert to the west. The intersection of these two ecoregions includes a wealth of native plant and wildlife species. At least 339 species of birds, 62 mammal species, and more than 30 reptile species call the region home. Seven species of native fish and 21 species of amphibians also rely on the region's life-giving network of rivers, streams, and springs.

Among the bird species in the region are upwards of 20 species of raptors including the Northern Goshawk (*Accipiter gentilis*), a special status species in Arizona. Others, such as the Mexican Spotted Owl (*Strix occidentalis lucida*) and California Condor (*Gymnogypes californianus*) are listed by the federal government as threatened or endangered, as is the Southwestern Willow Flycatcher (*Empidonax trailii extimus*), which also inhabits the region. The Mojave Desert biome supports the threatened desert tortoise (*Gopherus agassizii*) and includes critical habitat for the recovery of this species (USFWS 1994). Other species that are candidates for listing or are otherwise recognized as sensitive include the spotted bat (*Euderma maculatum*), western mastiff bat (*Eumops perotis californicus*), Townsend's big-eared bat (*Corynorhinus/Plecotus townsendii pallescens*), and native fish such as the spectacled dace (*Rhinichthys osculus*), Virgin River roundtail chub (*Gila robusta seminude*), and flannelmouth sucker (*Catostomus latipinnis*). Among the numerous federally listed plants are the Arizona agave (*Agave arizonica*) and Brady pincushion cactus (*Pediocactus bradyi*).

The U.S. Department of the Interior administers Grand Canyon-Parashant and Vermilion Cliffs. While most of the direct responsibility lies with the Department's Bureau of Land Management (BLM), the southern extent of Grand Canyon-Parashant National Monument is managed by the National Park Service (NPS) through the Lake Mead National Recreation Area. These agencies must adhere to mandates of the monuments'



Transportation features in the Arizona Strip affect many wildlife species — including the desert tortoise, mountain lion, desert bighorn sheep, pronghorn, and mule deer — through fragmentation of core area habitat and reduction of landscape connectivity.

proclamations. Those proclamations identify the significant resources that merit national monument status and call for their protection. Named "objects of interest," these resources include the key species described above as well as many archaeological, geological, historic, cultural, and scenic attributes.

Grand Canyon-Parashant and Vermilion Cliffs are outstanding units of the National Landscape Conservation System (NLCS), which was established in 2000 to consolidate conservation lands managed by BLM. BLM is updating its Resource Management Plan[1] (RMP) for the entire Arizona Strip Resource Area. The agency's task is to determine *how* to conserve the unique resources of the national monuments, not *if* they are to be protected. The RMP process, scheduled for completion in 2005, challenges both BLM and the NPS to set a course for management over the next 15 to 20 years that will protect the irreplaceable landscapes of this area for generations to come.

The NPS and BLM must prepare a transportation plan that addresses the actions, including road closures or travel restrictions, which are needed to protect the objects identified in the proclamations. Transportation routes and the motorized uses they encourage are a major concern in landscape planning and management because they fragment wildlife habitat, pose a threat to archaeological and historic objects, and destroy wilderness recreation experiences. The Arizona Strip contains some of the most remote lands remaining in the lower 48 states, which contributes mightily to the thriving biodiversity and well-preserved archaeological sites in this area.

As the agencies prepare the RMP, they are formulating a range of alternative transportation networks that include different total mileage and various patterns of routes. Traditionally, federal land management agencies have not used comprehensive spatial analyses to evaluate direct, indirect, and cumulative impacts of transportation networks on a region's cultural and natural resources. This report demonstrates the feasibility of using landscape fragmentation metrics to evaluate different transportation networks based on their impacts on specific wildlife species. This use of spatial analysis technology can inform land-use planning efforts across the Arizona Strip. Such analyses are also the best methods available for the agencies to meet their obligation under the National Environmental Policy Act (NEPA) to take a "hard look" at the direct, indirect, and cumulative effects of transportation systems on the landscape and on the specific wildlife species identified as monument objects.

The following sections describe the landscape metrics used in our spatial

Roads, Routes, and Transportation Networks

In this report, the terms "routes" and "transportation features" encompass all linear features used by motorized vehicles to access the monuments, including "roads." However, the term "roads" holds a precise legal definition with important management implications.

Within the monuments, all motorized and mechanized vehicle use is to be confined to roads formally designated in the Resource Management Plan. Roads must meet criteria established in Title 43, Part 19.2(e) of the Code of Federal Regulations — "an improved road that is suitable for public travel by means of four-wheeled, motorized vehicles intended primarily for highway use." In addition, the legal definition of a road, according to the U.S. Department of the Interior, is derived from the definition of "roadless" in the legislative history of FLPMA: "roads which have been improved and maintained by mechanical means to insure relatively regular and continuous use. A way maintained solely by the passage of vehicles does not constitute a road" (H.R. Rep. No. 94-1163 at 17 (1976).

[1] The BLM is obligated by the Federal Land Policy and Management Act (FLPMA) to create a Resource Management Plan (RMP) for each defined geographic area of the pubic land it manages. RMPs are frameworks to manage the land for multiple use and sustained yield and to prevent unnecessary or undue degradation; all subsequent management activities must conform with the RMPs (43 U.S.C. § 1712).

analysis and present calculations performed using the metrics for two transportation networks: the current network of existing and reported routes described as the BLM Route Inventory and a Conservation Route Proposal that would reduce the number and mileage of routes in the BLM Route Inventory and preserve large areas of roadless lands.[2] We compare the results for the two systems across the overall landscape and for five key wildlife species — the desert tortoise, mountain lion, bighorn sheep, pronghorn, and mule deer — and list a number of recommendations for the agencies to consider in approving their transportation plan as a key component of the RMP.

PHOTO COURTESY ARIZONA WILDERNESS COALITION

More than 2,441 miles of transportation routes criss-cross the two national monuments in the Arizona Strip — degrading the quality of critical wildlife habitat, archeological treasures, and wilderness landscapes.

2 Presented to the BLM and NPS in July 2003 by the Arizona Wilderness Coalition, Grand Canyon Trust, Grand Canyon Wildlands Council, Sierra Club, and The Wilderness Society.

2. Methods

Study Area

The study area includes the entire Arizona Strip Planning Area, approximately 2.8 million acres of public land in northern Arizona that includes Vermilion Cliffs and Grand Canyon-Parashant national monuments and 1.7 million acres located between the two monuments and managed by BLM (Figure 1).

Geographic Data Sources

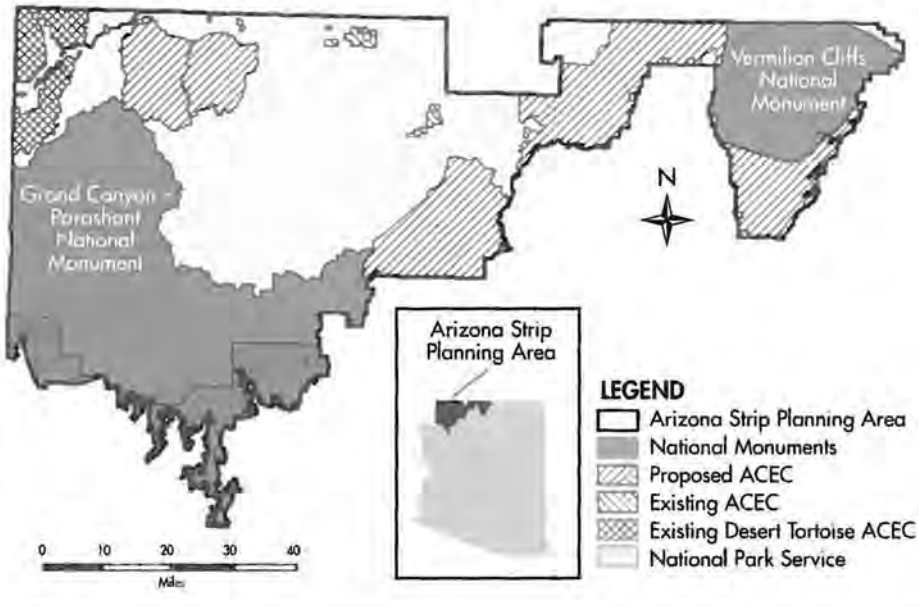
Management Boundaries. BLM has compiled geographic data for the Arizona Strip Planning Area boundary and national monument boundaries. We further divided BLM-managed land located between the two monuments into existing and citizen-proposed Areas of Critical Environmental Concern (ACECs). BLM developed the existing ACEC boundaries as part of the agency's 1992 Resource Management Plan (USDOI BLM 1992); the two northeastern ACECs indicate critical desert tortoise habitat, and the four small ACECs protect known sensitive archaeological resources. The four larger citizen-proposed ACECs were developed by the Grand Canyon Wildlands Council to protect and maintain several native animals such as mule deer, mountain lion, and raptors in natural patterns of abundance and distribution.

Transportation Routes. The first transportation route dataset, the "BLM Route Inventory," was obtained from BLM in January 2004 (Figure 2). This dataset is the result of an inventory that BLM conducted across the Arizona Strip. It documents all linear features evident on aerial photos and existing maps and from public comments. The BLM field-verified the inventory for the monuments, but no field verification was completed for BLM-managed land between the monuments. It is not clear if BLM used a consistent definition for "route;" nevertheless, this dataset represents the best data available for road distribution. We chose to use this dataset for analysis because it will likely resemble one of the alternatives analyzed for the Draft RMP and Environmental Impact Statement (EIS).

The second transportation route data set, "Conservation Route Proposal," (Figure 2) is the network supported by the Arizona conservation community and is the result of an extensive on-the-ground survey of the two national monuments coordinated by the Arizona Wilderness Coalition and Grand Canyon Wildlands Council. Staff and volunteers spent 1,160 hours in 2002 and 2003 surveying 2,050 miles of routes and taking nearly 2,000 photographs to document and evaluate each route. This survey evaluated all routes evident on the ground and documented whether the routes were legal "roads" and/or served a critical

FIGURE 1.

National Monuments and Areas of Critical Environmental Concern in the Arizona Strip Planning Area

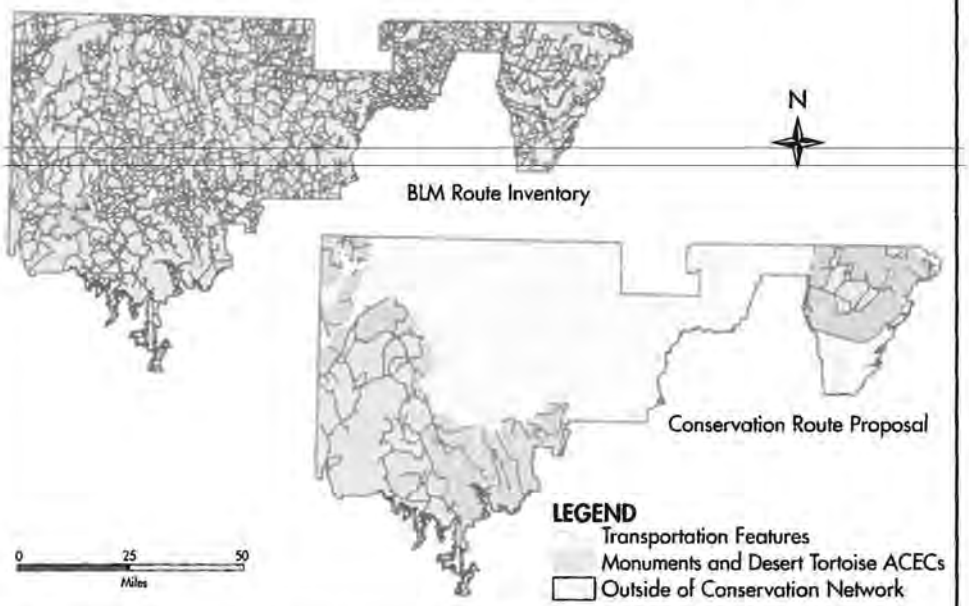


function such as exclusive access to an inholding or popular scenic destination.[3]

Subsequent to this work, the road assessment team developed a Conservation Route Proposal that indicated open roads based on a variety of considerations, including protection of monument "objects of interest," implementation of past planning decisions, and the transportation needs of surrounding communities. Roads that were not considered necessary or could negatively affect sensitive resources and monument "objects of interest" are considered closed to motorized and mechanized public access and do not appear in the Conservation Route Proposal. The team did not identify a route network for the non-monument lands, except for the desert tortoise ACECs in the northwestern corner of the study area. We chose to use this dataset for analysis because it too will likely resemble one of alternatives analyzed for the Draft RMP and EIS.

FIGURE 2.

