

November 15, 2017

Via Certified Mail, Return Receipt Requested

Secretary Ryan Zinke
U.S. Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Greg Sheehan, Acting Director
U.S. Fish and Wildlife Service
1849 C. Street N.W.
Washington, D.C. 20240

Chief Tony Tooke
U.S. Forest Service
1400 Independence Ave., S.W.
Washington, D.C. 20250

Supervisor Chip Weber, Forest Supervisor
Flathead National Forest
650 Wolfpack Way
Kalispell, MT 59901

**Sixty-Day Notice of Intent to Sue
Under § 7 of the Endangered Species Act**

Dear Secretary Zinke, Chief Tooke, Acting Director Sheehan, and Supervisor Weber:

In accordance with the sixty-day notice requirement of the Endangered Species Act (“ESA”), 16 U.S.C. § 1540(g), you are hereby notified that the following organizations intend to bring a civil action against the U.S. Forest Service and the officers and supervisors to whom this letter is directed (collectively the “Forest Service”) for violating Section 7 of the ESA, 16 U.S.C. § 1536.

The name and address of the organizations giving Notice of Intent to Sue:

WildEarth Guardians
80 SE Madison, Suite 210
Portland, OR 97206

Swan View Coalition
3165 Foothill Road
Kalispell, MT 59901

Friends of the Wild Swan
P.O. Box 103
Bigfork, MT 59911

As described herein, the Forest Service has violated and is violating the ESA by failing to reinstate Section 7 consultation with the U.S. Fish and Wildlife Service (“FWS”) concerning the effects of its amendment to the requirement to annually monitor forest road culverts on bull trout (*Salvelinus confluentus*) and bull trout critical habitat. *See* 16 U.S.C. § 1536(a)(2). The Forest Service is also violating the ESA by failing to comply with the reasonable and prudent measures or terms and conditions set out in FWS’s biological opinions that require annual culvert monitoring. This change to the Forest Service’s road-related activities causes an effect to bull trout and its critical habitat,

such as culvert failures, that was not considered in the original biological opinions. Thus the Forest Service has violated and is violating the ESA by failing to reinstate consultation. We will file suit after the 60-day period has run unless the violations described in this notice are remedied.

LEGAL BACKGROUND

Section 2(c) of the ESA establishes that it is “the policy of Congress that all Federal . . . agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of” the ESA. 16 U.S.C. § 1531(c)(1). The purpose of the ESA is to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered and threatened species . . .” 16 U.S.C. § 1531(b).

To implement this policy, Section 7(a)(2) of the ESA requires that each federal agency consult with FWS¹ to ensure that any action authorized, funded, or carried out by such agency is not likely to (1) jeopardize the continued existence of any threatened or endangered species or (2) result in the destruction or adverse modification of the critical habitat of such species. *See* 16 U.S.C. § 1536(a)(2).

The ESA’s consultation requirement applies “to all actions in which there is discretionary Federal involvement or control.” 50 C.F.R. § 402.03. Agency actions requiring consultation are broadly defined by regulation to mean “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies” and include “actions directly or indirectly causing modifications to the land, water, or air.” 50 C.F.R. § 402.02.

If listed species may be present in the area of agency action, the action agency must prepare a Biological Assessment (“BA”) to determine whether the listed species may be affected by the proposed action. *See* 16 U.S.C. § 1536(c)(1); 50 C.F.R. § 402.12. If the agency determines that its proposed action “may affect” any listed species, the agency must engage in “formal consultation” with FWS. 50 C.F.R. § 402.14; *see also* 51 Fed. Reg. 19,926, 19,949 (June 3, 1986) (explaining that “may affect” broadly includes “[a]ny possible effect, whether beneficial, benign, adverse, or of an undetermined character”).

The threshold for a “may affect” determination is very low, and ensures “actions that have any chance of affecting listed species or critical habitat—even if it is later determined that the actions are not likely to do so—require at least some consultation under the ESA.” *Karuk Tribe of Cal. v. U.S. Forest Serv.*, 681 F.3d 1006, 1028 (9th Cir. 2012). Under the FWS Consultation handbook, the “may affect” threshold is met if “a proposed action may pose *any* effects on listed species or designated critical habitat.” U.S. Fish and Wildlife Serv. & Nat’l Marine Fisheries Serv., *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act* at xvi (1998) (emphasis in original). The regulations implementing the ESA require an examination of both the direct effects of the action as well as the indirect effects of the action, which are defined as “those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur.” 50 C.F.R. § 402.02. Therefore, an agency must consult in every situation except when a proposed action will have “no effect” on a

¹ The bull trout is a species under FWS’s jurisdiction and was listed under the ESA subject to that jurisdiction.

listed species or critical habitat.

If the action agency concludes in a BA that the activity is not likely to adversely affect the listed species or adversely modify its critical habitat, and FWS concurs with that conclusion in a Letter of Concurrence, then the consultation is complete. 50 C.F.R. §§ 402.12, 402.14(b). If, however, the action agency determines that the activity is likely to adversely affect the listed species or its critical habitat, then FWS completes a biological opinion (“BiOp”) to determine whether the activity will jeopardize the species or result in destruction or adverse modification of critical habitat. *Id.* § 402.14. If FWS determines that an action will jeopardize the species or adversely modify critical habitat, it may propose reasonable and prudent alternative actions intended to avoid such results. 16 U.S.C. § 1536(b)(3)(A); 50 C.F.R. § 402.14(g)(5). If FWS determines the proposed action will “take” a species, the BiOp must include an incidental take statement that: (1) specifies the extent and impact of that take; (2) specifies reasonable and prudent measures necessary or appropriate to minimize such impact; (3) sets forth terms and conditions to implement those measures; and (4) contains a monitoring and reporting requirement to report impacts to FWS. 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14.

However, an agency’s Section 7 duties do not end with the issuance of a BiOp. The action agency “cannot abrogate its responsibility to ensure that its actions will not jeopardize a listed species; its decision to rely on a FWS biological opinion must not have been arbitrary or capricious.” *Pyramid Lake Paiute Tribe of Indians v. U.S. Dep’t of Navy*, 898 F.2d 1410, 1415 (9th Cir. 1990). *See also Defenders of Wildlife v. EPA*, 420 F.3d 946, 976 (9th Cir. 2005) (rev’d on other grounds).

Further, once the consultation is complete, the agencies have a duty to ensure that it remains valid. To this end, an agency must re-initiate consultation if certain “triggers” occur. 50 C.F.R. § 402.16. The ESA’s implementing regulations require the Forest Service to re-initiate consultation where discretionary federal involvement or control over the action has been retained or is authorized by law, and:

- (a) If the amount or extent of taking specified in the incidental take statement is exceeded;
- (b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
- (c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or
- (d) If a new species is listed or critical habitat designated that may be affected by the identified action.

50 C.F.R. § 402.16. The duty to reinitiate consultation lies with the action agency and the consulting agency.

After consultation is initiated or reinitiated, ESA Section 7(d) prohibits the agency or any permittee from “mak[ing] any irreversible or irretrievable commitment of resources” toward a project that would “foreclos[e] the formulation or implementation of any reasonable and prudent alternative measures . . .” 16 U.S.C. § 1536(d). The 7(d) prohibition “is in force during the consultation process and continues until the requirements of section 7(a)(2) are satisfied.” 50 C.F.R. § 402.09.

FACTUAL BACKGROUND

Bull Trout and its Critical Habitat

Bull trout (*Salvelinus confluentus*) was listed as threatened under the ESA throughout the coterminous United States in 1999. Bull trout are a cold-water fish of relatively pristine streams and lakes. They have specific habitat requirements: cold, clean, complex and connected habitat. Primary threats to bull trout include habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management, and the introduction of non-native species such as brown, lake, and brook trout. Effects resulting from climate change also threaten bull trout, because a warming climate is expected to shrink cool spawning and rearing areas. Bull trout occur over a large area, but their distribution and abundance has declined and scientists have documented several local extinctions. Remaining populations tend to be small and isolated from each other, making the species more susceptible to local extinctions.

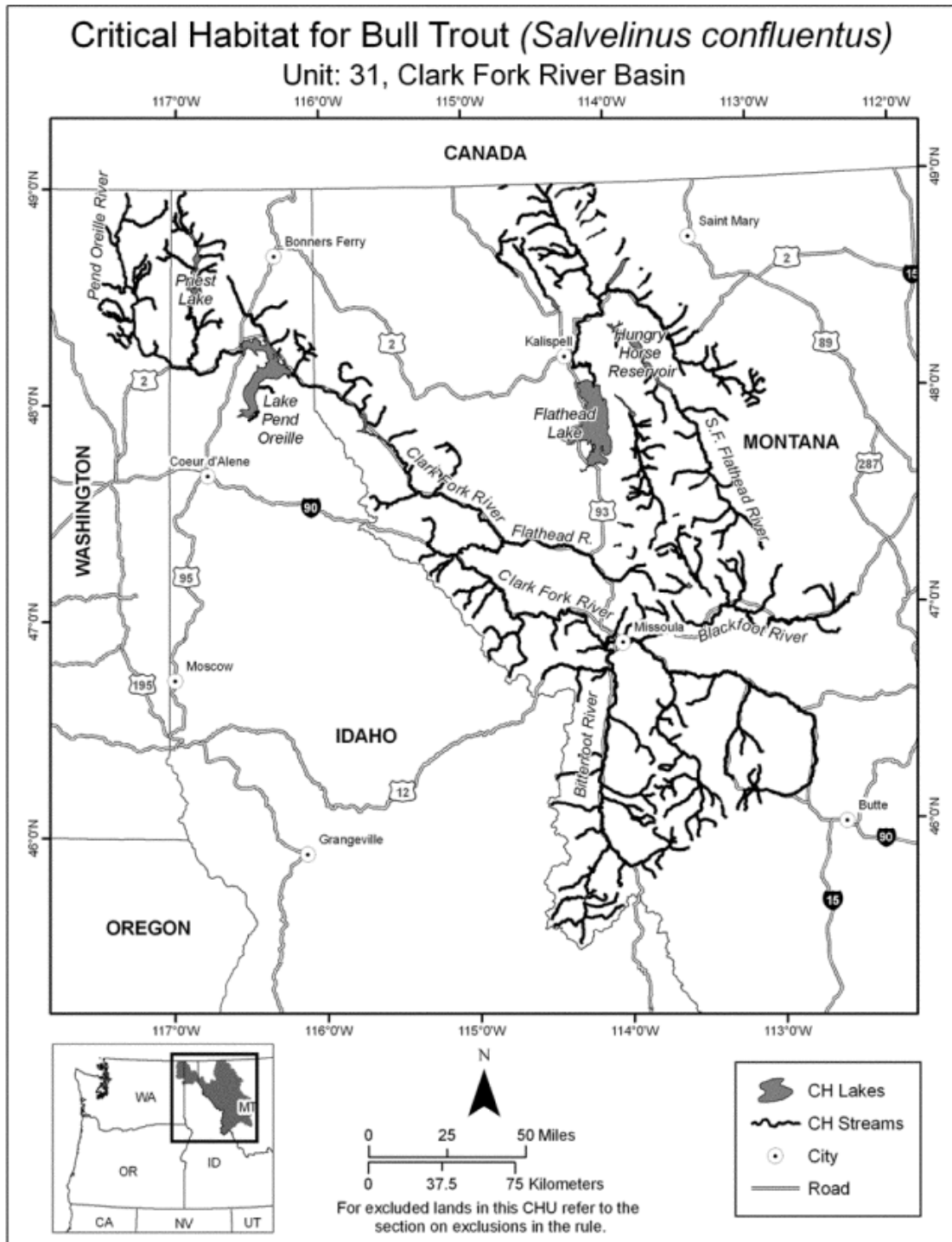
In 1995, Forest Service Regions 1, 4 and 6 adopted the Interim Strategy for Managing Fish-Producing Watersheds (“INFISH”) to provide interim direction to protect habitat and population of resident native fish. INFISH is a broad-reaching aquatic habitat conservation strategy for the northwestern United States and was incorporated into Forest Plans, including the Flathead’s Forest Plan, in a single Record of Decision.

In 1998, FWS issued a BiOp assessing the effects of implementing all affected Forest Plans as amended by INFISH (“1998 BiOp”). The 1998 BiOp analyzed the effects to bull trout from the Flathead Forest Plan, among others. In the 1998 BiOp, FWS noted, “within the range of the DPSs of bull trout, [Forest Plans] provide direction and standards for broad classes of project activities and land and water management practices that may affect bull trout. [Forest Plans] provide policy guidance for various federal activities carried out on the forest or management area.” The programmatic 1998 BiOp ultimately concluded that continued implementation of the Forest Plans is not likely to jeopardize the continued existence of bull trout. However, the 1998 BiOp also concluded that because “[n]o critical habitat has been designated for the species [...] none will be affected.”

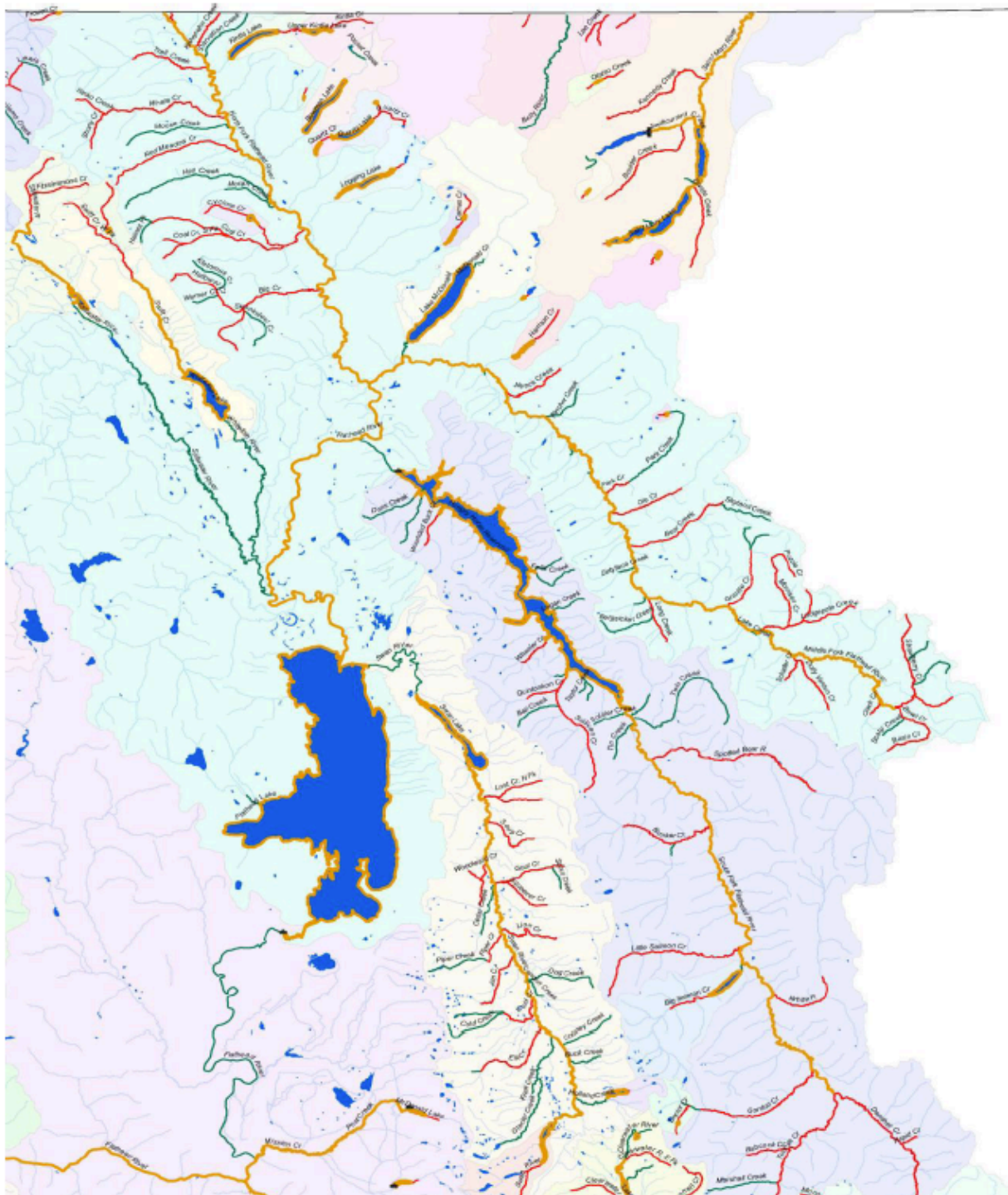
After years of legal and political wrangling, critical habitat for bull trout was most recently designated on October 18, 2010. 75 Fed. Reg. 63898 (Oct. 18, 2010). The rule designated a total of 19,729 miles of stream and 488,251.7 acres of reservoirs and lakes in the States of Washington, Oregon, Nevada, Idaho, and Montana as critical habitat for the bull trout.

Bull Trout on the Flathead National Forest

Bull trout and bull trout critical habitat exist on the Flathead National Forest. The following map shows Unit 31 of the bull trout critical habitat that was designated in 2010, 75 Fed. Reg. at 64,067, and includes the Flathead National Forest:



The following map shows spawning and occupied bull trout streams in the Flathead Forest Plan Amendment 19 project area in the Swan Lake and Flathead Lake bull trout core areas of northwest Montana:



See U.S. Fish and Wildlife Service Montana Ecological Services Office, Biological Opinion on Amendment 19 (A-19) Revised Implementation Schedule, Bull Trout (*Salvelinus confluentus*) (Nov. 22, 2010) (hereafter, 2010 Amendment 19 BiOp), page 7, Figure 1.

Impacts to Bull Trout from Forest Roads & Culverts

The best available science shows that roads cause significant adverse impacts to National Forest resources. A 2014 literature review from The Wilderness Society surveys the extensive and best available scientific literature—including the Forest Service’s General Technical Report synthesizing the scientific information on forest roads (Gucinski 2001)—on a wide range of road-related impacts to ecosystem processes and integrity on National Forest lands. *See The Wilderness Society, Transportation Infrastructure and Access on National Forests and Grasslands: A Literature Review* (May 2014) (Attachment A). Erosion, compaction, and other alterations in forest geomorphology and hydrology associated with roads seriously impair water quality and aquatic species viability. Roads disturb and fragment wildlife habitat, altering species distribution, interfering with critical life functions such as feeding, breeding, and nesting, and resulting in loss of biodiversity. Roads facilitate increased human intrusion into sensitive areas, resulting in poaching of rare plants and animals, human-ignited wildfires, introduction of exotic species, and damage to archaeological resources.

Roads often contribute to degraded baseline conditions in watersheds containing bull trout. Roads are a primary source of sediment impacts to developed watersheds. Accumulation of fine sediment is detrimental to bull trout habitat. Lee et al. (1997) found a pattern of decreasing strong populations of bull trout with increasing road density. Sediment delivered to streams is greatest in riparian areas where roads cross the streams. Fords and approaches to the crossings deliver sediment directly to streams. Roads and trails paralleling streams can interfere with large wood reaching the stream and cause increased erosion and decreased stream bank condition.

Culverts can deliver large amount of sediment to receiving waters when the culvert plugs and fails. A 2006 phone log of a discussion between the Forest Service and FWS shows the agencies identified addressing the existing road system on the Flathead as the key opportunity to conserve bull trout. *See Attachment B* (provided to us from FWS in response to a Freedom of Information Act (FOIA) request). The agencies recognized that harms to bull trout from un-maintained forest roads and culverts behind gates and berms are legitimate concerns, and allowing culverts to remain increases the risk of losing a fish population and degrading water quality, as shown in the literature.

FWS’s 2015 BiOp on the effects to bull trout and bull trout critical habitat from road-related activities in Western Montana states:

Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected . . . have an increased risk for failure by reducing awareness of potential maintenance needs. The accumulation of debris has the potential to obstruct culverts and other road drainage structures. Without maintenance and periodic cleaning, these structures can fail, resulting in sediment production from the road surface, ditch, and fill slopes. The design criteria to address drainage structures left behind gates and berms require annual monitoring of these structures.

See U.S. Fish and Wildlife Service Montana Ecological Services Office, Biological Opinion on the Effects to Bull Trout and Bull Trout Critical Habitat From the Implementation of Proposed Actions Associated with Road-related Activities that May Affect Bull Trout and Bull Trout Critical Habitat in Western Montana (April 15, 2015) (hereafter, 2015 Roads Programmatic BiOp), pages 45-46.

In 2006, the Forest Service and FWS affirmed that high-risk culverts (or “pipes”) left behind berms and gates on forest roads was the primary issue affecting bull trout habitat on the Flathead National Forest. *See* Meeting notes Seeley Lake 11/30/06 T&C Reporting (Attachment C). The attached maps—prepared by a GIS contractor from the Forest Service’s own data—show that many forest roads and culverts directly affect, or affect waters upstream of, bull trout critical habitat. *See* Attachment D.

Actions & Consultation: Flathead Forest Plan & Site-Specific Projects Requiring Culvert Monitoring

Since 2002, FWS has issued seven bull trout BiOps to the Flathead National Forest that include no jeopardy determinations based on reasonable and prudent measures or terms and conditions requiring annual or biannual culvert monitoring on gated or closed roads for the purpose of identifying high risk culverts and repairing or removing them to reduce the risk of failure. *See, e.g.*, Nov. 9, 2016 Letter from Chip Weber, Forest Supervisor, Flathead National Forest to Jodie Bush, U.S. Fish and Wildlife Service. For at least five of these BiOps, FWS based its no jeopardy determination in part on the Forest Service’s commitment to annually inspect culverts on closed roads in bull trout habitat. For the Moose Post-Fire Project, FWS based its conclusions in part on the Forest Service’s commitment to inspect culverts annually for the first two years following the project, and biannually thereafter. Although FWS did not explicitly base its no jeopardy determination for the West Side Reservoir Project on annual inspections of closed road culverts, reliance on this requirement is implicit given the requirement for the Forest Service to propose a culvert monitoring program and annually submit monitoring reports.

1. Chilly James Restoration Project (Jan. 2016)

In 2015, the Forest Service proposed the Chilly James Restoration Project, which included decommissioning 2.3 miles of road, placing 9 miles of road into intermittent stored service, implementing best management practices for 20.9 miles of road, and re-aligning 0.2 miles of road. *See* U.S. Fish and Wildlife Service Montana Field Office, Biological Opinions on the Effects of the Chilly James Restoration Project on Grizzly Bears, Bull Trout, and Bull Trout Critical Habitat (Jan. 20, 2016) (hereafter, 2016 Chilly James BiOp), page 5. FWS determined that the actions as proposed were not likely to jeopardize the continued existence of bull trout, and were not likely to destroy or adversely modify bull trout critical habitat. *Id.* at 46, 47. It based that determination, in part, on the Forest Service’s commitment to comply with the conservation recommendations and design criteria identified in the 2015 Roads Programmatic BiOp. *Id.* at 45.

As explained below, the design criteria require all culverts behind road gates and permanent barriers be inspected annually and, if annual monitoring behind barriers is not feasible, require the Forest Service to remove all stream crossing structures when the road is closed. They also require all stream crossing structures be removed when a road is reclaimed or decommissioned so that annual inspections are not necessary.

FWS anticipated implementation of the Chilly James Restoration Project would likely impart a level of adverse effect, and thus incidental take would occur. *Id.* at 48. To minimize the impact of incidental take that might otherwise result, FWS identified non-discretionary reasonable and prudent measures with implementing terms and conditions, including annual monitoring in the same format as is required by the 2015 Roads Programmatic BiOp. *Id.* at 49-51.

2. Roads Programmatic BiOp (April 2015)

In its 2015 Roads Programmatic BiOp, FWS concluded that the proposed road-related maintenance activities would not appreciably reduce the survival and recovery of bull trout based on the information presented, including the Forest Service's commitment to implement design criteria for all road-related activities. 2015 Roads Programmatic BiOp at 61-63. *See also id* at 65 ("The proposed action requires that each land management unit will monitor projects to assure design criteria are implemented and findings are documented"). Design criteria, listed in Appendix A of the 2015 Roads Programmatic BiOp, expressly incorporate Appendix E as detailing the design criteria for road decommissioning and road storage or closure. *Id.* at 92 (Appendix A, Detailed Description of Road-Related Activities Included in the Proposed Action). Those design criteria require all culverts behind road gates and permanent barriers be inspected annually and, if annual monitoring behind barriers "is not feasible, remove all stream crossing structures when the road is closed." *Id.* at 99 (Appendix E, Standards for Road Closures). They also require removal of all stream crossing structures when a road is reclaimed or decommissioned so that annual inspections are not necessary. *Id.* at 100.