BLM Route Inventory and Conservation Route Proposal



Species of Interest. We obtained species-distribution data layers from multiple sources. BLM's Arizona Strip Field Office provided desert tortoise and bighorn sheep habitat areas. For our geographic analyses, we combined both critical and categorical desert tortoise habitat into a single layer. These critical habitat data were originally developed by the U.S. Fish and Wildlife Service, and categorical data were developed by the BLM after considering preferred habitats and elevation gradients. The two layers largely overlapped and represent the best available data at the time the work was conducted. The bighorn sheep habitat layer represents the habitat range occupied by sheep after their re-introduction to the area in the early 1970s.

Habitat layers for mule deer, mountain lion, and pronghorn were obtained from Arizona Game and Fish Department (AGFD). The mule deer habitat is based on data originally created by hand tracing on transparent overlays. Distortion was introduced into the original dataset by AGFD when the transparent tracings were captured in digital format. Due to this distortion, the dataset does not align with other data; that is, it is notably shifted approximately 1.5 miles east and a few thousand feet north or south based on location. The mule deer dataset was used as is. The mountain lion data, completed in 2002, represent a statewide dataset that estimates the number of animals per square mile. The pronghorn data layer was derived from a model of potential habitat quality that is based on factors such as terrain, water, human development, vegetation, and fencing. Despite weaknesses in the data, these datasets are the best available for these species and are used statewide for important management decisions.

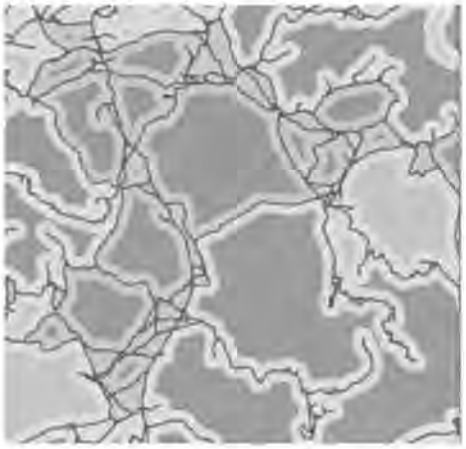
[3] These roads meet the definition of a road. See sidebar on page 4.

Landscape Fragmentation Metrics

Habitat fragmentation has been defined as the "creation of a complex mosaic of spatial and successional habitats from formerly contiguous habitat" (Lehmkuhl and Ruggiero 1991). The degree of fragmentation caused by a transportation network and the effects of such fragmentation on the ecological composition, structure, and functions of a landscape are difficult to measure and far from fully understood. But a variety of landscape metrics have been documented in the scientific literature to help measure the condition of a landscape and its level of fragmentation (McGarigal and Marks 1994).

For our study, we selected three landscape metrics: (1) density of routes in the transportation network, (2) acreage of habitat within the transportation effect zone, and (3) acreage of core areas (Hartley et al. 2003). The analytical work was conducted using ESRI's ArcGIS geographic information systems (GIS) software and custom software developed by The Wilderness Society.

FIGURE 3.
Explanation of Transportation Effect Zone and Core Area Analysis



In this sample landscape the black lines represent transportation features. The light gray indicates a transportation effect zone placed around the features and represents the area of impact attributable to the network. Area unaffected at this given transportation effect zone, or core area, is represented by the darker gray.

TABLE 1.
Summary of Transportation Effect Zones for Five Selected Species*

Species	TEZ (miles)	Literature Citation
Desert tortoise	0.5; 1.0; 2.5	Nicholson 1978, Boarman and Sazaki 1996, Von Seckendorff Hoff and Marlow 2002
Mountain lion	0.3	Dickson and Beier 2002
Mule deer	0.25	Rost and Baley 1979
Bighorn sheep**	0.09; 0.25	Papouchis et al. 2001
Pronghorn	0.25	Ockenfels et al. 1994

*TEZs selected for each species based on detrimental effects of roads identified in the cited literature.

**TEZs for bighorn sheep represent an approximation of the effect zones identified in the literature (132 meters and 363 meters). These values were rounded to reduce the total number of TEZs calculated for this analysis.

Metric 1: Density Analysis. Density is a measure of the number of miles of routes per unit area and is a common metric in quantitative assessments of ecological impacts from a landscape perspective. Route density is presented as miles per square mile (mi/mi^2) throughout this report. It was calculated as an average value across large management units and sampled across a grid of small sampling windows for presentation in map format. This helps to demonstrate the spatial variability of route density across the landscape. Using a sampling window technique, a square 16-mi^2 sampling window was selected because it is small enough to illustrate the wide variety of densities across the Arizona Strip, yet large enough to average over relatively small anomalies. Results for the density of transportation features include average density values for the entire planning area, the monuments, nonmonument lands within the planning area, ACECs, and habitats for five wildlife species. Also included are density calculations across sampling windows for the entire Arizona Strip and for mountain lion habitat displayed in map format.

Metric 2: Analysis of the Transportation Effect Zone. Forman (1999) uses the term "road effect zone" to describe the influence of roads beyond the actual physical feature. Extending this concept to include not just roads but all features of a transportation network, we defined a "transportation effect zone" (TEZ) (Figure 3). The width of the zone depends on the effects measured (noise, dust, erosion, human presence, etc.) and the activity that is affected (avian breeding, ungulate reproduction, and wilderness experiences for hikers among others).

We examined fragmentation patterns associated with the TEZ for a variety of zone widths (Table 1). Results of this analysis are reported in acres and repre-

sent the area affected. The zone widths were selected to identify the potential zone affected based on research described in the scientific literature. Note that in the interest of time and to reduce the volume of numbers and tables for this report, some of the TEZ widths do not match the numbers in the literature precisely where zone widths were close but not exactly the same. These small disparities, discussed in the "Implications for Conservation and Management" section, do not significantly alter our results.

Metric 3: Analysis of Core Area. Core areas, sometimes called interior habitat or secure habitat, exist in natural landscapes as contiguous blocks of uniform habitat types away from habitat edges. Free from fragmentation, communities of native species and ecological functions persist uninterrupted in the core areas. For our analysis, core areas are defined as portions of the landscape that are sufficiently far from transportation corridors to be relatively unaffected by them. In essence, core area is the natural habitat remaining outside a TEZ. For each of the TEZ data layers described above, we created a corresponding core area data layer.

PHOTO COURTESY EDWARD T. STEPHENSON

These Anasazi petroglyphs, located along the Colorado River adjacent to Vermilion Cliffs National Monument, date from 800 to 1100 AD. They demonstrate that pronghorns have long inhabited the Arizona Strip region and hold a long-lasting place of honor in native cultures.

3. Results

Overview

To understand how the two route networks affect the Arizona Strip Planning Area, our analysis first examined the landscape from an overall geographic perspective, independent of species habitat data. We started by calculating the overall route density for both the BLM Route Inventory and Conservation Route Proposal within the two monuments and the desert tortoise ACECs. In addition, we calculated route density outside these areas for the BLM Route Inventory. This feature density analysis shows the overall density of routes for the BLM Inventory and Conservation Proposal within a variety of administrative units of the Arizona Strip Planning Area (Table 2).

Transportation feature density is scale dependent and varies across a landscape. Densities measured within 16-mi^2 sample windows (Figures 4-6) illustrate the spatial variation in feature density across the planning area. In addition to demonstrating variation across the landscape, this analysis identifies localized areas of high route density. The maximum density measured for the BLM Route Inventory within monument lands was 3.6 mi/mi^2 compared to just 1.0 mi/mi^2 for the Conservation Route Proposal across the same area. Within the desert tortoise ACECs, the maximum route density was 4.4 mi/mi^2 for the BLM Route Inventory compared to just 0.8 mi/mi^2 for the Conservation Route Proposal. Across the entire

FIGURE 4.

Density Distribution for BLM Route Inventory

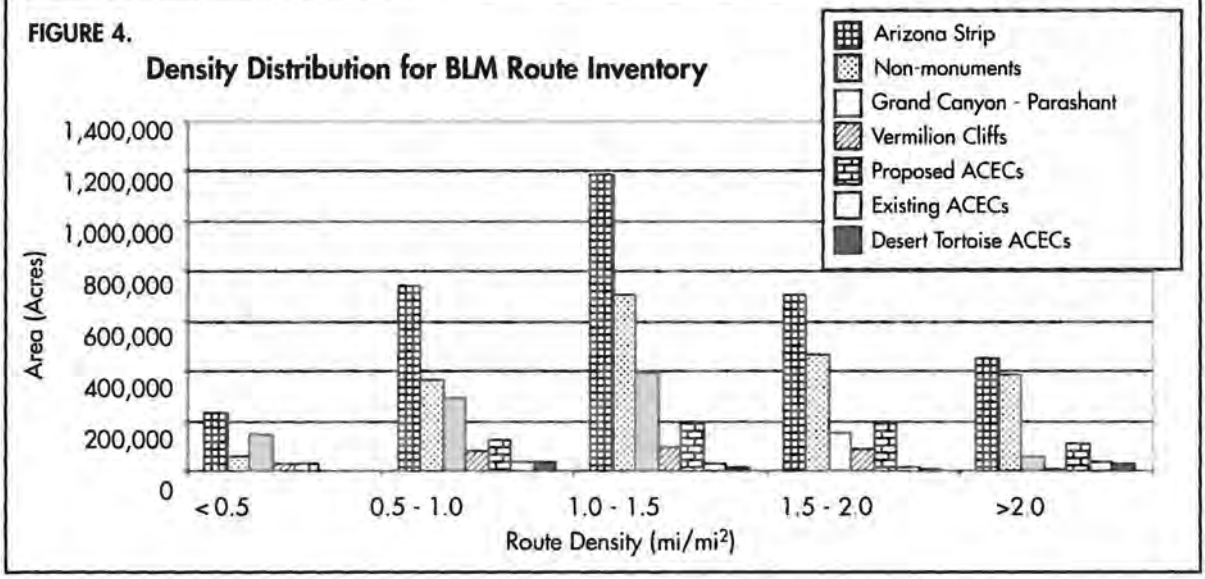


TABLE 2.

Summary of Overall Route Density*

	BLM ROUTE INVENTORY		CONSERVATION ROUTE PROPOSAL	
Administrative Unit	Length of Routes (miles)	Route Density (mi/mi^2)	Length of Routes (miles)	Route Density (mi/mi^2)
Arizona Strip	7,524	1.5	—	—
Total Monuments	2,441	1.2	822	0.4
Grand Canyon-Parashant	1,857	1.1	630	0.4
Vermilion Cliffs	585	1.3	191	0.4
Non-monument	5,082	1.6	—	—
All ACECs	2,041	1.7	—	—
Existing ACECs	285	1.6	—	—
Desert Tortoise ACECs	202	1.4	61	0.4
Proposed ACECs	1,756	1.8	—	—

*Average density of BLM and Conservation transportation features within a variety of administrative units of the Arizona Strip Planning Area.

Arizona Strip Planning area, the maximum density for the BLM Route Inventory was 5.0 mi/mi^2.

We also analyzed the relative impact of the two route networks on the landscape by applying a TEZ at widths of 1 mile and 2 miles to the BLM Inventory and Conservation Route Proposal (Table 3, Figures 7a and 7b). Across the entire Arizona Strip Planning Area, the BLM Route Inventory was found to cover 94 percent of the area with a 1-mile TEZ and 99 percent of the area with a 2-mile TEZ. In addition, 95 percent of existing and 97 percent of proposed ACECs were within a 1-mile TEZ placed on the BLM Route Inventory. A 2-mile TEZ includes 99 percent of the existing ACECs and 100 percent of the proposed ACECs.

Across monument lands, for the 1-mile TEZ, 90 percent of monument lands were affected by the BLM routes, versus 56 percent affected by the Conservation routes. For the 2-mile TEZ, 98 percent of monument lands were affected by BLM routes, versus 82 percent affected by the Conservation routes. This means that 98 percent of monument lands lie within 2 miles of a BLM route, while 82 percent are within 2 miles of a Conservation route.

Species-Specific Results

For the BLM Route Inventory, transportation feature density was calculated

FIGURE 5.

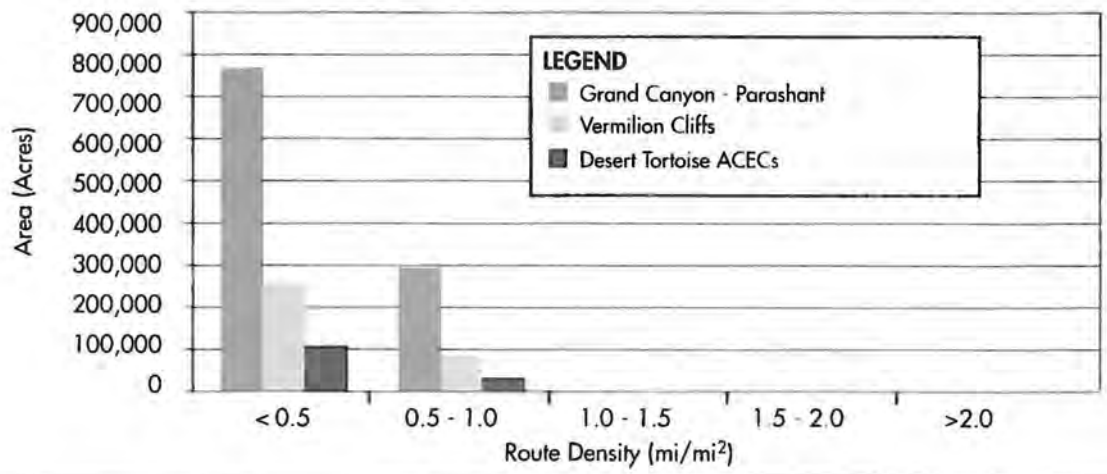
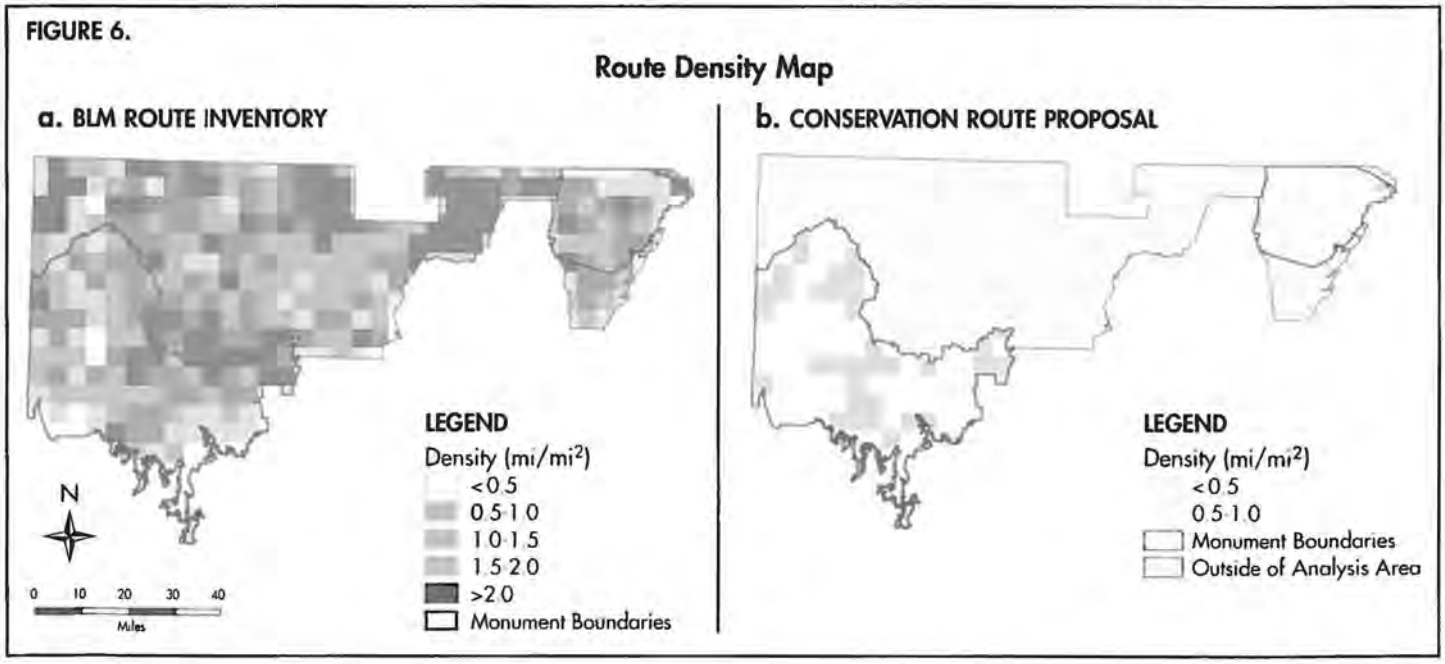


FIGURE 6.



across the entire habitat area for each of our five selected species, both within and outside monument lands. The species-specific route density for the Conservation Route Proposal could only be calculated for habitat in the monuments, the extent of this transportation network. The results are summarized in Table 4.

Route density was also measured using the sampling window technique for the mountain lion, given density thresholds

TABLE 3.

Summary of Overall Transportation Effect Zone Analysis for Arizona Strip, National Monuments, and ACECs

	1-MILE TEZ		2-MILE TEZ	
	BLM Route Inventory	Conservation Route Proposal	BLM Route Inventory	Conservation Route Proposal
Arizona Strip				
Effect zone area (acres)	3,107,819	*	3,300,544	*
Percent of landscape in TEZ	94	*	99	*
Core area (acres)	215,591	*	22,866	*
Percent of landscape in core area	6	*	1	*
Total Monuments				
Effect zone area (acres)	1,201,770	745,877	1,321,622	1,102,573
Percent of landscape in TEZ	90	56	98	82
Core area (acres)	140,372	596,265	20,520	239,570
Percent of landscape in core area	10	44	2	18
Grand Canyon-Parashant				
Effect zone area (acres)	932,066	582,010	1,032,598	852,843
Percent of landscape in TEZ	89	56	98	81
Core area (acres)	116,549	466,605	16,017	195,773
Percent of landscape in core area	11	44	2	19
Vermilion Cliffs				
Effect zone area (acres)	269,704	163,867	289,024	249,730
Percent of landscape in TEZ	92	56	98	85
Core area (acres)	23,823	129,660	4,503	43,797
Percent of landscape in core area	8	44	2	15
ACECs				
Existing				
Effect zone area (acres)	106,941	*	111,600	*
Percent of landscape in TEZ	95	*	99	*
Core area (acres)	5,284	*	626	*
Percent of landscape in core area	5	*	1	*
Proposed				
Effect zone area (acres)	622,583	*	641,959	*
Percent of landscape in TEZ	97	*	100	*
Core area (acres)	19,683	*	307	*
Percent of landscape in core area	3	*	0	*
Desert Tortoise				
Effect zone area (acres)	86,196	52,359	90,683	80,818
Percent of landscape in TEZ	94	57	99	89
Core area (acres)	5,113	38,950	626	10,491
Percent of landscape in core area	6	43	1	11

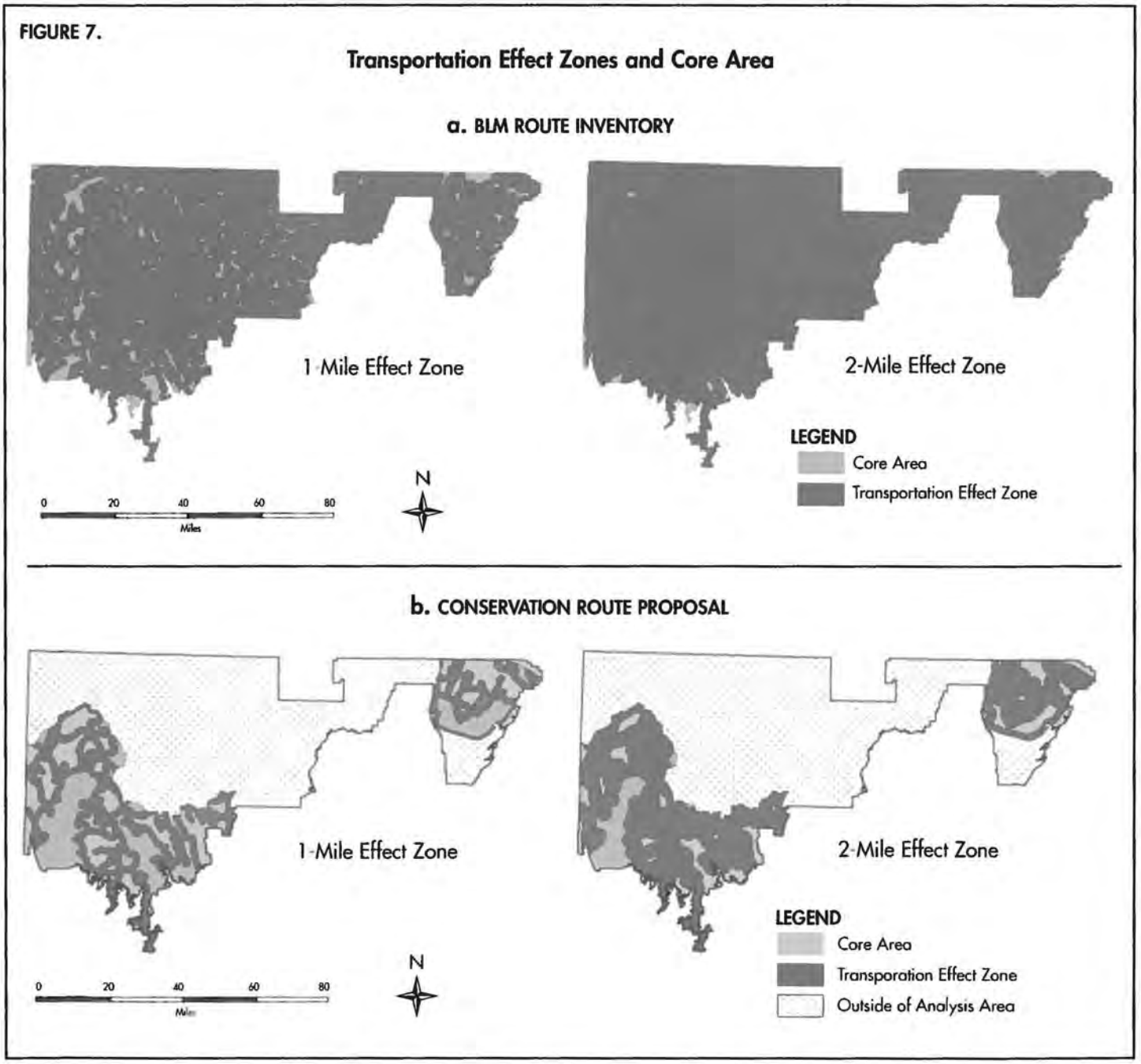
TEZs have impacts on varying areas of the Arizona Strip, monuments, and ACECs that depend on the type of impact and, consequently, the width of the zone being measured. (* Indicates the value was not calculated because the conservation route proposal does not extend beyond the monuments and desert tortoise ACECs.)

identified in the scientific literature. The results of the analysis are illustrated in Figures 8 and 9. For mountain lion habitat within the monuments, the maximum route density was 3.0 mi/mi^2 for the BLM Route Inventory and 1.0 mi/mi^2 for the Conservation Route Proposal. Sampling window density was also compared to mountain lion habitat outside the monuments for the BLM transportation network. The maximum density of BLM Inventory routes in mountain lion habitat outside of the monuments was 5.0 mi/mi^2.

For each of our five species of interest, we selected one or more TEZ widths (Table 1) based on our review of published wildlife literature. BLM and Conservation transportation networks were buffered by the selected widths to

FIGURE 7.

Transportation Effect Zones and Core Area



generate TEZs. The buffered networks were then overlain with the corresponding species-specific habitat boundaries to determine TEZs and core area for each species. The results of these overlay analyses are summarized by species in Tables 5 through 9 and illustrated in Figures 10 through 14.

TABLE 4.

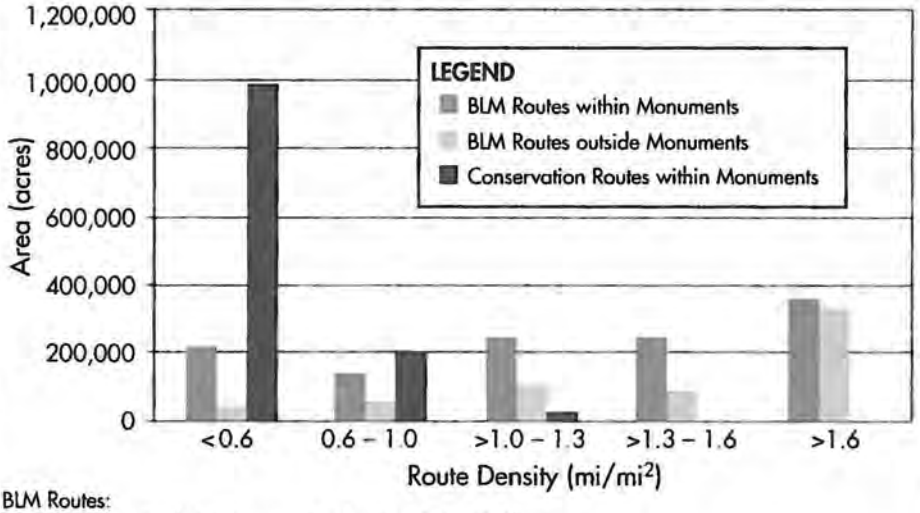
Summary of Route Density for Five Selected Species Habitats*

	Route Density (mi/mi²)				
	Desert Tortoise	Mountain Lion	Mule Deer	Bighorn Sheep	Pronghorn
BLM Route Inventory					
Entire habitat area	1.2	1.3	1.3	0.7	1.7
Monument lands	1.0	1.2	1.1	0.8	1.7
Non-monument lands	1.6	1.6	1.6	0.7	1.7
Conservation Route Proposal					
Monument lands	0.3	0.4	0.4	0.2	0.6
Desert Tortoise ACEC	0.4	—	—	—	—

*Density of BLM and Conservation routes within the habitat of each of the five selected species.