3. Amendment 19 Revised Implementation (Nov. 2010)

In 2010, the Forest Service sought to delay implementation of road-related projects identified in Amendment 19 to the Flathead's Forest Plan (referred to as A-19 projects) through 2009. *See* 2010 Amendment 19 BiOp at 15. This meant further delaying the decommissioning of 16.5 miles of roads in four Grizzly Bear Management Unit (GBMU) watersheds (Red Meadow Creek, Granite Creek, Morrison Creek, and North Fork Lost Creek). *Id.* FWS estimated those roads to contain 28 culverts and two bridges in bull trout drainages, failure of which could produce approximately 476 tons of sediment. *Id.* at 15, 53. FWS affirmed that leaving roads that remain on the landscape without appropriate maintenance adversely affects bull trout. *Id.* at 48.

FWS determined the revised implementation schedule was not likely to jeopardize the continued existence of bull trout, would not appreciably reduce the survival or recovery of bull trout in the wild, and was not likely to destroy or adversely modify bull trout critical habitat. *Id.* at 60-62. Those determinations were based in part on the Forest Service's commitment to, *inter alia*: (1) implement minimization measures to reduce sediment generated by the project; (2) reduce sediment delivery as a result of road related improvements, road decommissioning, and culvert removal and or replacement elsewhere in the A-19 project area; and (3) eventually implement A-19 projects to reduce sediment delivery in the identified GBMU watersheds. *Id.* at 61. As part of its incidental take statement, FWS outlined non-discretionary measures the Forest Service must undertake. *Id.* at 64-69 (including reasonable and prudent measures and terms and conditions that require annual culvert inspection and maintenance for all inventoried culverts, and a plan and schedule to remove or upgrade high risk culverts).

4. Robert-Wedge Post-Fire Project (Nov. 2004)

In 2004, the Forest Service proposed broad scale treatment of forested land and associated land management activities under the Robert and Wedge Post Fire Project. *See* U.S. Fish and Wildlife Service Montana Field Office, Biological Opinion for Bull Trout, Flathead National Forest Robert-Wedge Post-Fire Project 2004 (Nov. 22, 2004) (hereafter, 2004 Robert-Wedge BiOp), pages 4-5. FWS determined the project as proposed was not likely to jeopardize the continued existence of the

Columbia Basin DPS of bull trout. *Id.* at 40. As part of its proposal, the Forest Service committed to monitoring bermed or gated roads that remain on the system if funding allowed. *Id.* at 9.

FWS anticipated implementation of the Robert-Wedge Post-Fire Project activities may result in incidental take of bull trout. *Id.* at 42. To limit sediment delivery from those activities, the Forest Service proposed mitigation that included specific road maintenance mitigation activities identified in the *Biological Assessment of Road Related Actions on Western Montana's Federal Lands that are likely to Adversely Affect Bull Trout* (USDA 2001). *Id.* at 42. FWS also required the Forest Service to comply with non-discretionary reasonable and prudent measures and their implementing terms and conditions, including development of a proposal for monitoring culverts on bermed roads and reporting monitoring activities annually. *Id.* at 46.

5. West Side Reservoir Post-Fire Project (Dec. 2004)

In 2004, as part of the West Side Reservoir Post-Fire Project the Forest Service proposed post-fire logging, road activities, and restoration. *See* U.S. Fish and Wildlife Service Montana Field Office, Biological Opinion for Bull Trout, Flathead National Forest, West Side Reservoir Post-Fire Project 2004 (Dec. 21, 2004) (hereafter, 2004 West Side BiOp), pages 5-6. As part of its proposal, the Forest Service committed to monitoring bermed or gated roads that remain on the system if funding allowed. *Id.* at 9. FWS noted concerns with the Forest Service's proposal to berm 36 miles of road due to the likelihood that culverts would be left in place behind berms, limiting access to clean, repair, or monitor high risk culverts. *Id.* at 36. FWS determined the project as proposed was not likely to jeopardize the continued existence of bull trout. *Id.* at 46. It based that determination in part on minimization measures the Forest Service committed to. *Id.*

FWS anticipated implementation of the West Side Reservoir Project might result in incidental take of bull trout. *Id.* at 47. To minimize incidental take of bull trout, FWS required the Forest Service to comply with non-discretionary reasonable and prudent measures and their implementing terms and conditions, including submission of a proposal for monitoring culverts on bermed roads with annual reports. *Id.* at 51-52.

6. Moose Post-Fire Project (Nov. 2002)

Under the Moose Post-Fire Project, the Forest Service proposed salvage harvest, alternative bark beetle control measures, fuels reduction, and road management. *See* U.S. Fish and Wildlife Service Montana Field Office, Biological Opinion on the Effects of the Moose Post-Fire Project on Bull Trout, Flathead National Forest (Nov. 14, 2002) (hereafter, 2002 Moose BiOp), page 4. The incidental take statement noted that regular monitoring and maintenance of all culverts—not just culverts on actively used roads—is necessary to reduce the potential for culverts to plug or fail and thereby reduce the risk of sediment delivery to bull trout streams. *Id.* at 45. FWS determined the project was not likely to result in jeopardy of bull trout. *Id.* at 42. FWS based its determination in part on the Forest Service's commitment to annually monitor culverts in the project area for the first two years, and then every-other year thereafter. *Id.* at 47 (terms and conditions), 61 (Appendix A).

7. Spotted Beetle Project (March 2002).

In 2002, the Forest Service proposed vegetation management and road management actions, including closing 29 miles of road with an earthen berm or gate and maintenance of all culverts on

those closed roads, as part of the Spotted Beetle Resource Management Project. *See* U.S. Fish and Wildlife Service Montana Field Office, Biological Opinion, Bull Trout, Spotted Beetle Resource Management Project (Mar. 8, 2002) (hereafter, 2002 Spotted Beetle BiOp), page 2. FWS determined the project as proposed was not likely to jeopardize the continued existence of bull trout. *Id.* at 30.

As part of its proposed actions, the Forest Service proposed to inspect the culverts remaining on the 29 miles of closed roads to ensure they did not jam with debris and cause road bed erosion to occur. *Id.* at 25. It also committed to implementing the standards and guidelines for conducting road maintenance activities contained in the *Biological Assessment of Road Related Actions on Western Montana's Federal Lands that are Likely to Adversely Affect Bull Trout* (Forest Service and Bureau of Land Management 2001). *Id.* at 28.

FWS anticipated implementation of the Spotted Beetle Project would result in incidental take of bull trout. *Id.* at 31. To minimize incidental take of bull trout, FWS required the Forest Service to comply with non-discretionary reasonable and prudent measures and their implementing terms and conditions, including annual inspections of culverts on roads closed by gates or berms. *Id.* at 32.

Changes to Identified Actions & New Information

Failure to Monitor Culverts

The Forest Service has failed to monitor forest road culverts as required by the terms and conditions of the seven BiOps, a commitment that FWS relied on in its original consultations. *See, e.g.*, Nov. 9, 2016 Letter from Chip Weber, Forest Supervisor, Flathead National Forest to Jodie Bush, U.S. Fish and Wildlife Service (noting that “[s]ince 2009, engineering budgets have declined and monitoring has been inconsistent and incomplete.”).

For example, the Forest Service failed to comply with the terms and conditions of its incidental take permit on the West Side Reservoir Post-Fire Project. Under that decision, the agency committed to identify all high-risk culverts behind berms and gates and remove any high-risk culverts within one year, but failed to follow through on this commitment. *See* Attachment C (“the Forest was to identify which pipes are high risk (done) and fix high risk within a year (not done?)”). The agency later documented two major water events and culvert failure, highlighting the issue of abandoned culverts and impacts to water quality and bull trout habitat. *Id.* For the Forest Service, it was not a matter of whether the agency was failing to comply with the BiOp terms and conditions requiring culvert monitoring, but “how far have we missed the mark (i.e., by not meeting the commitments in the BA has take occurred over and above what was assessed in the BO?)”. *See* Attachment C.

Based on the Forest Service’s responses to a series of FOIA requests as well as meetings with the Forest Service staff between November 2014 and February 2016, the Forest Service has continued to fail to annually monitor stream-crossing culverts behind road closures in bull trout habitat forest-wide as required by the 2015 Roads Programmatic BiOp. *See, e.g.*, K. Hammer, Roads to Ruin: The Flathead National Forest Shirks Its Road Reclamation Duties (May 2016) (Attachment E), pages 18-20 nn.25-30. For example, the Forest Service has failed to conduct annual monitoring of ten culverts remaining on Raghorn Road (10802). *Id.* at 19 n. 32. The road is located upstream of Coal Creek, which is designated bull trout critical habitat. As another example, the Forest Service has failed to annually monitor 24 culverts remaining on Sullivan Creek Road above a 2014 mass road failure. *Id.* at 22 n.52. One of the culverts remaining on Sullivan Creek Road includes a three-foot “high risk”

culvert that the agency identified as “a critical situation” in June of 2015. *Id.* Sullivan Creek Road parallels bull trout critical habitat for spawning. Also based on the agency’s response (or lack of response) to FOIA requests, it has failed to develop a single culvert monitoring plan for roads closed by berms to provide Grizzly Bear Security Core. *Id.* at 18 n.27.

The Forest Service has failed to annually monitor culverts on North Lost Creek Road (5206), including two stream-aligned culverts located behind the berm that closes the road. Lost Creek is one of the four streams identified as requiring annual culvert monitoring to prevent failures per the 2010 Amendment 19 BiOp. It is a major tributary to North Lost Creek, which is designated critical habitat. The agency’s INFRA database incorrectly shows no culverts exist beyond the berm at milepost 4.77. But a Fish Passage Assessment dated 8/12/02 identifies a 72” x 45” squash culvert as low risk for blockage but as impassable to fish due to a free-fall at the culvert outlet. The same form is later marked and red-flagged as “Pulled Prior to 2010.” Based on our own surveys from June of 2016, the huge culvert remains, as well as a smaller live-stream culvert.

In 2007, the Forest Service surveyed 120 culverts on just 38 miles of road. In 2008, it surveyed 203 culverts on 47 miles of road. And in 2009 it surveyed 148 culverts on 65 miles of road. *See* Terms and Conditions Monitoring Report, Bull Trout Biological Opinions for Post-fire Salvage Operations, Flathead National Forest 2007-2009, Appendix A (Oct. 28, 2009).

As explained above, FWS relied on the Forest Service’s compliance with the reasonable and prudent measures and terms and conditions requiring the Forest Service to annually monitor culverts—as well as commitments to annually monitor culverts—as part of the basis for its determination in at least five of the seven BiOps that the Forest Service’s actions would not result in jeopardy to bull trout or destruction or adverse modification of critical habitat. The Forest Service is in violation of its duty under the ESA to reinitiate consultation because the agency subsequently modified its action in a manner that has and is continuing to cause effects to bull trout and bull trout critical habitat that was not considered in the seven BiOps.²

Culvert Failures

Based on the limited culvert monitoring in 2004 and the number of culvert failures, the agency underestimated the rate of “high risk” culverts and culvert failures.³ In 2005 and 2006, the Forest Service documented three failed culverts and one road slump in the West Side Reservoir project

² *See, e.g.*, 2015 Roads Programmatic BiOp at 68 (“If, during the course of the action, proposed action is not adhered to, the level of incidental take anticipated in the biological opinion may be exceeded; such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided.”); 2010 Amendment 19 BiOp at 69 (“If during the course of the proposed action, the Forest does not adhere to TC1(c), or other terms and conditions above, this would represent new information requiring reinitiation of consultation.”).

³ *See* Monitoring Plan for Culverts on Closed Roads, Robert-Wedge and West Side Reservoir Projects (2004), page 8 (“In 2004, we monitored 89 miles of roads and 234 stream crossings within the West Side Project . . . we found 7 failed culverts, 5 partially plugged culverts and 1 failed bridge. Once again, 15% of the culverts were identified as high risk to fail. There is an additional 19 miles of roads closed by vegetation, 38 miles closed by berms and 53 miles of gated roads that still need to be inventoried as a base level inventory to identify potential risks.”)

area. The failed culverts were 48", 36" and 18" in diameter. Monitoring determined that 48% of the culverts inspected and rated⁴ were "high risk." See R. Stevens and C. Kendall, Biological Opinion Terms and Conditions Monitoring Report for Bull Trout, Flathead National Forest, 2006 (Mar. 22, 2007), pages 16, 21, 23. This type of monitoring results led FWS to conclude: "[We need to t]ry and determine the level/extent outside the take already issued. Remember that the [West Side Project] BO does not cover what was discovered. We based analysis on 10 to 15% of the culverts in the action area are at high risk of failure the[n] discovered its more like 35 to 40%." See FWS's Notes from 12/4/06 Conference Call.

In 2006, the Forest Service and FWS documented at least seven major culvert failures and expected that number to increase. See Attachment B; see also Pre Meeting Notes: By Dan Brewer, For the meeting with Steve Phillips of the Flathead National Forest (Seeley Lake Ranger District 11/30/06) (Attachment F). Between 2007 and 2009, the Flathead observed 12 culvert failures (based on only a subset of stream culverts inventoried) as part of the agency's monitoring program to assess roads and culverts behind berms. See Terms and Conditions Monitoring Report, Bull Trout Biological Opinions for Post-fire Salvage Operations, Flathead National Forest 2007-2009, Appendix A (Oct. 28, 2009).

Another example is a culvert failure identified in 2014 on Bunker Creek Road (549), behind a closed road with a berm. See Attachment E at 7. The culvert blew out into a tributary that feeds directly into the main fork of Bunker Creek, which is designated bull trout critical habitat. The culvert monitoring was not annual, apparently not thorough, and essentially in 2010. *Id.* at 16-18 n.24. Our own monitoring identified a four-foot diameter culvert almost entirely plugged in 2014 on a tributary also feeding the main fork of Bunker Creek. *Id.* Survey crews in 2010 had been unable to remove "large immovable logs" that were partially blocking this culvert inlet. *Id.* Road 2820 runs up the Middle Fork of Bunker Creek, which is not designated critical habitat for bull trout, but flows into the main fork Bunker Creek, which is designated bull trout critical habitat. The Forest Service's culvert survey in 2010 and our own survey in 2014 found numerous plugged and partially failed culverts. See *id.*

FWS relied on the Forest Service's compliance with terms and conditions requiring the Forest Service to annually monitor culverts to minimize sediment releases into bull trout habitat and critical habitat as part of the basis for its determination in at least five of the seven BiOps that the Forest Service's actions would not result in jeopardy to bull trout or destruction or adverse modification of critical habitat. The agency's failure to monitor culverts as required by the terms and conditions of the BiOps has resulted in culvert failures that degrade bull trout critical habitat and harm bull trout. The Forest Service is therefore in violation of its duty under the ESA to reinstate consultation because the agency subsequently modified its action in a manner that has and is continuing to cause effects to bull trout and bull trout critical habitat that was not considered in the seven BiOps.⁵

⁴ The Forest Service identified 319 culverts for inspection, but inspected and rated only 231, with 112 (48%) being high risk. *Id.* The agency removed nine more culverts and did not rate them. The agency apparently mistakenly divided 112 by 319 to arrive at the 35% high risk it reported.

⁵ See, e.g., 2015 Roads Programmatic BiOp at 68; 2010 Amendment 19 BiOp at 69 ("in the unlikely event of a large runoff event causing massive or widespread culvert failures, and more than one culvert fails, the level of take exempted in this biological opinion would be exceeded, and reinitiation of consultation would be required.").

Modifications to Culvert Monitoring Plan

In 2016, the Flathead National Forest requested to amend the terms and conditions of the seven BiOps requiring annual (or biannual) forest road culvert monitoring. *See, e.g.*, Nov. 9, 2016 Letter from Chip Weber, Forest Supervisor, Flathead National Forest to Jodie Bush, U.S. Fish and Wildlife Service (requesting to “amend these Terms and Conditions such that the proposed monitoring plan would function in lieu of existing monitoring requirements.”). Under its proposed rotating panel design, the Forest Service would monitor culverts on closed or gated roads in bull trout watersheds every sixth year instead of annually.

The Forest Service failed to reinitiate consultation to assess these proposed changes to the reasonable and prudent measures and terms and conditions of the road-related BiOps identified above.

Even if the Forest Service does reinitiate consultation on its proposed changes to the culvert monitoring requirements, monitoring culverts once every six years is not adequate to assess the risk of and prevent culvert failures. The history of culvert failures on the Flathead due to lack of monitoring and maintenance in addition to best available science showing the harmful impacts of forest roads and culvert failures on water quality, bull trout, and bull trout critical habitat demonstrate it would be arbitrary and capricious for the Forest Service and FWS to modify the Flathead’s culvert monitoring requirements. In response to FOIA requests, the Forest Service and FWS did not provide any records supporting the Forest Service’s conclusions that annual culvert monitoring may be duplicative, or that a 5-10 year period may be reasonable to detect changes in culvert conditions or trends.

The Forest Service and FWS have historically under-estimated the number of high-risk culverts on the forest. As early as 2006, FWS found their assumption that 10-15% of culverts would be high risk was incorrect based on Forest Service monitoring that identified 35-40% of culverts as high risk. *See* Attachment E. Based on additional monitoring information available to us in response to FOIA requests, the Forest Service later found 67% of culverts are at high-risk. Because of these false assumptions, FWS noted it had concerns about the impacts of culvert management on bull trout and bull trout habitat across the Flathead. *See* Attachment E.

In its request to modify the culvert monitoring requirements set forth in the BiOps outlined above, the Forest Service pointed to field tests of the monitoring approach in the Sullivan Creek watershed. *See, e.g.*, Nov. 9, 2016 Letter from Chip Weber, Forest Supervisor, Flathead National Forest to Jodie Bush, U.S. Fish and Wildlife Service. But based on the culvert monitoring spreadsheet, provided as an example of culvert monitoring done using the proposed new culvert monitoring plan, the surveyors did not abide by the culvert monitoring plan protocol when assessing culverts in the Sullivan Creek watershed. *Compare* Sullivan Creek Monitoring Results 2016 *with* FNF Culvert Monitoring Plan 7-2016.

Of the 13 culverts identified, the surveyors found only one culvert had damage due to rust, even though three other culverts should have been marked as “damaged” due to blocked inlets and the stream flowing underneath the culvert. *See* FNF Culvert Monitoring Plan 7-2016 at 8 n.*. Moreover, six of the 13 culverts had upstream floatable material. It is very possible for that material to migrate and block the six downstream culvert inlets during the six-year period before this area would be

surveyed again. The survey reported only two of the 13 culverts had no issues with proper installment, flow or maintenance.

On May 10, 2017, our organizations submitted a letter to the Forest Service outlining our concerns about the Flathead National Forest's efforts to change its monitoring program for road culverts given the history of culvert failures on the forest landscape. The letter highlighted the harms culvert failures have on water quality and bull trout habitat. Our organizations have also submitted comments on the Flathead's forest-wide Travel Analysis Report and its draft revised Forest Plan, describing how the Flathead's road system is too large to adequately fund, maintain and monitor in order to protect listed species of fish and wildlife.

Climate Change Science

New studies regarding the impacts of climate change reveal that the actions assessed in the seven bull trout BiOps may affect bull trout and its designated critical habitat in a way or to an extent not previously considered in the earlier BiOps. New information shows climate change is expected to lead to more extreme weather events, resulting in increased flood severity, more frequent landslides, altered hydrographs, and changes in erosion and sedimentation rates and delivery processes.⁶ Forest roads that were designed for storms and water flows typical of past decades may fail under future weather scenarios, further exacerbating adverse ecological impacts, public safety concerns, and maintenance needs.⁷

New information shows that climate change is affecting bull trout and its critical habitat by warming stream temperatures, altering stream hydrology, and changing the frequency, magnitude, and extent of climate-induced events like floods, droughts, and wildfires. These new studies document the larger role of climate change in affecting the status of bull trout throughout their range:

- 1) Luce, C. H, J. T. Abatzoglou, and Z. A. Holden. 2013. The Missing Mountain Water: Slower Westerlies Decrease Orographic Enhancement in the Pacific Northwest USA. *Science* 342: 1360-1364 (Attachment G) (documenting declining trends in streamflow timing and volume attributed to orographic precipitation enhancement, in addition to increased temperatures).
- 2) Isaak, D. J., *et al.* 2016. Slow climate velocities of mountain streams portend their role as refugia for cold-water biodiversity. *Proc Natl Acad Sci*, DOI: 10.1073/pnas.1522429113 (Attachment H) (showing temperature resistance of mountain streams and highlighting their importance in buffering cold-water species from climate change).

The Forest Service's own Climate Shield website provides a wealth of new information identifying colder, high-elevation streams that serve as a refugia for native bull trout with the goal of improving

⁶ See, e.g., Halofsky, J.E. *et al eds.*, USDA, Forest Service, Pacific Northwest Research Station, *Adapting to Climate Change at Olympic National Forest and Olympic National Park*, PNW-GTR-844 (2011), pages 21-27.

⁷ See, e.g., Strauch, R.L. *et al.*, *Adapting transportation to climate change on federal lands in Washington State*, *Climate Change* 130(2), 185-199 (2015) (noting the biggest impacts to roads and trails are expected from temperature-induced changes in hydrologic regimes that enhance autumn flooding and reduce spring snowpack).

the odds of preserving native trout populations:

- 3) U.S. Forest Service Rocky Mountain Research Station, Climate Shield Cold-Water Refuge Streams for Native Trout, *available at* <http://www.fs.fed.us/rm/boise/AWAE/projects/ClimateShield.html> (last accessed June 23, 2016).

The Forest Service predicts cold-water refuge streams will play an important role in the future protection of bull trout in light of anticipated climate change-related temperature increases.

In addition, new methods of documenting bull trout, new documentation, and new studies on management and restoration efforts indicate the Forest Service's actions may affect the species to a greater extent than previously considered:

- 4) Auerbach, N. A., K. A. Wilson, A. I. T. Tulloch, J. R. Rhodes, J. O. Hanson, and H. P. Possingham. 2015. Effects of threat management interactions on conservation priorities. *Conservation Biology* 29:1626-1635 (Attachment I) (concluding species conservation management that does not consider interactions between actions may result in misplaced investments or misguided expectations of the effort to mitigate threats to species).
- 5) Barnas, K. A., *et al.* 2015. Is habitat restoration targeting relevant ecological needs for endangered species? Using Pacific Salmon as a case study. *Ecosphere* 6(7), art 110 (Attachment J) (identifying improvements for habitat management to improve efficiencies in matching identified needs for conserving a species with explicit management actions).
- 6) Meyer, K.A. *et al.* 2014. Bull trout trends in abundance and probabilities of persistence in Idaho. *North American Journal of Fisheries Management* 34:202-214 (Attachment K) (describing bull trout population trends and probability of persistence in Idaho).
- 7) Wilcox, T. M. *et al.* 2014. A blocking primer increases specificity in environmental DNA detection of bull trout (*Salvelinus confluentus*). *Conservation Genetics Resources* 6:283-284 (Attachment L) (newly developed environmental DNA survey methods are improving agencies' ability to assess bull trout distribution and identify watersheds where bull trout are at risk of extirpation).

The Montana Climate Assessment (MCA), an effort to synthesize, evaluate, and share credible and relevant scientific information about climate change in Montana, is another source of new information regarding climate change that the Forest Service failed to consider in its current BiOps. See <http://montanaclimate.org>.

This wealth of significant new information reveals the agency's actions may affect bull trout and its designated critical habitat in a manner not previously considered in several of the BiOps. The more recent studies were not available for the 2002, 2004, and 2010 BiOps. Climate change effects were not considered as a factor affecting bull trout at the time of listing in 1999. U.S. Fish and Wildlife Service, Recovery Plan for the Coterminous United States Population of Bull Trout (*Salvelinus confluentus*) (Sept. 2015), page iv. The Forest Service is in violation of its duty under the ESA to reinstitute consultation because new information about the effects of climate change reveals the effects of the agency's actions, in the cumulative, may affect threatened bull trout and its critical

habitat to an extent not previously considered.

Failure to Consult or Reinitiate

Failing to reinitiate consultation despite changes to the identified action in a manner that causes effects to the listed species or critical habitat that was not considered in the BiOps, and despite new information revealing effects of the actions that were not previously considered, violates ESA regulation 50 C.F.R. § 402.16.