FIGURE 8.

Route Density within Mountain Lion Habitat: BLM Route Inventory and Conservation Route Proposal



BLM Routes:
75% of entire habitat area with density >1.0 mi/mi²
70% of habitat within monuments with density >1.0 mi/mi²

Conservation Routes:
2% of habitat with monuments with density >1.0 mi/mi²

FIGURE 9.

Route Density Analysis within Mountain Lion Habitat

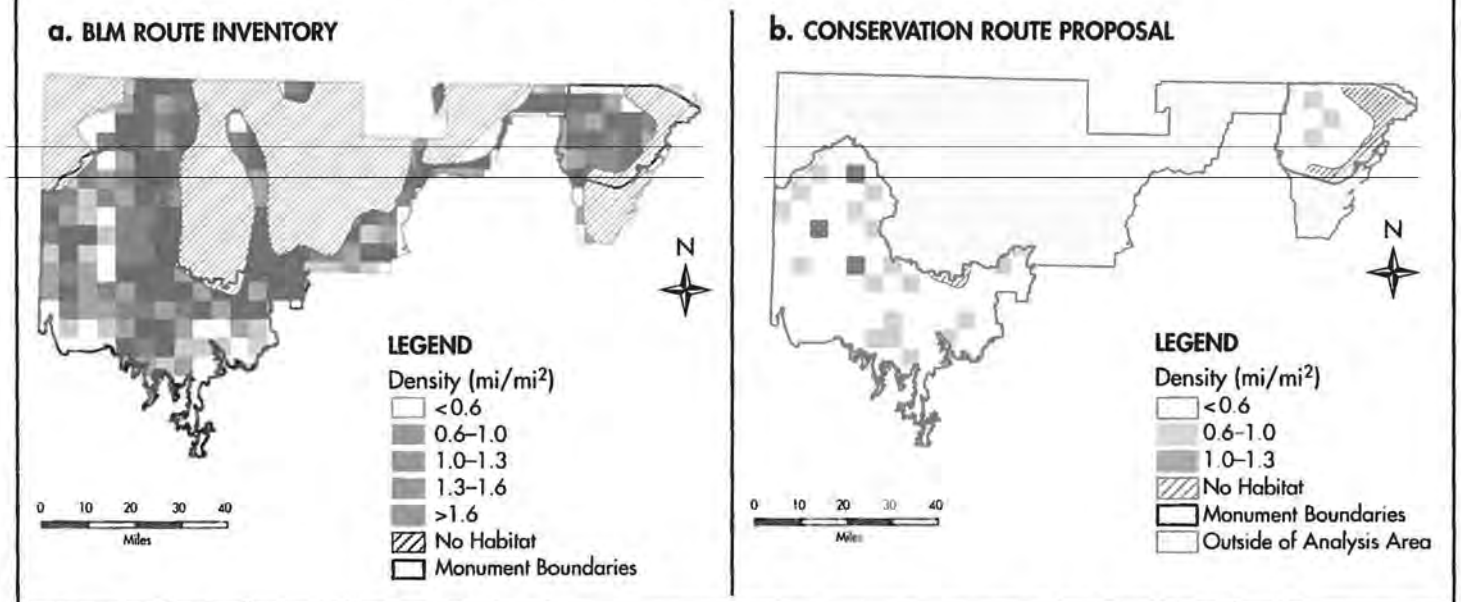


TABLE 5.

Summary of Transportation Effect Zone and Core Area Results for Desert Tortoise Habitat

DESERT TORTOISE	Transportation Effect Zone (TEZ) Area (acres)	Area (%)	Core Area Area (acres)	Area (%)
BLM Route Inventory				
Desert Tortoise ACECs				
0.5-mile TEZ	66,978	74	23,000	26
1.0-mile TEZ	84,726	87	5,052	6
2.5-mile TEZ	89,872	100	106	0
Monuments				
0.5-mile TEZ	146,177	62	89,839	38
1.0-mile TEZ	205,726	87	30,291	13
2.5-mile TEZ	235,480	100	536	0
Conservation Route Proposal				
Desert Tortoise ACECs				
0.5-mile TEZ	30,122	33	59,856	67
1.0-mile TEZ	51,988	58	37,990	42
2.5-mile TEZ	85,629	95	4,349	5
Monuments				
0.5-mile TEZ	53,588	23	182,429	77
1.0-mile TEZ	95,505	40	140,511	60
2.5-mile TEZ	180,382	76	55,634	24

Features of the BLM Route Inventory and Conservation Route Proposal affect different percentages of areas of desert tortoise habitat. For example, within the monuments, 87 percent of the habitat has been and continues to be affected by a 1-mile TEZ placed on the BLM Route Proposal, compared to 40 percent for the same TEZ applied to the Conservation Route Proposal.

TABLE 6.

Summary of Transportation Effect Zone and Core Area Results for Mountain Lion Habitat

MOUNTAIN LION	Transportation Effect Zone (TEZ) Area (acres)	Area (%)	Core Area Area (acres)	Area (%)
BLM Route Inventory				
Arizona Strip				
0.3-mile TEZ	996,292	53	872,974	47
Non-monument				
0.3-mile TEZ	393,658	61	253,156	39
Monuments				
0.3-mile TEZ	602,635	49	619,818	51
Conservation Route Proposal				
Monuments				
0.3-mile TEZ	261,837	21	960,616	79

Features of the BLM Route Inventory and Conservation Route Proposal affect different percentages of areas of mountain lion habitat. For example, 49 percent of the lion habitat that falls within national monument boundaries has been and continues to be affected by the BLM Route Inventory, compared to 21 percent for the Conservation Route Proposal.

TABLE 7.

Summary of Transportation Effect Zone and Core Area Results for Bighorn Sheep Habitat

BIGHORN SHEEP	Transportation Effect Zone (TEZ) Area (acres)	Area (%)	Core Area Area (acres)	Area (%)
BLM Route Inventory				
Arizona Strip				
0.09-mile TEZ	41,985	12	317,529	88
0.25-mile TEZ	101,003	28	258,511	72
Non-monument				
0.09-mile TEZ	18,288	11	151,740	89
0.25-mile TEZ	43,761	26	126,266	74
Monuments				
0.09-mile TEZ	23,697	13	165,789	87
0.25-mile TEZ	57,241	30	132,245	70
Conservation Route Proposal				
Monuments				
0.09-mile TEZ	7,878	4	181,608	96
0.25-mile TEZ	21,636	11	167,850	89

Features of the BLM Route Inventory and Conservation Route Proposal affect different percentages of bighorn sheep habitat. For example, using the 0.25-mile transportation effect zone, 30 percent of the bighorn habitat that falls within national monument boundaries has been and continues to be affected by the BLM Route Inventory, compared to 11 percent for the Conservation Route Proposal.

TABLE 8.

Summary of Transportation Effect Zone and Core Area Results for Pronghorn Habitat

PRONGHORN	Transportation Effect Zone (TEZ) Area (acres)	Area (%)	Core Area Area (acres)	Area (%)
BLM Route Inventory				
Arizona Strip				
0.25-mile TEZ	786,208	55	636,918	45
Non-monument				
0.25-mile TEZ	722,622	55	580,161	45
Monuments				
0.25-mile TEZ	63,585	53	56,757	47
Conservation Route Proposal				
Monuments				
0.25-mile TEZ	28,248	23	92,094	77

Features of the BLM Route Inventory and Conservation Route Proposal affect different percentages of the pronghorn habitat. For example, 53 percent of the habitat that falls within national monument boundaries has been and continues to be affected by the BLM Route Inventory, compared to 23 percent for the Conservation Route Proposal.

TABLE 9.

Summary of Transportation Effect Zone and Core Area Results for Mule Deer Habitat

MULE DEER	Transportation Effect Zone (TEZ) Area (acres)	Area (%)	Core Area Area (acres)	Area (%)
BLM Route Inventory				
Arizona Strip				
0.25-mile TEZ	902,205	46	1,061,271	54
Non-monument				
0.25-mile TEZ	442,142	53	399,273	47
Monuments				
0.25-mile TEZ	460,063	41	661,998	59
Conservation Route Proposal				
Monuments				
0.25-mile TEZ	195,403	17	926,658	83

Features of the BLM Route Inventory and Conservation Route proposal affect different percentages of area of mule deer habitat. For example, 41 percent of the habitat that falls within national monument boundaries has been and continues to be affected by the BLM Route Inventory, compared to 17 percent for the Conservation Route Proposal.

FIGURE 10.
Transportation Effect Zone and Core Area within Desert Tortoise Habitat

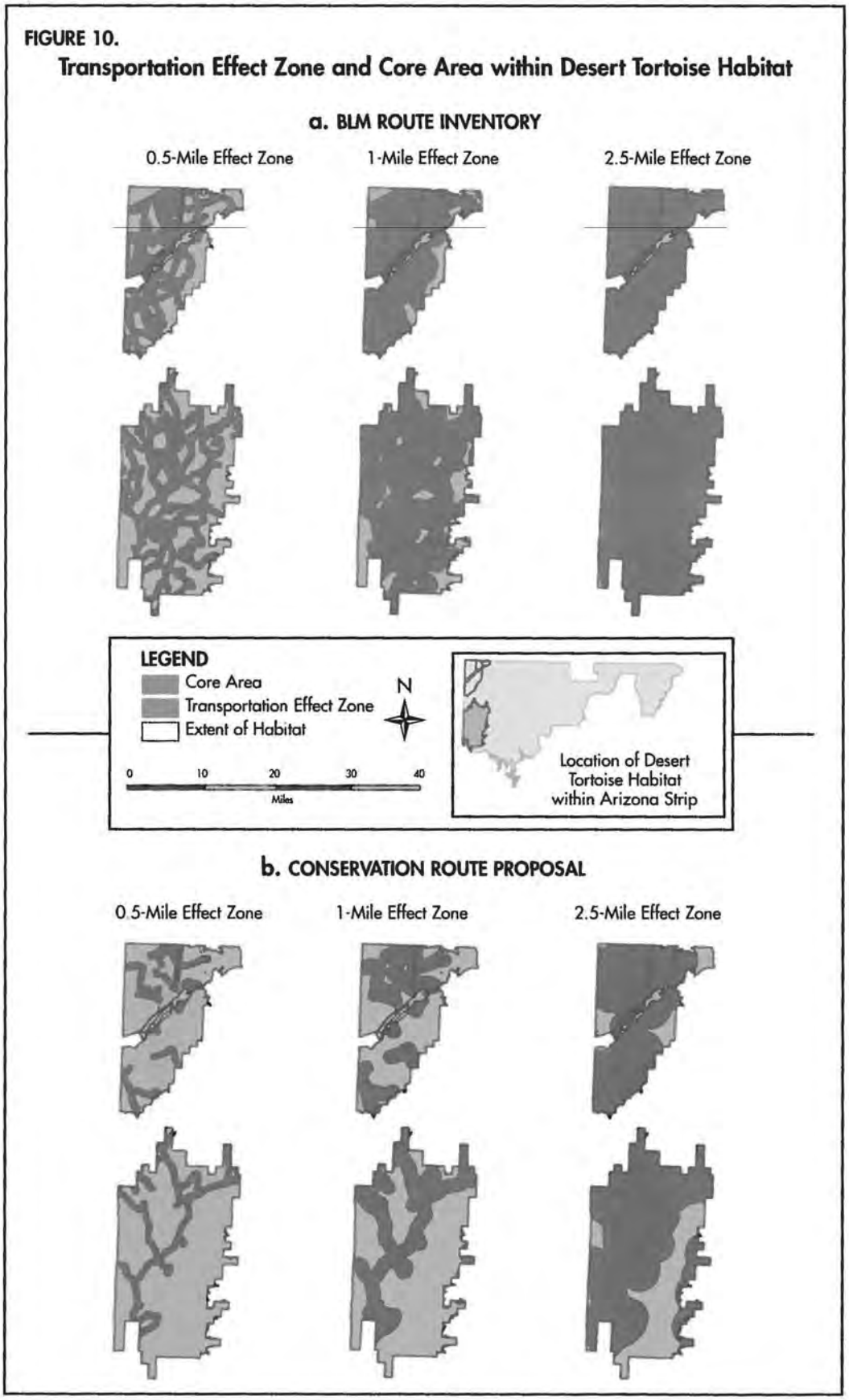


FIGURE 11.

Transportation Effect Zone and Core Area within Mountain Lion Habitat

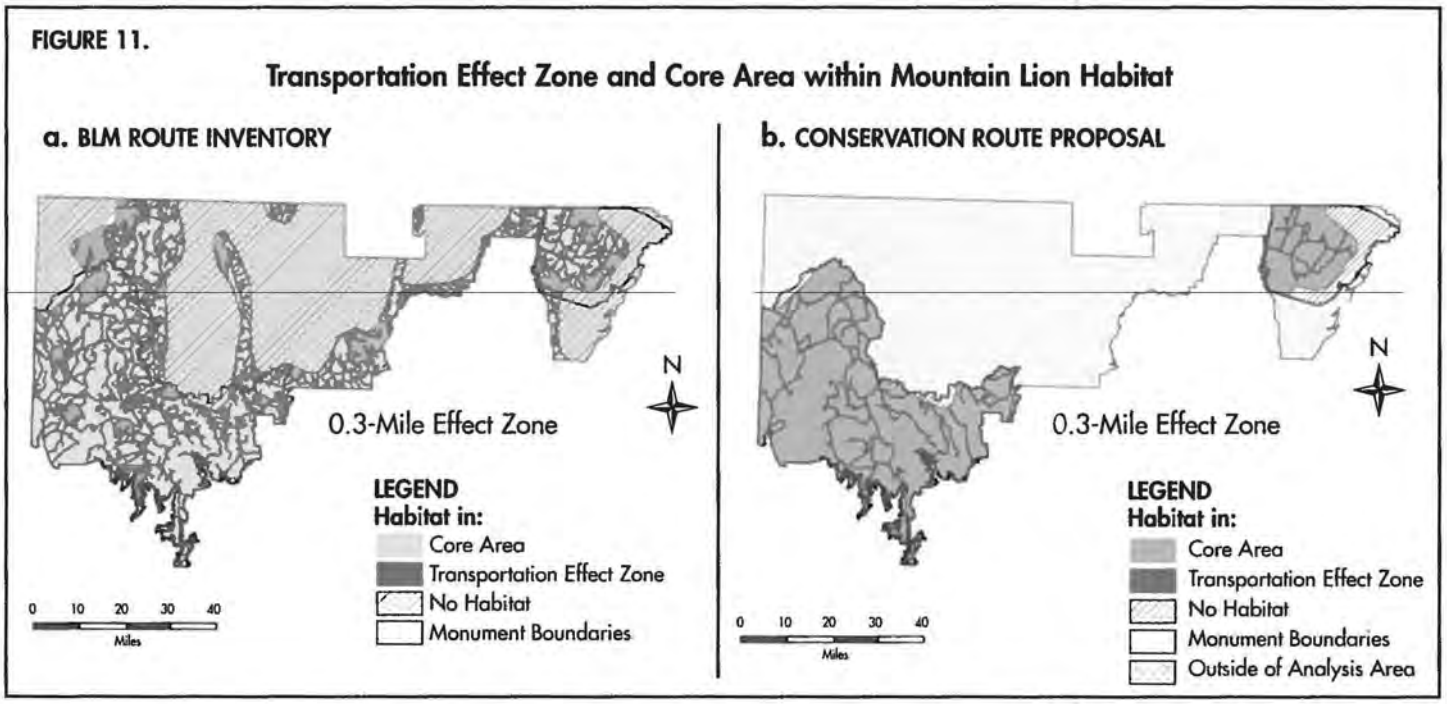


FIGURE 12.

Transportation Effect Zone and Core Area within Bighorn Sheep Habitat

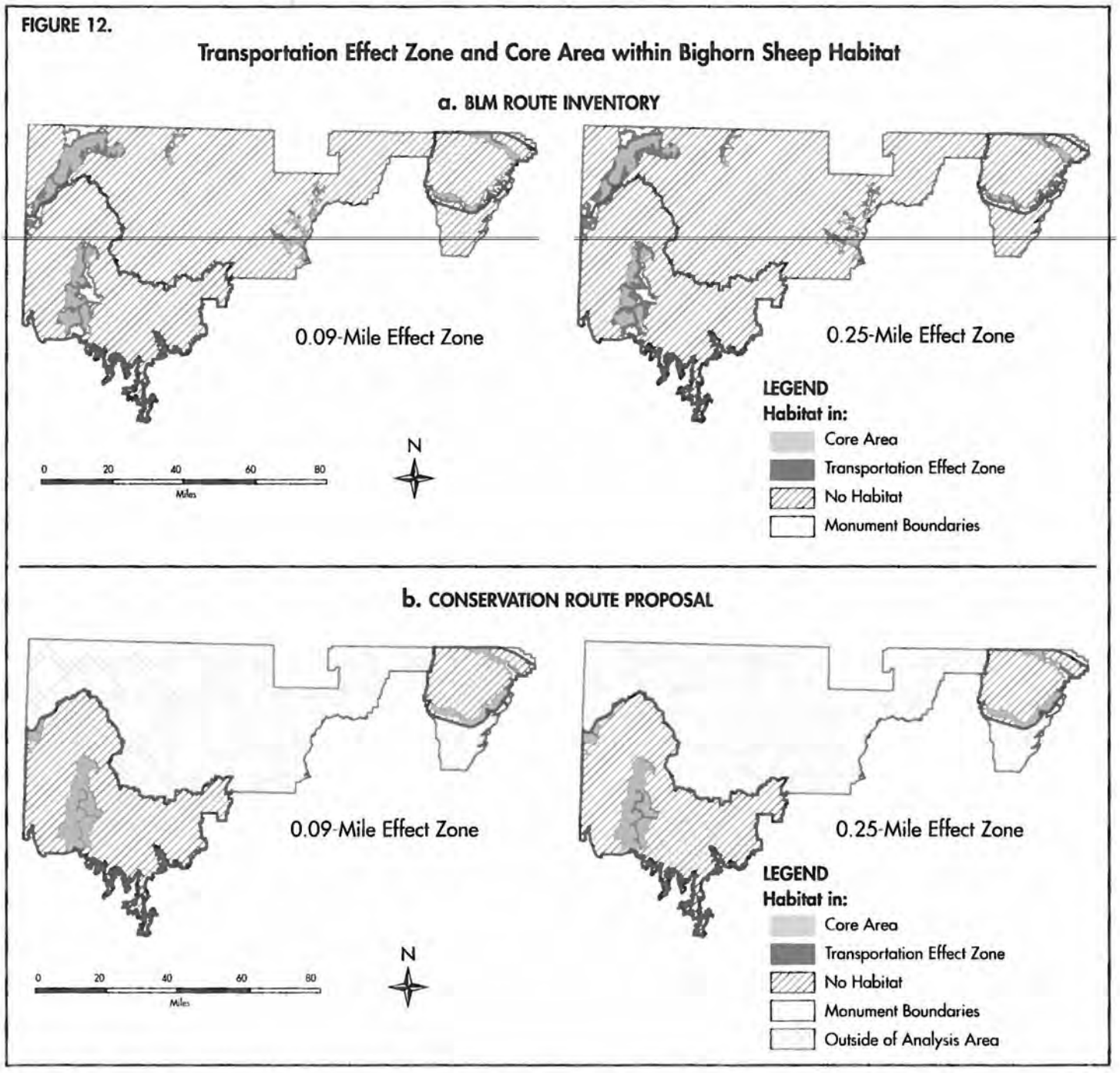


FIGURE 13.

Transportation Effect Zone and Core Area within Pronghorn Habitat

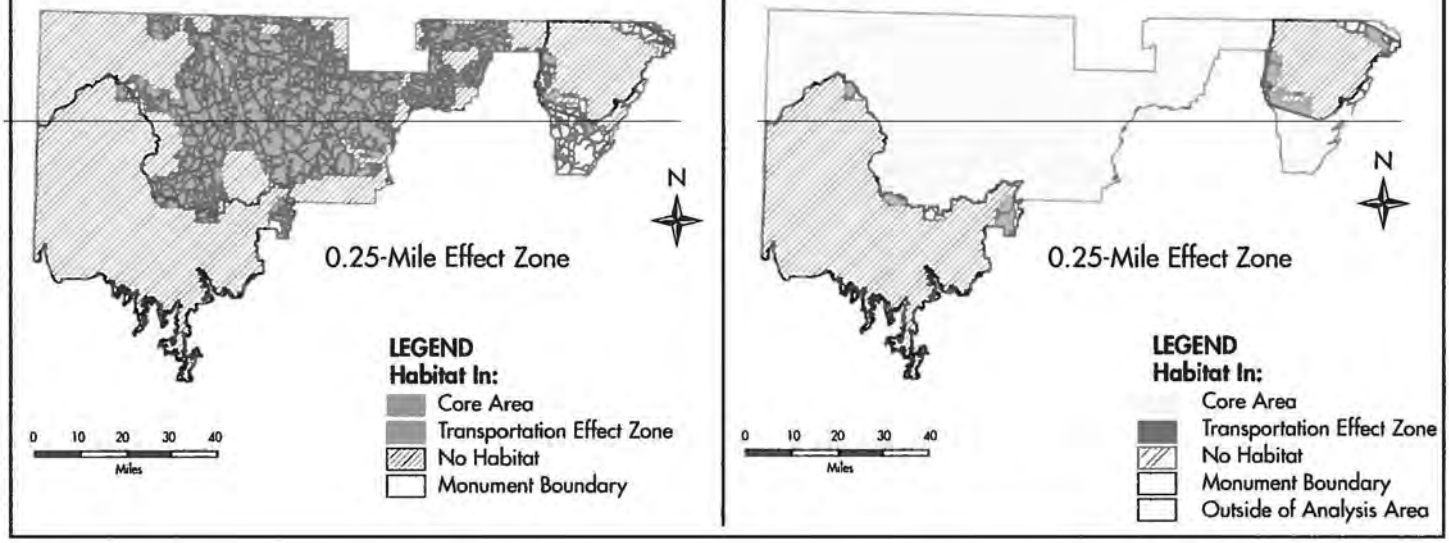
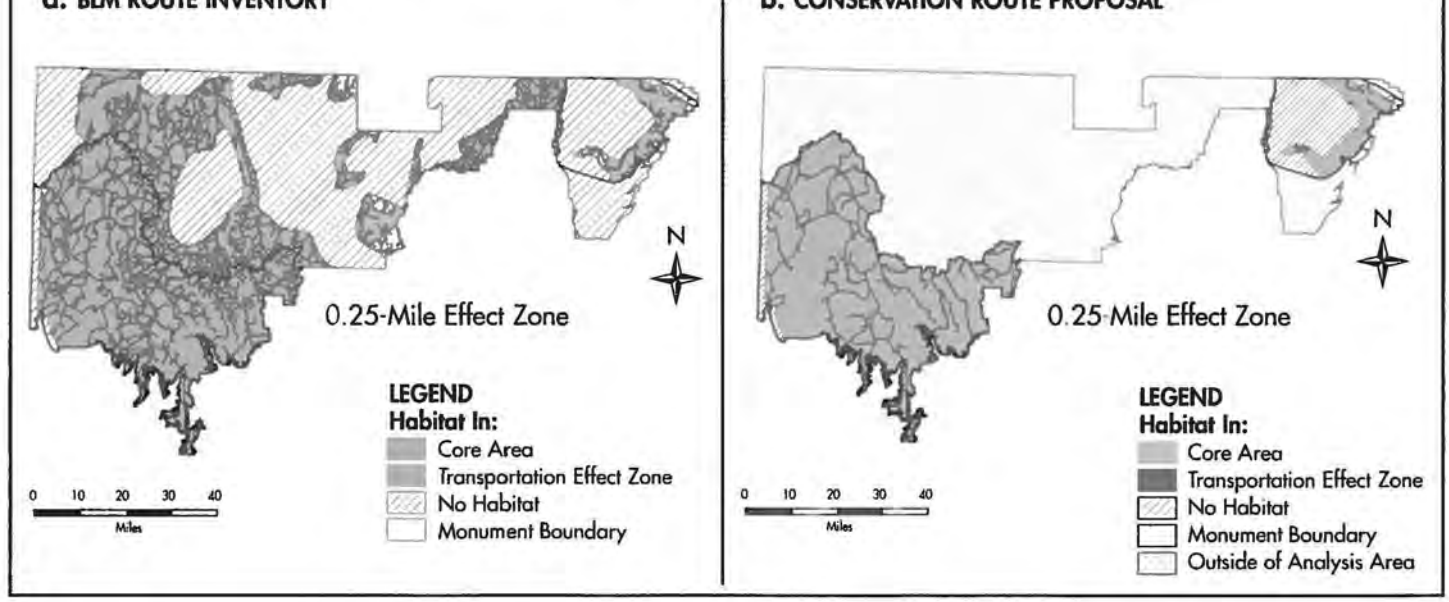


FIGURE 14.

Transportation Effect Zone and Core Area within Mule Deer Habitat



4. Implications for Conservation and Management

The results discussed in this section provide information about the distribution and pattern of routes across the Arizona Strip landscape. The discussion compares the effects of the two transportation networks across administrative units and evaluates the effects for five selected species — the desert tortoise, mountain lion, bighorn sheep, pronghorn, and mule deer — based on the findings in scientific literature. These animals are critical components of the Arizona Strip ecosystem and, as "objects of interest" in the monument proclamations, should be the BLM's priority focus for management.