Potential “No Effect” Determination

Based on information available to us and received in response to FOIA requests to the Forest Service and FWS, the Forest Service did not make any further determinations regarding the effects of its actions on bull trout or designated bull trout critical habitat. If the Forest Service did make a “no effect” determination, based on the information set forth above, that determination would be arbitrary and capricious, and contrary to law.

ESA VIOLATIONS

1. The Forest Service has violated the ESA by failing to reinitiate consultation under Section 7 regarding the impacts of its road-related activities on bull trout and its critical habitat despite proposing to eliminate the requirement to annually monitor forest road culverts. This change to culvert monitoring affects bull trout and its critical habitat in a way that was not considered in any of the seven BiOps. 50 C.F.R. § 402.16(c).
2. The Forest Service has violated the ESA by failing to reinitiate consultation under Section 7 regarding the impacts of its road-related activities on bull trout and its critical habitat. The Forest Service failed to reinitiate consultation over effects to bull trout and its critical habitat from road-related activities, despite the agency’s multiple failures to implement key aspects of the 2016 Chilly James BiOp, 2015 Roads Programmatic BiOp, 2010 Amendment 19 BiOp, 2004 Robert-Wedge BiOp, 2004 West Side BiOp, 2002 Moose BiOp, and 2002 Spotted Beetle BiOp. The resulting culvert failures show that effects to bull trout and its critical habitat from the road-related activities are greater than what was considered in those BiOps. 50 C.F.R. § 402.16(c). In addition, the Forest Service failed to reinitiate consultation over effects to bull trout and its critical habitat from its road-related activities despite new information since completion of those BiOps show that effects to bull trout and its critical habitat from the road-related activities are greater than what was considered in those BiOps. 50 C.F.R. § 402.16(b).
3. The Forest Service is in violation of Section 7(d) of the ESA by adopting changes to and implementing the road-related activities and reduced culvert monitoring before adequate and lawful consultation is complete. Such actions constitute an “irreversible and irretrievable commitment of resources” and warrant an injunction. See 16 U.S.C. §1536(d).

WildEarth Guardians, Swan View Coalition, and Friends of the Wild Swan will initiate litigation over the Forest Service’s ESA violations unless the Forest Service consults, or reinitiates consultation, on the modifications to the culvert monitoring plans. Further, reinitiation of consultation is not sufficient to cure these violations of the ESA. Rather, the Forest Service must complete the Section

7 consultation process after reinitiation has been initiated.

For the above stated reasons, the Forest Service has violated and remains in ongoing violation of the ESA. The 60-day notice requirement is intended to provide you an opportunity to correct the actions in violation of the ESA.

We appreciate your consideration of the ESA violations outlined in this notice and hope that you will take action to resolve them. Please contact me if the Forest Service or FWS is interested in meeting, or if you have any questions or concerns regarding this notice of intent to sue.

Sincerely,

Marla Fox, Rewilding Attorney
WildEarth Guardians

cc: Jeff Sessions, U.S. Attorney General

Attachments

Attachment A: The Wilderness Society, *Transportation Infrastructure and Access on National Forests and Grasslands: A Literature Review* (May 2014).

Attachment B: Phone Log 11/17/06 (Dan Brewer, FWS and Steve Phillips, Forest Service).

Attachment C: Meeting notes Seeley Lake 11/30/06 T&C Reporting.

Attachment D: Maps of bull trout critical habitat, Flathead National Forest roads, barriers, and gates by Ranger District.

Attachment E: K. Hammer, *Roads to Ruin: The Flathead National Forest Shirks Its Road Reclamation Duties* (May 2016).

Attachment F: Pre Meeting Notes: By Dan Brewer. For the meeting with Steve Phillips of the Flathead National Forest (Seeley Lake Ranger District 11/30/06).

Attachment G: Luce, C. H., J. T. Abatzoglou, and Z. A. Holden. 2013. The Missing Mountain Water: Slower Westerlies Decrease Orographic Enhancement in the Pacific Northwest USA. *Science* 342: 1360-1364.

Attachment H: Isaak, D. J., *et al.* 2016. Slow climate velocities of mountain streams portend their role as refugia for cold-water biodiversity. *Proc Natl Acad Sci*, DOI: 10.1073/pnas.1522429113.

Attachment I: Auerbach, N. A., K. A. Wilson, A. I. T. Tulloch, J. R. Rhodes, J. O. Hanson, and H. P. Possingham. 2015. Effects of threat management interactions on conservation priorities. *Conservation Biology* 29:1626-1635.

Attachment J: Barnas, K. A., *et al.* 2015. Is habitat restoration targeting relevant ecological needs for endangered species? Using Pacific Salmon as a case study. *Ecosphere* 6(7), art 110.

Attachment K: Meyer, K.A. *et al.* 2014. Bull trout trends in abundance and probabilities of persistence in Idaho. *North American Journal of Fisheries Management* 34:202-214.

Attachment L: Wilcox, T. M. *et al.* 2014. A blocking primer increases specificity in environmental DNA detection of bull trout (*Salvelinus confluentus*). *Conservation Genetics Resources* 6:283-284.



**Transportation Infrastructure and Access on National Forests and Grasslands
A Literature Review
May 2014**

Introduction

The Forest Service transportation system is very large with 374,883 miles (603,316 km) of system roads and 143,346 miles (230,693 km) of system trails. The system extends broadly across every national forest and grasslands and through a variety of habitats, ecosystems and terrains. An impressive body of scientific literature exists addressing the various effects of roads on the physical, biological and cultural environment – so much so, in the last few decades a new field of “road ecology” has emerged. In recent years, the scientific literature has expanded to address the effects of roads on climate change adaptation and conversely the effects of climate change on roads, as well as the effects of restoring lands occupied by roads on the physical, biological and cultural environments.

The following literature review summarizes the most recent thinking related to the environmental impacts of forest roads and motorized routes and ways to address them. The literature review is divided into three sections that address the environmental effects of transportation infrastructure on forests, climate change and infrastructure, and creating sustainable forest transportation systems.

- I. [Impacts of Transportation Infrastructure and Access to the Ecological Integrity of Terrestrial and Aquatic Ecosystems and Watersheds](#)
- II. [Climate Change and Transportation Infrastructure Including the Value of Roadless Areas for Climate Change Adaptation](#)
- III. [Sustainable Transportation Management in National Forests as Part of Ecological Restoration](#)

I. Impacts of Transportation Infrastructure and Access to the Ecological Integrity of Terrestrial and Aquatic Ecosystems and Watersheds

It is well understood that transportation infrastructure and access management impact aquatic and terrestrial environments at multiple scales, and, in general, the more roads and motorized routes the greater the impact. In fact, in the past 20 years or so, scientists have realized the magnitude and breadth of ecological issues related to roads; entire books have been written on the topic, e.g., Forman et al. (2003), and a new scientific field called “road ecology” has emerged. Road ecology research centers have been created including the Western

Transportation Institute at Montana State University and the Road Ecology Center at the University of California - Davis.¹

Below, we provide a summary of the current understanding on the impacts of roads and access allowed by road networks to terrestrial and aquatic ecosystems, drawing heavily on Gucinski et al. (2000). Other notable recent peer-reviewed literature reviews on roads include Trombulak and Frissell (2000), Switalski et al. (2004), Coffin (2007), Fahrig and Rytwinski (2009), and Robinson et al. (2010). Recent reviews on the impact of motorized recreation include Joslin and Youmans (1999), Gaines et al. (2003), Davenport and Switalski (2006), Ouren et al. (2007), and Switalski and Jones (2012). These peer-reviewed summaries provide additional information to help managers develop more sustainable transportation systems

Impact on geomorphology and hydrology

The construction or presence of forest roads can dramatically change the hydrology and geomorphology of a forest system leading to reductions in the quantity and quality of aquatic habitat. While there are several mechanisms that cause these impacts (Wemple et al. 2001 , Figure 1), most fundamentally, compacted roadbeds reduce rainfall infiltration, intercepting and concentrating water, and providing a ready source of sediment for transport (Wemple et al. 1996, Wemple et al. 2001). In fact, roads contribute more sediment to streams than any other land management activity (Gucinski et al. 2000). Surface erosion rates from roads are typically at least an order of magnitude greater than rates from harvested areas, and three orders of magnitude greater than erosion rates from undisturbed forest soils (Endicott 2008).

¹ See <http://www.westerntransportationinstitute.org/research/roadecology> and <http://roadecology.ucdavis.edu/>

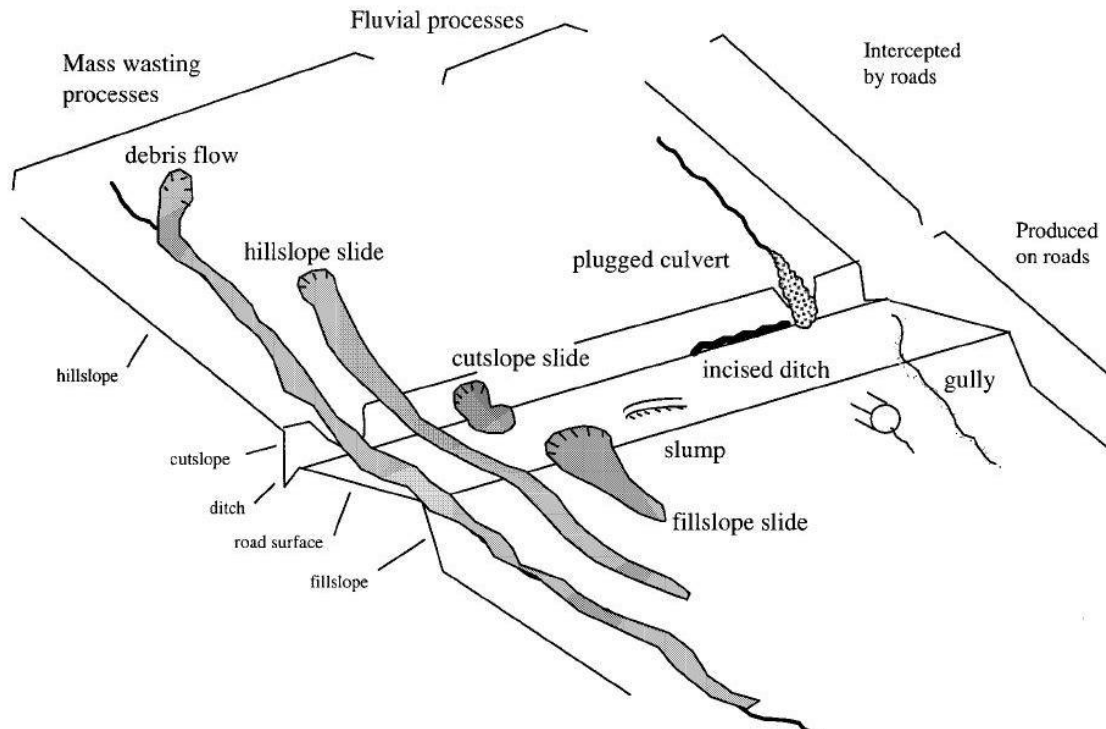


Figure 1: Typology of erosional and depositional features produced by mass-wasting and fluvial processes associated with forest roads (reprinted from Wemple et al. 2001)

Erosion of sediment from roads occurs both chronically and catastrophically. Every time it rains, sediment from the road surface and from cut- and fill-slopes is picked up by rainwater that flows into and on roads (fluvial erosion). The sediment that is entrained in surface flows are often concentrated into road ditches and culverts and directed into streams. The degree of fluvial erosion varies by geology and geography, and increases with increased motorized use (Robichaud et al. 2010). Closed roads produce less sediment, and Foltz et al. (2009) found a significant increase in erosion when closed roads were opened and driven upon.

Roads also precipitate catastrophic failures of road beds and fills (mass wasting) during large storm events leading to massive slugs of sediment moving into waterways (Endicott 2008; Gucinski et al. 2000). This typically occurs when culverts are undersized and cannot handle the volume of water, or they simply become plugged with debris. The saturated roadbed can fail entirely and result in a landslide, or the blocked stream crossing can erode the entire fill down to the original stream channel.

The erosion of road- and trail-related sediment and its subsequent movement into stream systems affects the geomorphology of the drainage system in a number of ways. The magnitude of their effects varies by climate, geology, road age, construction / maintenance practices and storm history. It directly alters channel morphology by embedding larger gravels as well as filling pools. It can also have the opposite effect of increasing peak discharges and scouring channels, which can lead to disconnection of the channel and floodplain, and lowered base flows (Furniss et al. 1991; Joslin and Youmans 1999). The width/depth ratio of the stream changes which then can trigger changes in water temperature, sinuosity and other geomorphic factors important for aquatic species survival (Joslin and Youmans 1999; Trombulak and Frissell 2000).

Roads also can modify flowpaths in the larger drainage network. Roads intercept subsurface flow as well as concentrate surface flow, which results in new flowpaths that otherwise would not exist, and the extension of the drainage network into previously unchannelized portions of the hillslope (Gucinski et al. 2000; Joslin and Youmans 1999). Severe aggradation of sediment at stream structures or confluences can force streams to actually go subsurface or make them too shallow for fish passage (Endicott 2008; Furniss et al. 1991).

Impacts on aquatic habitat and fish

Roads can have dramatic and lasting impacts on fish and aquatic habitat. Increased sedimentation in stream beds has been linked to decreased fry emergence, decreased juvenile densities, loss of winter carrying capacity, and increased predation of fishes, and reductions in macro-invertebrate populations that are a food source to many fish species (Rhodes et al. 1994, Joslin and Youmans 1999, Gucinski et al. 2000, Endicott 2008). On a landscape scale, these effects can add up to: changes in the frequency, timing and magnitude of disturbance to aquatic habitat and changes to aquatic habitat structures (e.g., pools, riffles, spawning gravels and in-channel debris), and conditions (food sources, refugi, and water temperature) (Gucinski et al. 2000).

Roads can also act as barriers to migration (Gucinski et al. 2000). Where roads cross streams, road engineers usually place culverts or bridges. Culverts in particular can and often interfere with sediment transport and channel processes such that the road/stream crossing becomes a barrier for fish and aquatic species movement up and down stream. For instance, a culvert may scour on the downstream side of the crossing, actually forming a waterfall up which fish cannot move. Undersized culverts and bridges can infringe upon the channel or floodplain and trap sediment causing the stream to become too shallow and/or warm such that fish will not migrate past the structure. This is problematic for many aquatic species but especially for anadromous species that must migrate upstream to spawn. Well-known native aquatic species affected by roads include salmon such as coho (*Oncorhynchus kisutch*), chinook (*O. tshawytscha*), and chum (*O. keta*); steelhead (*O. mykiss*); and a variety of trout species including bull trout (*Salvelinus confluentus*) and cutthroat trout (*O. clarki*), as well as other native fishes and amphibians (Endicott 2008).

Impacts on terrestrial habitat and wildlife

Roads and trails impact wildlife through a number of mechanisms including: direct mortality (poaching, hunting/trapping) changes in movement and habitat use patterns (disturbance/avoidance), as well as indirect impacts including alteration of the adjacent habitat and interference with predatory/prey relationships (Wisdom et al. 2000, Trombulak and Frissell 2000). Some of these impacts result from the road itself, and some result from the uses on and around the roads (access). Ultimately, roads have been found to reduce the abundance and distribution of several forest species (Fayrig and Ritwinski 2009, Benítez-López et al. 2010).

Table 1: Road- and recreation trail-associated factors for wide-ranging carnivores (Reprinted from Gaines et al. (2003)²

² For a list of citations see Gaines et al. (2003)

Focal species	Road-associated factors	Motorized trail-associated factors	Nonmotorized trail-associated factors
Grizzly bear	Poaching	Poaching	Poaching
	Collisions	Negative human interactions	Negative human interactions
	Negative human interactions	Displacement or avoidance	Displacement or avoidance
	Displacement or avoidance		
Lynx	Down log reduction	Disturbance at a specific site	Disturbance at a specific site
	Trapping	Trapping	
	Collisions		
	Disturbance at a specific site		
Gray wolf	Trapping	Trapping	Trapping
	Poaching	Disturbance at a specific site	Disturbance at a specific site
	Collisions		
	Negative human interactions		
	Disturbance at a specific site		
Wolverine	Displacement or avoidance		
	Down log reduction	Trapping	Trapping
	Trapping	Disturbance at a specific site	Disturbance at a specific site
	Disturbance at a specific site		
	Collisions		

Direct mortality and disturbance from road and trail use impacts many different types of species. For example, wide-ranging carnivores can be significantly impacted by a number of factors including trapping, poaching, collisions, negative human interactions, disturbance and displacement (Gaines et al. 2003, Table 1). Hunted game species such as elk (*Cervus canadensis*), become more vulnerable from access allowed by roads and motorized trails resulting in a reduction in effective habitat among other impacts (Rowland et al. 2005, Switalski and Jones 2012). Slow-moving migratory animals such as amphibians, and reptiles who use roads to regulate temperature are also vulnerable (Gucinski et al. 2000, Brehme et al. 2013).

Habitat alteration is a significant consequence of roads as well. At the landscape scale, roads fragment habitat blocks into smaller patches that may not be able to support successfully interior forest species. Smaller habitat patches also results in diminished genetic variability, increased inbreeding, and at times local extinctions (Gucinski et al. 2000; Trombulak and Frissell 2000). Roads also change the composition and structure of ecosystems along buffer zones, called edge-affected zones. The width of edge-affected zones varies by what metric is being discussed; however, researchers have documented road-avoidance zones a kilometer or more away from a road (Table 2). In heavily roaded landscapes, edge-affected acres can be a significant fraction of total acres. For example, in a landscape area where the road density is 3 mi/mi² (not an uncommon road density in national forests) and where the edge-affected zone is estimated to be 500 ft from the center of the road to each side, the edge-affected zone is 56% of the total acreage.

Table 2: A summary of some documented road-avoidance zones for various species (adapted from Robinson et al. 2010).

Species	Avoidance zone		Reference
	m (ft)	Type of disturbance	
Snakes	650 (2133)	Forestry roads	Bowles (1997)
Salamander	35 (115)	Narrow forestry road, light traffic	Semlitsch (2003)
Woodland birds	150 (492)	Unpaved roads	Ortega and Capen (2002)
Spotted owl	400 (1312)	Forestry roads, light traffic	Wasser et al. (1997)
Marten	<100 (<328)	Any forest opening	Hargis et al. (1999)
Elk	500–1000 (1640-3281)	Logging roads, light traffic	Edge and Marcum (1985)
	100–300 (328-984)	Mountain roads depending on traffic volume	Rost and Bailey (1979)
Grizzly bear	3000 (9840)	Fall	Mattson et al. (1996)
	500 (1640)	Spring and summer	
	883 (2897)	Heavily traveled trail	Kasworm and Manley (1990)
	274 (899)	Lightly traveled trail	
	1122 (3681)	Open road	Kasworm and Manley (1990)
Black bear	665 (2182)	Closed road	
	274 (899)	Spring, unpaved roads	Kasworm and Manley (1990)
	914 (2999)	Fall, unpaved roads	

Roads and trails also affect ecosystems and habitats because they are also a major vector of non-native plant and animal species. This can have significant ecological and economic impacts when the invading species are aggressive and can overwhelm or significantly alter native species and systems. In addition, roads can increase harassment, poaching and collisions with vehicles, all of which lead to stress or mortality (Wisdom et al. 2000).

Recent reviews have synthesized the impacts of roads on animal abundance and distribution. Fahrig and Rytwinski (2009) did a complete review of the empirical literature on effects of roads and traffic on animal abundance and distribution looking at 79 studies that addressed 131 species and 30 species groups. They found that the number of documented negative effects of roads on animal abundance outnumbered the number of positive effects by a factor of 5. Amphibians, reptiles, most birds tended to show negative effects. Small mammals generally showed either positive effects or no effect, mid-sized mammals showed either negative effects or no effect, and large mammals showed predominantly negative effects. Benítez-López et al. (2010) conducted a meta-analysis on the effects of roads and infrastructure proximity on mammal and bird populations. They found a significant pattern of avoidance and a reduction in bird and mammal populations in the vicinity of infrastructure.

Road density³ thresholds for fish and wildlife

³ We intend the term “road density” to refer to the density all roads within national forests, including system roads, closed roads, non-system roads administered by other jurisdictions (private, county, state), temporary roads and motorized trails. Please see Attachment 2 for the relevant existing scientific information supporting this approach.

It is well documented that beyond specific road density thresholds, certain species will be negatively affected, and some will be extirpated. Most studies that look into the relationship between road density and wildlife focus on the impacts to large endangered carnivores or hunted game species, although high road densities certainly affect other species – for instance, reptiles and amphibians. Gray wolves (*Canis lupus*) in the Great Lakes region and elk in Montana and Idaho have undergone the most long-term and in depth analysis. Forman and Hersperger (1996) found that in order to maintain a naturally functioning landscape with sustained populations of large mammals, road density must be below 0.6 km/km² (1.0 mi/mi²). Several studies have since substantiated their claim (Robinson et al. 2010, Table 3).

A number of studies at broad scales have also shown that higher road densities generally lead to greater impacts to aquatic habitats and fish density (Table 3). Carnefix and Frissell (2009) provide a concise review of studies that correlate cold water fish abundance and road density, and from the cited evidence concluded that “1) no truly “safe” threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km/km² (1.0 mi/mi²) or less” (p. 1).

Table 3: A summary of some road-density thresholds and correlations for terrestrial and aquatic species and ecosystems (reprinted from Robinson et al. 2010).

Species (Location)	Road density (mean, guideline, threshold, correlation)	Reference
Wolf (Minnesota)	0.36 km/km ² (mean road density in primary range); 0.54 km/km ² (mean road density in peripheral range)	Mech et al. (1988)
Wolf	>0.6 km/km ² (absent at this density)	Jalkotzy et al. (1997)
Wolf (Northern Great Lakes region)	>0.45 km/km ² (few packs exist above this threshold); >1.0 km/km ² (no pack exist above this threshold)	Mladenoff et al. (1995)
Wolf (Wisconsin)	0.63 km/km ² (increasing due to greater human tolerance)	Wydeven et al. (2001)
Wolf, mountain lion (Minnesota, Wisconsin, Michigan)	0.6 km/km ² (apparent threshold value for a naturally functioning landscape containing sustained populations)	Thiel (1985); van Dyke et al. (1986); Jensen et al. (1986); Mech et al. (1988); Mech (1989)
Elk (Idaho)	1.9 km/km ² (density standard for habitat effectiveness)	Woodley 2000 cited in Beazley et al. 2004
Elk (Northern US)	1.24 km/km ² (habitat effectiveness decline by at least 50%)	Lyon (1983)
Elk, bear, wolverine, lynx, and others	0.63 km/km ² (reduced habitat security and increased mortality)	Wisdom et al. (2000)
Moose (Ontario)	0.2-0.4 km/km ² (threshold for pronounced response)	Beyer et al. (2013)
Grizzly bear (Montana)	>0.6 km/km ²	Mace et al. (1996); Mattson et al. (1996)
Black bear (North Carolina)	>1.25 km/km ² (open roads); >0.5 km/km ² (logging roads); (interference with use of habitat)	Brody and Pelton (1989)
Black bear	0.25 km/km ² (road density should not exceed)	Jalkotzy et al. (1997)
Bobcat (Wisconsin)	1.5 km/km ² (density of all road types in home range)	Jalkotzy et al. (1997)

Large mammals	>0.6 km/km ² (apparent threshold value for a naturally functioning landscape containing sustained populations)	Forman and Hersperger (1996)
Bull trout (Montana)	Inverse relationship of population and road density	Rieman et al. (1997); Baxter et al. (1999)
Fish populations (Medicine Bow National Forest)	(1) Positive correlation of numbers of culverts and stream crossings and amount of fine sediment in stream channels (2) Negative correlation of fish density and numbers of culverts	Eaglin and Hubert (1993) cited in Gucinski et al. (2001)
Macroinvertebrates	Species richness negatively correlated with an index of road density	McGurk and Fong (1995)
Non-anadromous salmonids (Upper Columbia River basin)	(1) Negative correlation likelihood of spawning and rearing and road density (2) Negative correlation of fish density and road density	Lee et al. (1997)

Where both stream and road densities are high, the incidence of connections between roads and streams can also be expected to be high, resulting in more common and pronounced effects of roads on streams (Gucinski et al. 2000). For example, a study on the Medicine Bow National Forest (WY) found as the number of culverts and stream crossings increased, so did the amount of sediment in stream channels (Eaglin and Hubert 1993). They also found a negative correlation with fish density and the number of culverts. Invertebrate communities can also be impacted. McGurk and Fong (1995) report a negative correlation between an index of road density with macroinvertebrate diversity.