Summary of Findings

Our analysis indicates that the existing routes in the two monuments and greater Arizona Strip area are extensive enough to have negative effects on all five selected wildlife species. The BLM Route Inventory includes approximately 7,524 miles across the Arizona Strip; 2,441 miles are in the two Monuments. Based on the scientific literature, we interpreted our results and evaluated the percentage of habitat for each of the selected wildlife species that is affected by the BLM Route Inventory. We found that:

- The average route density in various administrative units across the Arizona Strip vary generally between 1 and 2 mi/mi^2 in BLM's Route Inventory. The average route density in the Conservation Route Proposal are notably lower (0.4 mi/mi^2) for the monuments and the desert tortoise ACECs.
- Areas of highest route density in the BLM Route Inventory — and with potentially large negative impacts on wildlife habitat and ecological functions — are the northwestern corner of the Arizona Strip, the northeastern border of the Grand Canyon-Parashant National Monument, and lands immediately west and east of Kaibab Indian Reservation (Figure 6a).
- At least 62 percent of desert tortoise habitat in Grand Canyon-Parashant National Monument and 74 percent in desert tortoise ACECs are potentially negatively affected because it lies within 0.5 miles of a route. The scientific literature indicates that tortoise populations tend to decrease within these parameters (Nicholson 1978, Boarman and Sazaki 1996, Von Seckendorff Hoff and Marlow 2002).
- Fifty-three percent to 75 percent of mountain lion habitat is potentially negatively affected because it has a route density higher than 1 mi/mi^2 and/or lies within 0.3 miles of a road. The scientific literature indicates that mountain lions tend to avoid areas with route densities greater than 1 mi/mi^2 and/or 0.3 miles from a road (Van Dyke, Brocke, Shaw et al. 1986, Forman and Alexander 1998, Dickson and Beier 2002).
- Twelve percent to 28 percent of all bighorn sheep habitat is potentially negatively affected because it lies within 0.09 miles to 0.25 miles of a route. The scientific literature indicates that bighorn sheep are disturbed by human activity on routes within these parameters (Papouchis et al. 2001).
- At least 55 percent of pronghorn habitat is potentially negatively affected because it lies within 0.25 miles of a route. The scientific literature indicates that pronghorn

avoid areas this close to a road or four-wheel drive trail (Ockenfels et al. 1994).

- At least 41 percent of the total documented mule deer habitat in the monuments is potentially negatively affected because it lies within 0.25 miles of a route. The scientific literature indicates that mule deer avoid areas this close to a road (Rost and Baley 1979).

The Effect of Roads on Wildlife and the Landscape

BLM inventoried a substantial network of routes that fragment wildlife habitat in the Arizona Strip. The effects of transportation features on terrestrial and aquatic wildlife include mortality from collisions, modifications of animal behavior, disruption of the physical environment, alteration of the chemical environment, spread of exotic species, and changes in human use of lands and water (Trombulak and Frissell 2000). Examples are habitat loss and fragmentation; diminished animal use of habitats because of noise, dust, emissions, and the presence of humans; loss of forage for herbivores; interference with wildlife life-history functions (courtship, nesting, migration, and others); spread of nonnative species that are introduced by vehicles and that alter the availability and use of habitat; increased poaching or unethical hunting practices; increased dispersion of recreation impacts, particularly by off-road vehicles; and degradation of aquatic habitats through alteration of stream banks and increased sediment loads. Transportation access also increases vandalism, theft, and damage to archaeological and cultural sites (Huffman 1993, Sullivan et al 2002).

A reduction in the number and size of core areas and increases in edge habitat created by transportation routes lead to cumulative adverse effects on species that depend on natural interior landscapes. Included among such effects are greater competition between interior species and species that prefer edge habitat or openings in the landscape; nest predation and parasitism; secondary extinctions from the loss of keystone species; progressive loss of patches due to edge creep; and changing microclimates such as increased evaporation, increased temperature, increased solar radiation, and decreased soil moisture (Franklin and Forman 1987, Lehmkuhl and Ruggiero 1991, Reed et al. 1996).

PHOTO BY KIM CRUMBO

Just 8 percent of the land in Vermilion Cliffs National Monument is more than 1 mile from an existing transportation route, a ratio that can have negative impacts on habitat for sensitive species such as mountain lions and bighorn sheep.

Discussion of Results for the Arizona Strip Landscape

Route densities in the BLM Route Inventory are high enough to affect some species and reduce the remote, wild character of the region. Average route densities in administrative units vary generally between 1 and 2 mi/mi^2 (Table 2). Route densities are lowest in the two national monuments; Grand Canyon-Parashant National Monument has the lowest route density at 1.1 mi/mi^2. The highest average route density — 1.8 mi/mi^2 — falls in the combined proposed ACECs outside the monuments. Average route densities in the Conservation Route Proposal are notably lower at 0.4 mi/mi^2 for the monuments and the desert tortoise ACECs.

▼
The desert tortoise is protected as a threatened species under the Endangered Species Act, but existing transportation routes in the Arizona Strip negatively impact the majority of this animal's habitat.
▲

Approximately 80 percent of the sampling window densities fall in the 0.5 to 2.0 mi/mi^2 range for the BLM network (Figure 4). Nearly all sample windows for the Conservation Proposal in the monuments fall below 1 mi/mi^2, and the majority fall below 0.5 mi/mi^2 (Figure 5).

Closure of a substantial number of routes in the BLM Route Inventory would be needed to provide large core area habitat for wildlife in the study region (Table 3; Figure 7a). Only 6 percent of the Arizona Strip (10 percent of monument lands) is more than 1 mile from a road. Less than 1 percent of the entire Arizona Strip area (2 percent of the monuments) is more than 2 miles from a route. Under the Conservation Route Proposal, 44 percent of monument lands are more than 1 mile from a road, and 18 percent are more than 2 miles from a road (Table 3, Figure 7b).

Existing ACECs are of particular interest, because despite their recognized contribution to wildlife habitat, these areas are heavily roaded; only 5 percent of existing ACEC lands lie more than 1 mile from a route and only 1 percent are more than 2 miles from a road.

Discussion of Results for Selected Wildlife Species

Desert Tortoise

Habitat. Desert tortoise habitat in the Arizona Strip is located in the Mojave Desert in desert tortoise ACECs and in Grand Canyon-Parashant National Monument (Figures 1, 10a, and 10b).

Impacts from Roads. Paved and unpaved roads detrimentally affect desert tortoise populations. Roads increase mortality, act as barriers to dispersal, and fragment habitat (USFWS 1994, Boarman 2002). Direct impacts from roads include vehicular crushing of tortoises and their burrows (Boarman 2002). Cumulative human impacts such as habitat fragmentation and habitat destruction from roads have led to declines in almost all desert tortoise populations (USFWS 1994). Most studies have been conducted in the Mojave region of California, but results from those studies can be expected to reflect effects on tortoises in other areas (USFWS 1994). Population declines led to the listing of the desert tortoise as a threatened species under the federal Endangered Species Act.

Juvenile and subadult tortoises are particularly at risk from transportation routes. Juvenile numbers have been found to be depressed near dirt or paved roads (Berry and Turner 1984), while dispersing subadults are at high risk because they are more likely to encounter roads the further they travel (Boarman and Sazaki 1996). It has been observed that roads may also concentrate ravens, which prey upon juvenile tortoises; 250 tortoise shells were found beneath one raven nest alone (Boarman 1997, Boarman et al. 1997). Late sexual maturity (15 to 20 years) and low reproductive rates make desert tortoise populations especially vulnerable to influences such as the effects of roads (Boarman 2002).

An increase in the number of roads means increased human access, which can lead to illegal collecting and death by motor vehicles (Boarman 2002). Bury and Luchenbach (2002) compared nearby off-road vehicle (ORV) and non-ORV plots and discovered roughly four times the number of tortoises and tortoise burrows and higher body weight animals in the non-ORV plot. Even if ORV activity is prohibited, more roads lead to more opportunities for ORVs (Boarman 2002). And more roads lead to a more rapid decline in tortoise populations (USFWS 1994, see Berry 1990 as amended and 1992). Even low-intensity

vehicle routes, including unpaved utility access roads (Von Seckendorff Hoff and Marlow 2002), have been shown to depress tortoise population numbers (Berry et al. 1986).

Threshold Values. The extensive scientific literature documenting the direct and indirect impacts of roads on the desert tortoise indicates some threshold values. We used those values to quantify the acreage of available habitat in the Arizona Strip that has been and would continue to be compromised under any transportation network. To develop a threshold value for a transportation effect zone and core area, we incorporated scientific literature that demonstrated that tortoise signs decrease with proximity to paved roads, beginning at 0.2 miles (LaRue 1993) or 1 mile (Nicholson 1978). Similarly, Boarman and Sazaki (1996) found fewer tortoise signs in sampling transects immediately adjacent to a highway or at a 0.25-mile distance, but that tortoise signs were more numerous at 0.5 miles and 1 mile from a highway. A study in southern Nevada (Von Seckendorff Hoff and Marlow 2002) showed reduced tortoise signs as far as 2.5 miles from a highway and that the higher the density of traffic (220 to 5000 vehicles a day), the greater the zone of impact.

The literature suggests that the use of available habitat is reduced at 0.2 miles from a road and that this impact extends even as much as 2.5 miles from a highway. Based on these results and to evaluate a reasonable range of potential impacts, our analysis calculated the TEZ and core area conservatively at a distance of 0.5 miles, 1 mile, and 2.5 miles from a road.

Implications of the Analysis. A majority of desert tortoise habitat falls within the 0.5-mile threshold — at least 62 percent in Grand Canyon-Parashant National Monument and 74 percent in the desert tortoise ACECs — and is thus potentially negatively affected by the BLM Route Inventory (Figures 10a and 10b, Table 5). This conservative threshold suggests that a majority of habitat for the imperiled desert tortoise is impacted, which is inappropriate since this species is protected under the Endangered Species Act and is cited as an "object of interest" in the monument proclamations.

In addition, there is virtually no desert tortoise habitat that is beyond the 2.5-mile threshold. Even under the Conservation Route Proposal, only 5 percent of the desert tortoise habitat in the desert tortoise ACECs and 24 percent of the desert tortoise habitat in Grand Canyon-Parashant National Monument is more than 2.5 miles from a route. Therefore, even this reduced route network would be inadequate to protect this imperiled species.

The Conservation Route Proposal would reduce the amount of potentially impacted habitat under the 0.5-mile threshold to 33 percent in the ACECs and 23 percent in Grand Canyon-Parashant. Figure 10b indicates that the Conservation Route Proposal creates large areas of contiguous, uninterrupted habitat under the 0.5-mile and 1.0-mile thresholds, particularly in the southern habitat in the monument.

Mountain Lion

Habitat. The majority of mountain lion habitat in the Arizona Strip falls in the national monuments and proposed ACECs to the north and east of Grand Canyon-Parashant (Figures 1, 9a, and 9b).

Impacts of Roads. Roads affect mountain lion populations by decreasing the quality of habitat through fragmentation. Large carnivores, and mountain lions in particular, are especially vulnerable to road networks because of their need for

Seventy-five percent of mountain lion habitat in the Arizona Strip has route densities higher than the 1 mi/mi^2 threshold that scientific studies indicate the species can tolerate.

large home ranges, sensitivity to habitat fragmentation, and low population growth rates (Ruediger 1998, Crooks 2002). Roads also increase the potential for mortality through collisions with motorized vehicles and hunting and trapping. In addition, the primary source of mortality for most mountain lion populations is legal hunting (Murphy et al. 1999), which is further enabled by road access.

Several studies demonstrate that mountain lions avoid paved roads (Van Dyke, Brocke and Shaw 1986, Sweanor et al. 2000, Dickson and Beier 2002) and prefer habitat areas with lower road densities (Van Dyke, Brocke and Shaw 1986, Dickson and Beier 2002). Mountain lions have been observed to skirt logging areas, both while a timber sale is active and for several years thereafter, either by avoiding roads or changing to nocturnal behavior (Van Dyke, Brocke and Shaw et al. 1986). In a study in northern Arizona and southern Utah, Van Dyke, Brocke and Shaw (1986) found that mountain lions established home ranges in areas where improved dirt roads or paved roads were either under-represented, in comparison to the entire study area, or entirely absent. Similarly, researchers in southern California showed that mountain lions established home ranges further from roads than was typical in the overall study area (Dickson and Beier 2002). Dickson and Beier (2002) concluded that new roads in wild areas will force mountain lions out of previously occupied habitats. Van Dyke, Brocke and Shaw (1986) observed that mountain lions on the Kaibab Plateau did not appear to cross paved or dirt roads in their home ranges.