The U.S. Fish and Wildlife Service's Final Rule listing bull trout as threatened (USDI Fish and Wildlife Service 1999) addressed road density, stating:

"... assessment of the interior Columbia Basin ecosystem revealed that increasing road densities were associated with declines in four non-anadromous salmonid species (bull trout, Yellowstone cutthroat trout, westslope cutthroat trout, and redband trout) within the Columbia River Basin, likely through a variety of factors associated with roads (Quigley & Arbelbide 1997). Bull trout were less likely to use highly roaded basins for spawning and rearing, and if present, were likely to be at lower population levels (Quigley and Arbelbide 1997). Quigley et al. (1996) demonstrated that when average road densities were between 0.4 to 1.1 km/km² (0.7 and 1.7 mi/mi²) on USFS lands, the proportion of subwatersheds supporting "strong" populations of key salmonids dropped substantially. Higher road densities were associated with further declines" (USDI Fish and Wildlife Service 1999, p. 58922).

Anderson et al. (2012) also showed that watershed conditions tend to be best in areas protected from road construction and development. Using the US Forest Service's Watershed Condition Framework assessment data, they showed that National Forest lands that are protected under the Wilderness Act, which provides the strongest safeguards, tend to have the healthiest watersheds. Watersheds in Inventoried Roadless Areas – which are protected from road building and logging by the Roadless Area Conservation Rule – tend to be less healthy than watersheds in designated Wilderness, but they are considerably healthier than watersheds in the managed landscape.

Impacts on other resources

Roads and motorized trails also play a role in affecting wildfire occurrence. Research shows that human-ignited wildfires, which account for more than 90% of fires on national lands, is almost five times more likely in areas with roads (USDA Forest Service 1996a; USDA Forest Service 1998). Furthermore, Baxter (2002) found that off-road vehicles (ORVs) can be a significant source of fire ignitions on forestlands. Roads can affect where and how forests burn and, by extension, the vegetative condition of the forest. See Attachment 1 for more information documenting the relationship between roads and wildfire occurrence.

Finally, access allowed by roads and trails can increase of ORV and motorized use in remote areas threatening archaeological and historic sites. Increased visitation has resulted in intentional and unintentional damage to many cultural sites (USDI Bureau of Land Management 2000, Schiffman 2005).

II. Climate Change and Transportation Infrastructure including the value of roadless areas for climate change adaptation

As climate change impacts grow more profound, forest managers must consider the impacts on the transportation system as well as from the transportation system. In terms of the former, changes in precipitation and hydrologic patterns will strain infrastructure at times to the breaking point resulting in damage to streams, fish habitat, and water quality as well as threats to public safety. In terms of the latter, the fragmenting effect of roads on habitat will impede the movement of species which is a fundamental element of adaptation. Through planning, forest managers can proactively address threats to infrastructure, and can actually enhance forest resilience by removing unneeded roads to create larger patches of connected habitat.

Impact of climate change and roads on transportation infrastructure

It is expected that climate change will be responsible for more extreme weather events, leading to increasing flood severity, more frequent landslides, changing hydrographs (peak, annual mean flows, etc.), and changes in erosion and sedimentation rates and delivery processes. Roads and trails in national forests, if designed by an engineering standard at all, were designed for storms and water flows typical of past decades, and hence may not be designed for the storms in future decades. Hence, climate driven changes may cause transportation infrastructure to malfunction or fail (ASHTO 2012, USDA Forest Service 2010). The likelihood is higher for facilities in high-risk settings—such as rain-on-snow zones, coastal areas, and landscapes with unstable geology (USDA Forest Service 2010).

Forests fragmented by roads will likely demonstrate less resistance and resilience to stressors, like those associated with climate change (Noss 2001). First, the more a forest is fragmented (and therefore the higher the edge/interior ratio), the more the forest loses its inertia characteristic, and becoming less resilient and resistant to climate change. Second, the more a forest is fragmented characterized by isolated patches, the more likely the fragmentation will interfere with the ability of species to track shifting climatic conditions over time and space. Noss (2001) predicts that weedy species with effective dispersal mechanisms might benefit from fragmentation at the expense of native species.

Modifying infrastructure to increase resilience

To prevent or reduce road failures, culvert blow-outs, and other associated hazards, forest managers will need to take a series of actions. These include replacing undersized culverts with larger ones, prioritizing maintenance and upgrades (e.g., installing drivable dips and more outflow structures), and obliterating roads that are no longer needed and pose erosion hazards (USDA Forest Service 2010, USDA Forest Service 2012a, USDA Forest Service 2011, Table 4).

Olympic National Forest has developed a number of documents oriented at protecting watershed health and species in the face of climate change, including a 2003 travel management strategy and a report entitled *Adapting to Climate Change in Olympic National Park and National Forest*. In the travel management strategy, Olympic National Forest recommended that 1/3rd of its road system be decommissioned and obliterated (USDA Forest Service 2011a). In addition, the plan called for addressing fish migration barriers in a prioritized and strategic way – most of these are associated with roads. The report calls for road decommissioning, relocation of roads away from streams, enlarging culverts as well as replacing culverts with fish-friendly crossings (USDA Forest Service 2011a, Table 4).

Table 4: Current and expected sensitivities of fish to climate change on the Olympic Peninsula, associated adaptation strategies and action for fisheries and fish habitat management and relevant to transportation management at Olympic National Forest and Olympic National Park (excerpt reprinted from USDA Forest Service 2011a).

Current and expected sensitivities	Adaptation strategies and actions
Changes in habitat quantity and quality	<ul style="list-style-type: none"> • Implement habitat restoration projects that focus on re-creating watershed processes and functions and that create diverse, resilient habitat.
Increase in culvert failures, fill-slope failures, stream adjacent road failures, and encroachment from stream-adjacent road segments	<ul style="list-style-type: none"> • Decommission unneeded roads. • Remove sidecast, improve drainage, and increase culvert sizing on remaining roads. • Relocate stream-adjacent roads.
Greater difficulty disconnecting roads from stream channels	<ul style="list-style-type: none"> • Design more resilient stream crossing structures.
Major changes in quantity and timing of streamflow in transitional watersheds	<ul style="list-style-type: none"> • Make road and culvert designs more conservative in transitional watersheds to accommodate expected changes.
Decrease in area of headwater streams	<ul style="list-style-type: none"> • Continue to correct culvert fish passage barriers. • Consider re-prioritizing culvert fish barrier correction projects.
Decrease in habitat quantity and connectivity for species that use headwater streams	<ul style="list-style-type: none"> • Restore habitat in degraded headwater streams that are expected to retain adequate summer streamflow (ONF).

In December 2012, the USDA Forest Service published a report entitled “Assessing the Vulnerability of Watersheds to Climate Change.” This document reinforces the concept expressed by Olympic National Forest that forest managers need to be proactive in reducing erosion potential from roads:

“Road improvements were identified as a key action to improve condition and resilience of watersheds on all the pilot Forests. In addition to treatments that reduce erosion, road improvements can reduce the delivery of runoff from road segments to channels, prevent diversion of flow during large events, and restore aquatic habitat connectivity by providing for passage of aquatic organisms. As stated previously, watershed sensitivity is determined by both inherent and management-related factors. Managers have no control over the inherent factors, so to improve resilience, efforts must be directed at anthropogenic influences such as instream flows, roads, rangeland, and vegetation management....

[Watershed Vulnerability Analysis] results can also help guide implementation of travel management planning by informing priority setting for decommissioning roads and road reconstruction/maintenance. As with the Ouachita NF example, disconnecting roads from the stream network is a key objective of such work. Similarly, WVA analysis could also help prioritize aquatic organism passage projects at road-stream crossings to allow migration by aquatic residents to suitable habitat as streamflow and temperatures change” (USDA Forest Service 2012a, p. 22-23).

Reducing fragmentation to enhance aquatic and terrestrial species adaptation

Decommissioning and upgrading roads and thus reducing the amount of fine sediment deposited on salmonid nests can increase the likelihood of egg survival and spawning success (McCaffery et al. 2007). In addition, this would reconnect stream channels and remove barriers such as culverts. Decommissioning roads in riparian areas may provide further benefits to salmon and other aquatic organisms by permitting reestablishment of streamside vegetation, which provides shade and maintains a cooler, more moderated microclimate over the stream (Battin et al. 2007).

One of the most well documented impacts of climate change on wildlife is a shift in the ranges of species (Parmesan 2006). As animals migrate, landscape connectivity will be increasingly important (Holman et al. 2005). Decommissioning roads in key wildlife corridors will improve connectivity and be an important mitigation measure to increase resiliency of wildlife to climate change. For wildlife, road decommissioning can reduce the many stressors associated with roads. Road decommissioning restores habitat by providing security and food such as grasses and fruiting shrubs for wildlife (Switalski and Nelson 2011).

Forests fragmented by roads and motorized trail networks will likely demonstrate less resistance and resilience to stressors, such as weeds. As a forest is fragmented and there is more edge habitat, Noss (2001) predicts that weedy species with effective dispersal mechanisms will increasingly benefit at the expense of native species. However, decommissioned roads when seeded with native species can reduce the spread of invasive species (Grant et al. 2011), and help restore fragmented forestlands. Off-road vehicles with large knobby tires and large undercarriages are also a key vector for weed spread (e.g., Rooney 2006). Strategically closing and decommissioning motorized routes, especially in roadless areas, will reduce the spread of weeds on forestlands (Gelbard and Harrison 2003).

Transportation infrastructure and carbon sequestration

The topic of the relationship of road restoration and carbon has only recently been explored. There is the potential for large amounts of carbon (C) to be sequestered by reclaiming roads. When roads are decompacted during reclamation, vegetation and soils can develop more

rapidly and sequester large amounts of carbon. A recent study estimated total soil C storage increased 6 fold to $6.5 \times 10^7 \text{ g C/km}$ (to 25 cm depth) in the northwestern US compared to untreated abandoned roads (Lloyd et al. 2013). Another recent study concluded that reclaiming 425 km of logging roads over the last 30 years in Redwood National Park in Northern California resulted in net carbon savings of 49,000 Mg carbon to date (Madej et al. 2013, Table 5).

Kerekvliet et al. (2008) published a Wilderness Society briefing memo on the impact to carbon sequestration from road decommissioning. Using Forest Service estimates of the fraction of road miles that are unneeded, the authors calculated that restoring 126,000 miles of roads to a natural state would be equivalent to revegetating an area larger than Rhode Island. In addition, they calculate that the net economic benefit of road treatments are always positive and range from US\$0.925-1.444 billion.

Table 5. Carbon budget implications in road decommissioning projects (reprinted from Madej et al. 2013).

Road Decommissioning Activities and Processes	Carbon Cost	Carbon Savings
Transportation of staff to restoration sites (fuel emissions)	X	
Use of heavy equipment in excavations (fuel emissions)	X	
Cutting trees along road alignment during hillslope recontouring	X	
Excavation of road fill from stream crossings		X
Removal of road fill from unstable locations		X
Reduces risk of mass movement		X
Post-restoration channel erosion at excavation sites	X	
Natural revegetation following road decompaction		X
Replanting trees		X
Soil development following decompaction		X

Benefits of roadless areas and roadless area networks to climate change adaptation

Undeveloped natural lands provide numerous ecological benefits. They contribute to biodiversity, enhance ecosystem representation, and facilitate connectivity (Loucks et al. 2003; Crist and Wilmer 2002, Wilcove 1990, The Wilderness Society 2004, Strittholt and Dellasala 2001, DeVelice and Martin 2001), and provide high quality or undisturbed water, soil and air (Anderson et al. 2012, Dellasalla et al. 2011). They also can serve as ecological baselines to help us better understand our impacts to other landscapes, and contribute to landscape resilience to climate change.

Forest Service roadless lands, in particular, are heralded for the conservation values they provide. These are described at length in the preamble of the Roadless Area Conservation Rule (RACR)⁴ as well as in the Final Environmental Impact Statement (FEIS) for the RACR⁵, and

⁴ Federal Register .Vol. 66, No. 9. January 12, 2001. Pages 3245-3247.

include: high quality or undisturbed soil, water, and air; sources of public drinking water; diversity of plant and animal communities; habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; primitive, semi-primitive non- motorized, and semi-primitive motorized classes of dispersed recreation; reference landscapes; natural appearing landscapes with high scenic quality; traditional cultural properties and sacred sites; and other locally identified unique characteristics (e.g., include uncommon geological formations, unique wetland complexes, exceptional hunting and fishing opportunities).