Many factors in addition to the type of route (paved or dirt) influence how close a mountain lion will approach a road, including vegetation type and whether the road is in an established home range or a migration area (Dickson and Beier 2002, Dickson et al. 2004). While the literature suggests mountain lions tend to use habitats further from transportation routes, these animals have been observed on trails and remote dirt roads when dense vegetation makes travel difficult (Dickson and Beier 2002, Dickson et. al 2004).

Threshold Values. The relationship between mountain lions and routes is complex, but the literature does suggest threshold values that can be used for our route density and transportation effect zone analyses. In a study of radio-collared animals on the Kaibab Plateau, mountain lions were shown to avoid using habitat with a road density of 1 mi/mi^2 in timber sale areas versus 0.64 mi/mi^2 in the rest of the study area (Van Dyke, Brocke and Shaw et al. 1986). The authors suggest that this avoidance may be due to several factors, including the presence and activity of humans, increased road density and human access (including hunting pressure), altered prey densities, and altered habitat such as removal of stalking cover. Forman and Alexander (1998) also suggest that a road density of 1 mi/mi^2 is the maximum for a "naturally functioning landscape" that can sustain large predators, including mountain lions. Route proximity impacts on mountain lion habitat use remain poorly studied; however, limited data from a study in southern California (Dickson and Beier 2002) suggest that mountain lions prefer areas 0.3 miles to 0.6 miles from a high speed road.

Recognizing the limited research available on the impacts of roads on mountain lions, we evaluated thresholds of route density of 1 mi/mi^2 and a TEZ of 0.3 miles. Note that research for the TEZ was done on higher speed roads than many in the Arizona Strip, and assessments need to be repeated as better road avoidance data become available for this species.

Implications of the Analysis. Seventy-five percent of the mountain lion habitat in the Arizona Strip has route densi-

ties higher than the 1 mi/mi^2 threshold for the BLM Route Inventory, much of it more than double that value (Figures 8 and 9a). To compare, only 2 percent of mountain lion habitat has road densities greater than 1 mi/mi^2 in the two monuments under the Conservation Route Proposal (Figures 8 and 9b).

Figure 11a and Table 6 show the impacted areas and core areas resulting from a 0.3-mile TEZ on the BLM route network. Fifty-three percent of the mountain lion habitat across the entire Arizona Strip and 49 percent of lion habitat in the monuments fall within 0.3 miles of a road. The same effect zone on the conservation network (Figure 11b) reduces the potentially affected area by more than half, to 21 percent of the habitat in the monuments. These values suggest that the BLM Route Inventory may be inadequate to protect this critical species — a species which holds a vital ecological niche as a large predator and is protected as an "object of interest" for Vermilion Cliffs National Monument.

Bighorn Sheep

Habitat. Bighorn sheep range is limited to those areas where re-introduction occurred in the early 1970s. There are bighorn habitat fragments in the higher-elevation cliffs and mountains in each of the monuments, as well as in the Virgin Mountains north of Grand Canyon-Parashant and in the proposed ACEC along Kanab Creek in the non-monument lands of the Arizona Strip (Figures 1, 12a, and 12b).

Impacts of Roads. Transportation routes adversely affect desert bighorn sheep by inducing road avoidance behavior, creating barriers to dispersal, and limiting movement across open landscapes to locate food, habitat, and mates. Of the Arizona Strip ungulates, bighorn sheep appear to be the most susceptible to the effects of human disturbance (Canfield et al. 1999). In a southern Utah study, bighorn sheep were found to spend time significantly further away from roads in high human use areas (Papouchis et al. 2001). The same field study noted that bighorn exhibited the greatest avoidance of humans traveling by foot, followed by humans in vehicles and on bicycles. In southern California, researchers found that bighorn probably were forced into less suitable habitat because of vehicles. Bighorn activity decreased by 50 percent when vehicles were present on unpaved roads (Jorgensen 1974). In an experiment conducted by Rubin et al. (1998), four of eight ewe flocks of bighorn sheep were separated by paved roads because ewes rarely crossed the paved roads or highways.

Threshold Values. The literature record is clear that bighorn sheep are sensitive to roads, although there are few studies that attempt to quantify the distance where this impact could occur. However, Papouchis et al. (2001) observed that the bighorn sheep defense radius was 0.23 miles and their flight response radius averaged 0.08 miles. Therefore, based on this literature and to evaluate a reasonable range of potential impacts, our analysis calculated the TEZ and core area at a distance of 0.09 miles and 0.25 miles from a road.[4]

Implications of the Analysis. Our results show that 12 percent of all sheep habitat is within 0.09 miles of a BLM

[4] These distances are not exact matches for the threshold values in the literature (0.08 and 0.23, respectively). We chose to use our close approximations of 0.09 miles and 0.25 miles for the TEZ because those metric parameters were applied to additional species (pronghorn and mule deer), and the 0.9-mile TEZ was also needed earlier in the analysis.

route, and 28 percent of the habitat is within 0.25 miles of a BLM route (Figure 12a, Table 7). These percentages are similar within and outside of the monuments. In the Conservation Route Proposal (Figure 12b), these values are reduced by roughly a third. Four percent and 11 percent of the bighorn habitat fall within 0.09 miles and 0.25 miles of a route, respectively.

Pronghorn

Habitat. The majority of the pronghorn habitat in the Arizona Strip is located in the non-monument land managed by the BLM between the two monuments (Figures 13a and 13b).

Impacts of Roads. Pronghorn are a free-ranging species that must be able to move freely across an open landscape for food, habitat, and mates. Pronghorn will cross roads, however they are strongly affected by fencing along paved roads. Van Riper and Ockenfels (1998) found that this factor was the greatest barrier to dispersal; in more than 3,000 movements that were recorded, not one pronghorn ever crossed a fenced road. It is unknown how much of the existing Arizona Strip road network is fenced.

Threshold Values. A central Arizona study showed that pronghorn generally exhibited a weak avoidance of areas within 0.6 miles of a maintained road or areas near unmaintained dirt roads and four-wheel-drive trails (Ockenfels et al. 1994). The same study observed that males (and perhaps females) avoided habitat within 0.25 miles of highways. However, it may be that pronghorn are more strongly affected by the noise and activity associated with a road than the road bed itself (Ockenfels et al. 1994). Based on this work, and to evaluate a reasonable area where pronghorn are negatively impacted, our analysis calculated the TEZ and core area at a distance of 0.25 miles.

Implications of the Analysis. Fifty-five percent of the habitat lies within 0.25 miles of a route in the BLM Route Inventory (Figure 13a, Table 8), suggesting that more than half of the pronghorn's habitat may be adversely affected under this alternative. Twenty-three percent of the pronghorn habitat in the monuments lies within 0.25 miles of a road (Figure 13b, Table 8); however, this result may not be significant for assessing the overall impact on pronghorn habitat because most of the habitat is outside the monuments.

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Fifty-five percent of pronghorn habitat lies within 0.25 miles of a route in the BLM Route Inventory, suggesting more than half of the pronghorn's habitat may be adversely affected.

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Mule Deer

Habitat. Mule deer habitat extends across and to the northeast of Grand Canyon-Parashant National Monument, and along the eastern edge of Vermilion Cliffs National Monument (Figures 1, 14a, and 14b).

Impacts of Roads. Roads affect mule deer populations by fragmenting their habitat, creating barriers to dispersal, and increasing mortality through collisions with vehicles. Since the animals tend to avoid roads, the habitat that is adjacent to roads may not be used to its full potential.

Threshold Values. A study conducted in North Dakota reported that mule deer avoid human activity associated with roads and energy production facilities (Fox 1989). Fox (1989) observed that active deer used habitat within 0.06 miles of a road less than its availability, while bedded deer avoided habitat within 0.03 miles of a road. Rost and Baley (1979) used mule deer pellet counts as an indication of winter habitat use, reporting lower

density of deer along heavily used roads as compared to less frequently used roads. Their data show that deer were three times more likely to occur from 0.18 to 0.25 miles from a road than 0.06 miles from a road. Based on the threshold identified in this study, our analysis calculated the TEZ and core area at a distance of 0.25 miles.

Implications of the Analysis. Forty-six percent of the total documented mule deer habitat in the Arizona Strip and 41 percent of habitat in the national monuments falls within the 0.25 mile threshold for the BLM Route Inventory (Figure 14a, Table 9), and may be negatively affected by routes. For the Conservation Route Proposal, only 17 percent of mule deer habitat in the monuments lies within the 0.25 mile threshold (Figure 14b, Table 9).

Study Limitations and Future Work

Our analysis is based on the best available distribution data for the selected wildlife species. These data are regularly used by a number of agencies. However, as discussed in the methodology section of this report, the data often lack accuracy. Additional studies can further quantify the direct, indirect, and cumulative effects of routes and motorized travel on the five selected species in open and forested habitat conditions that exist across the Arizona Strip. Future research could focus on the distance away from paved and unpaved routes where effects occur, the density of routes that critically affect species, how different rates of route use affect species, and life functions (foraging, calving, dispersing, etc.) that are affected by roads and use of motorized vehicles.

This study likely underestimates actual habitat fragmentation on the landscape because it only addressed fragmentation that results from roads. It does not account for non-transportation features that fragment the landscape (e.g., other human infrastructure, natural topographic barriers, and natural vegetation breaks). It also does not address habitat connectivity, variations in scale, differences in types of transportation features, seasonal variations in a species' use of habitat, and habituation to hunting regulations or other human activities. When these factors are considered, it may well be that even less optimal habitat remains. With additional research, a more comprehensive assessment of fragmentation metrics for each species or set of species could be generated. Such an analysis would help to determine the amount of remaining habitat and indicate priority areas to protect and restore wildlife habitat affected by habitat fragmentation.

5. Conclusions and Recommendations

This report demonstrates the feasibility and applicability of spatial analyses to transportation planning in the Arizona Strip. Transportation routes have a range of effects — direct, indirect, and cumulative — on the landscape, and informed decision-making requires state-of-the-art tools such as spatial analysis to provide critical information and gauge the potential negative effects of these routes.

The spatial analyses in this report also indicates that the BLM Route Inventory contains enough routes to severely fragment the Arizona Strip landscape and to have significant negative effects on all five of the wildlife species considered, in particular that of the desert tortoise, mountain lion, and pronghorn. We did not assess potential impacts on other wildlife species in this analysis. However, the Arizona Strip contains numerous species that would also be subject to the effects of transportation features and their use. Further, because our analysis does not include other causes of habitat fragmentation, such as fences and off-road vehicle activity, the negative consequences to wildlife habitat are likely even greater. The RMP process should use the best available data, techniques, and results such as those presented in this report, to reduce route density and increase the number and size of core habitat areas.

Recommendation #1: Use Spatial Analysis and Conduct Research for Transportation Planning

We recommend that the agencies employ the spatial analysis techniques used in this report to carefully evaluate the impacts of alternative transportation systems on other species and "objects of interest," including cultural resources. The agencies should use the landscape fragmentation metrics we have provided to guide management decisions regarding transportation routes. The agencies should calculate road density, transportation effect zones, and core areas in accordance with scientific literature and evaluate the likely impacts of potential route networks on wildlife species and other resources the agencies are required to protect. Overall goals of the transportation plan should include reductions in road density and edge effects and increases in core areas to provide greater habitat security.

NEPA requires federal agencies to assess the environmental impacts of proposed actions, taking a "hard look" at environmental consequences, and the scope of the analysis "must be appropriate to the action in question."[5] Spatial analysis is an appropriate way to take that hard look, particularly in relation to the impacts of routes on wildlife in the Arizona Strip. We believe the agencies must apply these techniques to fulfill the mandates of NEPA.

We also recommend that the agencies acquire better data on the distribution and available habitat of all monument "objects of interest." Under the Data Quality Act of 2000, BLM is required to use information that is of high quality and that is objective, useful, and verifiable by others. The agency must also use "sound statistical and research" methods and subject all analyses to formal, independent, external peer review.

Our findings clearly show that the BLM Route Inventory is negatively affecting several of the species that the agencies are required to protect. While these results have some limitations (as discussed elsewhere in this report), the agencies should take a conservative approach and err on the side of protecting species and reduce route density to preserve core habitat areas. This recom-

[5] 42 U.S.C. § 4321 et seq.; Metcalf v. Daley, 214 F.3d 1135, 1151 (9th Cir. 2000); Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 348 (1989).

mendation is in concert with the "precautionary principle" of conservation biology, which states that precautionary measures should be taken when a certain activity or inactivity threatens to harm human health or the environment, even when science has not fully established cause and effect relationships (Meffe et al. 1994, Noss and Cooperrider 1994). This principle is rooted in the recognition that scientific understanding of ecosystems is complicated by numerous factors, including dynamic ecosystem processes and the various effects of human activities. Put simply, it is easier to prevent harm to biodiversity than to attempt to repair it later. This is critical in the monuments and in endangered species habitat, where the agencies' primary duty is to protect "objects of interest" and endangered species.

Recommendation #2: Reduce Route Density and Preserve Core Habitat

BLM and NPS should adopt an RMP that includes significant route decommissioning and restoration of the landscape's ecological health and integrity. Specific procedures, protocols, and priorities should be defined and implemented to close and reclaim roads and other routes. The Conservation Route Proposal reduces the total mileage of routes in the monuments from 2,441 miles to 822 miles. This proposal would better meet the agencies' responsibility to protect the five selected wildlife species, other wildlife species, and important archaeological, historic, and geological resources. Additional actions that the agencies should take to develop a suitable RMP include:

- Manage the landscape to promote primitive areas and wilderness characteristics as a means to protect wildlife habitat. Some 266,000 acres of the Arizona Strip are designated and managed as Wilderness. However, our analysis clearly shows that these lands are not sufficient to protect habitat for the desert tortoise, mountain lion, bighorn sheep, pronghorn, and mule deer. The agencies should maintain primitive qualities and protect roadless areas on at least the 948,000 additional acres of the Arizona Strip that the Arizona Wilderness Coalition has inventoried and shown to possess wilderness characteristics.
- Designate and manage the proposed ACECs assessed in this report for mule deer, mountain lions, pronghorn, and bighorn sheep outside the monuments. The ACECs should include specific management prescriptions such as road closures to increase protection and ensure landscape connectivity with habitat outside the Arizona Strip.
- **Desert tortoise.** Create a transportation system within desert tortoise habitat that provides large blocks of core habitat more than a mile from a road. One mile is a reasonable compromise between smaller and larger road effect zones found in the literature. This will mean reductions in road mileage from those in the Conservation Route Proposal, particularly in the ACECs where critical habitat was designated under the U.S. Fish and Wildlife Service's desert tortoise habitat recovery plan.
- **Mountain lion.** Reduce road mileage in mountain lion habitat, which includes most of the land in both monuments and some non-monument lands. Densities should be less than 1 mi/mi^2, core areas should be based on transportation effect zones of 0.3 miles. This means the closure of many routes included in the BLM Route Inventory.

BLM and the National Park Service should adopt a travel plan that decommissions many existing transportation features and restores ecological health and landscape integrity to the Arizona Strip.

- **Bighorn sheep**. At a minimum, road mileage in bighorn sheep habitat should be reduced to levels in the Conservation Route Proposal. This is needed to ensure that core habitat areas are more than 0.25 miles from a road. Note that current bighorn habitat in the Arizona Strip consists of small, disconnected areas.
- **Pronghorn**. As with bighorn habitat, road mileage in pronghorn habitat must be reduced so that core areas are greater than 0.25 miles from a road. This requires substantial reductions in the routes included in the BLM Route Inventory across much of the non-monument lands. The proposed ACECs in the central and eastern regions of the Arizona Strip should be designated and managed to help conserve pronghorn habitat.
- **Mule deer.** Road mileage in mule deer habitat must also be reduced to ensure that a substantial majority of core areas are more than 0.25 miles from a road. This means the closure of numerous routes in the BLM Route Inventory on non-monument lands and small portions of the monuments. In the monuments, roads should be reduced at least to the level of the Conservation Route Proposal. The proposed ACECs should be designated and managed to help conserve mule deer habitat.

Each of the core areas recommended above should be generous in size because minimum habitat requirements are not well understood. In addition, this landscape, particularly the monuments and ACECs, is protected land that should be a refuge from impacts on surrounding lands. Based on our findings, even the Conservation Route Proposal retains too many roads to protect some species adequately, particularly the desert tortoise.

The above recommendations are based on the best available data about wildlife-road interactions and the distribution of habitat for the selected species. The agencies should promote additional wildlife research within BLM, NPS, and other agencies and institutions, collect up-to-date and accurate digital data on the distribution of wildlife habitats, and work to more thoroughly understand the ecological impacts of all forms of transportation routes on wildlife species in the Arizona Strip. As better data become available from agency and academic sources, the affected provisions of the RMP can and should be adjusted and improved.

Recommendation #3: Create A Responsible Transportation Plan

To make the best use of the data, analysis, and specific recommendations presented in this report, we urge the agencies to incorporate the following guidance as they develop a transportation plan.

Legal Obligations. BLM and NPS have substantial obligations to collect and assess data in the decision-making and planning processes that lead to a transportation plan, including under NEPA and FLPMA.

NEPA requires that the agencies take a hard look at the environmental consequences of a proposed action. FLPMA mandates that BLM "take any action necessary to prevent unnecessary or undue degradation of the lands"[6] and "minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved."[7] When conducting

[6] 43 U.S.C. § 1732(b).

[7] 43 U.S.C. §1732(d)(2)(a).

land-use planning, agencies must give priority to the designation and protection of ACECs and consider physical, biological, economic, and other sciences.[8]

The agencies cannot evaluate consequences to the environment, determine avoidable or excessive degradation, and assess how best to designate and protect ACECs without adequate data and analysis. NEPA's hard look at environmental consequences must be based on "accurate scientific information" of "high quality."[9] Essentially, NEPA "ensures that the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts."[10] The Data Quality Act and BLM's interpreting guidance expand on this obligation, requiring that influential scientific information use "best available science and supporting studies conducted in accordance with sound and objective scientific practices."[11]

BLM's internal guidance also recognizes the importance of accumulation and proper analysis of data. The agency's Land Use Planning Handbook in Appendix H concludes, "Data without applicable models is no more useful than models without applicable data." In other words, appropriate analysis of data is as important as the accumulation of sufficient data.[12]

The agencies have significant obligations to fully assess the potential environmental consequences of actions. They must take into account the direct, indirect, and cumulative impacts of proposed actions and three related actions: (1) connected actions, (2) cumulative actions, and (3) similar actions.[13] Also, as part of the land-use planning process, the agencies must develop and assess a reasonable range of alternatives, including analysis of the direct, indirect, and cumulative environmental impacts of the alternatives and a clear definition of mitigation measures to reduce environmental impacts.[14]

Once an alternative is selected and a management plan is in place, the agencies are required to continue to monitor the plan, evaluate whether its implementation is meeting the established objectives, and, as necessary, make appropriate revisions.[15] The sufficiency

Federal law requires BLM and the National Park Service to collect and assess sound scientific data as they move forward in their transportation planning and decision-making processes in the Arizona Strip.

8 43 U.S.C. § 1712(c).

9 40 C.F.R. § 1500.1(b).

10 Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989).

11 Treasure and general Government Appropriations Act for Fiscal Year 2001, Pub.L.No. 106-554, § 515. See also, Bureau of Land Management "Information Quality Guidelines," Available at http://www.blm.gov/nhp/efoia/data_quality/guidelines.pdf.

12 BLM is considering a revision of its Handbook and has proposed a new Appendix H, titled "Data and Information," to address this crucial aspect of planning. The agency's statements in the current Handbook are notable. Section I ("Managing and Identifying Data") states, "Standardized, accurate, and reliable data and information are critical to the development of plan assessments, alternatives, impact analyses, and planning decisions." Section I.B ("Identifying Data Needs for a Land Use Plan"), directs: The BLM planning project manager must identify existing data and information sources, and determine what additional data must be collected. A table of information should be prepared by the planning project manager and planning team which describes the specific data required to answer planning questions associated with the plan, along with the availability and status of the data. The table will reveal data deficiencies and identify strategies to obtain missing or incomplete data or information.

13 See 40 C.F.R. § 1508.25.

14 See 40 C.F.R. Part 1502.

15 See 43 U.S.C. § 1712 (a); 43 C.F.R. §1610.4-9.

of these analyses, in relation to meeting the legal standards and protection of wildlife, depends on data of sufficient quantity and quality.

Follow A Four Step Process: To meet these data and data analysis obligations, the agencies should use the following procedures to develop a transportation network for the Arizona Strip through the land-use planning process, taking into account the need to protect wildlife from the effects of transportation features.

1. Generate transportation network scenarios based on directives in the monument proclamations, reliable data, and high-quality analysis.

a) Generate GIS data layers for all roads in each proposed transportation network alternative in a draft environmental impact statement.
b) Limit the potential transportation network scenarios to the purpose of the monuments; that is, the transportation plan must advance the protective purposes of the monuments and minimize the number and length of routes to those necessary for use and access — while not degrading the monuments.
c) Limit routes:
   i) To meet the monument proclamations' requirement to eliminate off-road activity.[16] This automatically precludes the inclusion of illegal, user-created "wildcat" routes in the transportation system. The Conservation Route Proposal meets the legal definition of a road.
   ii) To ensure that each road is justified and managed through an analysis of impacts on objects of scientific and historic interest and other key resources at the level required by the NEPA and taking into account spatial patterns of roads in addition to road length.
   iii) To ensure that each road is deemed necessary for specified and defined uses of the monument.

2. Assemble wildlife habitat use information through accumulation of sufficient data in compliance with agency obligations to use "accurate scientific information" of "high quality" needed to perform the requisite thorough analysis.

a) Collect information on the impacts of roads on wildlife from the published literature available for threatened and endangered species and other key plant and animal species in the area. The goal is to provide data needed to devise the parameters of metrics and for interpretation. The information should include, but not be limited to, the impacts of road density on local species, the distance of road effects to determine the width of effect zones for infrastructure features, and species dispersal distances to evaluate the size of core areas.

3. Generate landscape fragmentation metrics to represent the best available science and supporting studies conducted in accordance with sound and objective scientific practices.

a) Calculate landscape fragmentation metrics for all road network alternatives. Include, at a minimum, road density, road effect zones, and core areas. Metric parameters and the evaluation of results should be relevant to ecological conditions, species that are present, and human uses of the landscape.

4. Integrate the results into management plan alternatives and use them as the basis for selecting the preferred alternative. Through the application of the metrics to relevant ecological conditions and other uses, the agencies can

[16] See box on page 4.

evaluate the direct, indirect, and cumulative impacts of the various alternatives.[17] To the extent that the agencies intend to rely on mitigation of potential impacts, sufficient support for the success of mitigation can be developed. Adaptive management can help to fulfill the obligations to monitor, evaluate, and revise plans.

a) Evaluate landscape fragmentation metrics to determine the impacts on specific local species and the necessary actions to protect habitat. Incorporate the results into proposed management alternatives. The preferred alternative should be determined with an objective to reduce impacts on wildlife based on the fragmentation metrics. Include these wildlife impacts with other ecological impact data in the planning documents throughout the land-use planning process and subsequent management or land-use decisions.

b) Include a road closure plan and define necessary mitigation to protect and improve habitat, core areas, and ACECs.

i) Procedures, protocols, and priorities should be defined and implemented to close and reclaim roads and routes that are unnecessary, do not meet the legal definition of a road, and are no longer actively used for a specified purpose.

ii) An adaptive management plan should be established to ensure that the effects of the existing plan are monitored and that additional road closures and other mitigation measures are completed if monitoring and additional data collection indicate that wildlife populations are negatively affected.

PHOTO BY MICHAEL COLLIER

Majestic rock formations carved by the Colorado River define Grand Canyon-Parashant National Monument. Protection of large roadless areas in the monument will help conserve the wild character of the Arizona Strip — one of the most remote natural landscapes remaining in the contiguous 48 states.

In Summary

This report offers the agencies science-based information and analysis for use in making critical management decisions. Grand Canyon-Parashant and Vermilion Cliffs national monuments are remote and dramatic landscapes that were explicitly designated as national

[17] Cumulative impacts are the impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from minor but collectively significant actions over a period of time. 40 C.F.R. § 1508.7.

monuments to preserve their scientific and historic resources for generations to come.

BLM and the NPS are responsible for adopting a protective transportation plan that improves the Arizona Strip's long-term ecological health and integrity while providing for balanced public access and use. Each of the five species analyzed in this report is an "object of interest" in the monument proclamations, and therefore must be a priority for management under the Antiquities Act. Our analysis clearly demonstrates that the BLM Route Inventory has significant negative effects on these species, in particular on desert tortoise, mountain lion, and pronghorn. The scientific literature documents numerous direct, indirect, and cumulative impacts of transportation features on ecological processes, wildlife, plants, and archaeological sites. Since the agencies are responsible for making management decisions based on the best available science, they could violate their management mandates if they choose to designate the BLM Route Inventory as the preferred alternative for the Arizona Strip.

We encourage BLM and NPS to reach management decisions that are based in good science, the law, and sound policy, and that will close roads to restore large areas of contiguous wildlife habitat. Those areas will have value far beyond the five selected species discussed in this report. Maintenance of large roadless areas will also preserve the wild character of the Arizona Strip, a region that harbors some of the most remote, truly natural lands remaining in the contiguous 48 states — lands that help clear the air, filter water, and provide a natural retreat from the stress of everyday life.

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COVER PHOTOS:
Sculpted and finely bedded sandstone stratigraphy, Vermilion Cliffs National Monument, Arizona.
Photo courtesy of Julie Sherman

Ancient petroglyph drawing, Grand Canyon-Parashant National Monument, Arizona.
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Desert bighorn ram.
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