The Forest Service, National Park Service, and US Fish and Wildlife Service recognize that protecting and connecting roadless or lightly roaded areas is an important action agencies can take to enhance climate change adaptation. For example, the Forest Service National Roadmap for Responding to Climate Change (USDA Forest Service 2011b) establishes that increasing connectivity and reducing fragmentation are short and long term actions the Forest Service should take to facilitate adaptation to climate change.⁶ The National Park Service also identifies connectivity as a key factor for climate change adaptation along with establishing “blocks of natural landscape large enough to be resilient to large-scale disturbances and long-term changes” and other factors. The agency states that: “The success of adaptation strategies will be enhanced by taking a broad approach that identifies connections and barriers across the landscape. Networks of protected areas within a larger mixed landscape can provide the highest level of resilience to climate change.”⁷ Similarly, the National Fish, Wildlife and Plants Climate Adaptation Partnership’s Adaptation Strategy (2012) calls for creating an ecologically-connected network of conservation areas.⁸

⁵ Final Environmental Impact Statement, Vol. 1, 3–3 to 3–7

⁶ Forest Service, 2011. *National Roadmap for Responding to Climate Change*. US Department of Agriculture. FS-957b. Page 26.

⁷ National Park Service. *Climate Change Response Program Brief*. <http://www.nature.nps.gov/climatechange/adaptationplanning.cfm>. Also see: National Park Service, 2010. *Climate Change Response Strategy*. http://www.nature.nps.gov/climatechange/docs/NPS_CCRS.pdf. Objective 6.3 is to “Collaborate to develop cross-jurisdictional conservation plans to protect and restore connectivity and other landscape-scale components of resilience.”

⁸ See <http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Chapter-3.pdf>. Pages 55- 59. The first goal and related strategies are:

Goal 1: Conserve habitat to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate.

Strategy 1.1: identify areas for an ecologically-connected network of terrestrial, freshwater, coastal, and marine conservation areas that are likely to be resilient to climate change and to support a broad range of fish, wildlife, and plants under changed conditions.

Strategy 1.2: Secure appropriate conservation status on areas identified in Strategy 1.1 to complete an ecologically-connected network of public and private conservation areas that will be resilient to climate change and support a broad range of species under changed conditions.

Strategy 1.4: Conserve, restore, and as appropriate and practicable, establish new ecological connections among conservation areas to facilitate fish, wildlife, and plant migration, range shifts, and other transitions caused by climate change.

Crist and Wilmer (2002) looked at the ecological value of roadless lands in the Northern Rockies and found that protection of national forest roadless areas, when added to existing federal conservation lands in the study area, would 1) increase the representation of virtually all land cover types on conservation lands at both the regional and ecosystem scales, some by more than 100%; 2) help protect rare, species-rich, and often-declining vegetation communities; and 3) connect conservation units to create bigger and more cohesive habitat “patches.”

Roadless lands also are responsible for higher quality water and watersheds. Anderson et al. (2012) assessed the relationship of watershed condition and land management status and found a strong spatial association between watershed health and protective designations. Dellasalla et al. (2011) found that undeveloped and roadless watersheds are important for supplying downstream users with high-quality drinking water, and developing these watersheds comes at significant costs associated with declining water quality and availability. The authors recommend a light-touch ecological footprint to sustain the many values that derive from roadless areas including healthy watersheds.

III. Sustainable Transportation Management in National Forests as Part of Ecological Restoration

At 375,000 miles strong, the Forest Service road system is one of the largest in the world – it is eight times the size of the National Highway System. It is also indisputably unsustainable – that is, roads are not designed, located, or maintained according to best management practices, and environmental impacts are not minimized. It is largely recognized that forest roads, especially unpaved ones, are a primary source of sediment pollution to surface waters (Endicott 2008, Gucinski et al. 2000), and that the system has about 1/3rd more miles than it needs (USDA Forest Service 2001). In addition, the majority of the roads were constructed decades ago when road design and management techniques did not meet current standards (Gucinski et al. 2000, Endicott 2008), making them more vulnerable to erosion and decay than if they had been designed today. Road densities in national forests often exceed accepted thresholds for wildlife.

Only a small portion of the road system is regularly used. All but 18% of the road system is inaccessible to passenger vehicles. Fifty-five percent of the roads are accessible only by high clearance vehicles and 27% are closed. The 18% that is accessible to cars is used for about 80% of the trips made within National Forests.⁹ Most of the road maintenance funding is directed to the passenger car roads, while the remaining roads suffer from neglect. As a result, the Forest Service currently has a \$3.7 billion road maintenance backlog that grows every year. In other words, only about 1/5th of the roads in the national forest system are used most of the time, and the fraction that is used often is the best designed and maintained because they are higher level access roads. The remaining roads sit generally unneeded and under-maintained – arguably a growing ecological and fiscal liability.

Current Forest Service management direction is to identify and implement a sustainable transportation system.¹⁰ The challenge for forest managers is figuring out what is a sustainable road system and how to achieve it – a challenge that is exacerbated by climate change. It is

⁹ USDA Forest Service. Road Management Website Q&As. Available online at http://www.fs.fed.us/eng/road_mgt/qanda.shtml.

¹⁰ See Forest Service directive memo dated March 29, 2012 entitled “Travel Management, Implementation of 36 CFR, Part 202, Subpart A (36 CFR 212.5(b))”

reasonable to define a sustainable transportation system as one where all the routes are constructed, located, and maintained with best management practices, and social and environmental impacts are minimized. This, of course, is easier said than done, since the reality is that even the best roads and trail networks can be problematic simply because they exist and usher in land uses that without the access would not occur (Trombulak and Frissell 2000, Carnefix and Frissell 2009, USDA Forest Service 1996b), and when they are not maintained to the designed level they result in environmental problems (Endicott 2008; Gucinski et al. 2000). Moreover, what was sustainable may no longer be sustainable under climate change since roads designed to meet older climate criteria may no longer hold up under new climate scenarios (USDA Forest Service 2010, USDA Forest Service 2011b, USDA Forest Service 2012a, AASHTO 2012).

Forest Service efforts to move toward a more sustainable transportation system

The Forest Service has made efforts to make its transportation system more sustainable, but still has considerable work to do. In 2001, the Forest Service tried to address the issue by promulgating the Roads Rule¹¹ with the purpose of working toward a sustainable road system (USDA 2001). The Rule directed every national forest to identify a minimum necessary road system and identify unneeded roads for decommissioning. To do this, the Forest Service developed the Roads Analysis Process (RAP), and published Gucinski et al. (2000) to provide the scientific foundation to complement the RAP. In describing the RAP, Gucinski et al. (2000) writes:

“Roads Analysis is intended to be an integrated, ecological, social, and economic approach to transportation planning. It uses a multiscale approach to ensure that the identified issues are examined in context. Roads Analysis is to be based on science. Analysts are expected to locate, correctly interpret, and use relevant existing scientific literature in the analysis, disclose any assumptions made during the analysis, and reveal the limitations of the information on which the analysis is based. The analysis methods and the report are to be subjected to critical technical review” (p. 10).

Most national forests have completed RAPs, although most only looked at passenger vehicle roads which account for less than 20% of the system’s miles. The Forest Service Washington Office in 2010 directed that forests complete a Travel Analysis Process (TAP) by the end of fiscal year 2015, which must address all roads and create a map and list of roads identifying which are likely needed and which are not. Completed TAPs will provide a blueprint for future road decommissioning and management, they will not constitute compliance with the Roads Rule, which clearly requires the identification of the minimum roads system and roads for decommissioning. Almost all forests have yet to comply with subpart A.

The Forest Service in 2005 then tried to address the off-road portion of this issue by promulgating subpart B of the Travel Management Rule,¹² with the purpose of curbing the most serious impacts associated with off-road vehicle use. Without a doubt, securing summer-time travel management plans was an important step to curbing the worst damage. However, much work remains to be done to approach sustainability, especially since many national forests used the travel management planning process to simply freeze the footprint of motorized routes, and did not try to re-design the system to make it more ecologically or socially sustainable. Adams

¹¹ 36 CFR 215 subpart A

¹² 36 CFR 212 subpart B

and McCool (2009) considered this question of how to achieve sustainable motorized recreation and concluded that:

As the agencies move to revise [off-road vehicle] allocations, they need to clearly define how they intend to locate routes so as to minimize impacts to natural resources and other recreationists in accordance with Executive Order 11644....¹³

...As they proceed with designation, the FS and BLM need to acknowledge that current allocations are the product of agency failure to act, not design. Ideally, ORV routes would be allocated as if the map were currently empty of ORV routes. Reliance on the current baseline will encourage inefficient allocations that likely disproportionately impact natural resources and non-motorized recreationists. While acknowledging existing use, the agencies need to do their best to imagine the best possible arrangement of ORV routes, rather than simply tinkering around the edges of the current allocations.¹⁴

The Forest Service only now is contemplating addressing the winter portion of the issue, forced by a lawsuit challenging the Forest Service's inadequate management of snowmobiles. The agency is expected to issue a third rule in the fall of 2014 that will trigger winter travel management planning.

Strategies for identifying a minimum road system and prioritizing restoration

Transportation Management plays an integral role in the restoration of Forestlands. Reclaiming and obliterating roads is key to developing a sustainable transportation system. Numerous authors have suggested removing roads 1) to restore water quality and aquatic habitats (Gucinski et al. 2000), and 2) to improve habitat security and restore terrestrial habitat (e.g., USDI USFWS 1993, Hebblewhite et al. 2009).

Creating a minimum road system through road removal will increase connectivity and decrease fragmentation across the entire forest system. However, at a landscape scale, certain roads and road segments pose greater risks to terrestrial and aquatic integrity than others. Hence, restoration strategies must focus on identifying and removing/mitigating the higher risk roads. Additionally, areas with the highest ecological values, such as being adjacent to a roadless area, may also be prioritized for restoration efforts. Several methods have been developed to help prioritize road reclamation efforts including GIS-based tools and best management practices (BMPs). It is our hope that even with limited resources, restoration efforts can be prioritized and a more sustainable transportation system created.

GIS-based tools

¹³ Recent court decisions have made it clear that the minimization requirements in the Executive Orders are not discretionary and that the Executive Orders are enforceable. See

- *Idaho Conservation League v. Guzman*, 766 F. Supp. 2d 1056 (D. Idaho 2011) (Salmon-Challis National Forest TMP).
- *The Wilderness Society v. U.S. Forest Service*, CV 08-363 (D. Idaho 2012) (Sawtooth-Minidoka district National Forest TMP).
- *Central Sierra Environmental Resource Center v. US Forest Service*, CV 10-2172 (E.D. CA 2012) (Stanislaus National Forest TMP).

¹⁴ Page 105.

Girvetz and Shilling (2003) developed a novel and inexpensive way to analyze environmental impacts from road systems using the Ecosystem Management Decision Support program (EMDS). EMDS was originally developed by the United States Forest Service, as a GIS-based decision support tool to conduct ecological analysis and planning (Reynolds 1999). Working in conjunction with Tahoe National Forest managers, Girvetz and Shilling (2003) used spatial data on a number of aquatic and terrestrial variables and modeled the impact of the forest's road network. The network analysis showed that out of 8233 km of road analyzed, only 3483 km (42%) was needed to ensure current and future access to key points. They found that the modified network had improved patch characteristics, such as significantly fewer "cherry stem" roads intruding into patches, and larger roadlessness.

Shilling et al. (2012) later developed a recreational route optimization model using a similar methodology and with the goal of identifying a sustainable motorized transportation system for the Tahoe National Forest (Figure 2). Again using a variety of environmental factors, the model identified routes with high recreational benefits, lower conflict, lower maintenance and management requirements, and lower potential for environmental impact operating under the presumption that such routes would be more sustainable and preferable in the long term. The authors combined the impact and benefit analyses into a recreation system analysis "that was effectively a cost-benefit accounting, consistent with requirements of both the federal Travel Management Rule (TMR) and the National Environmental Policy Act" (p. 392).

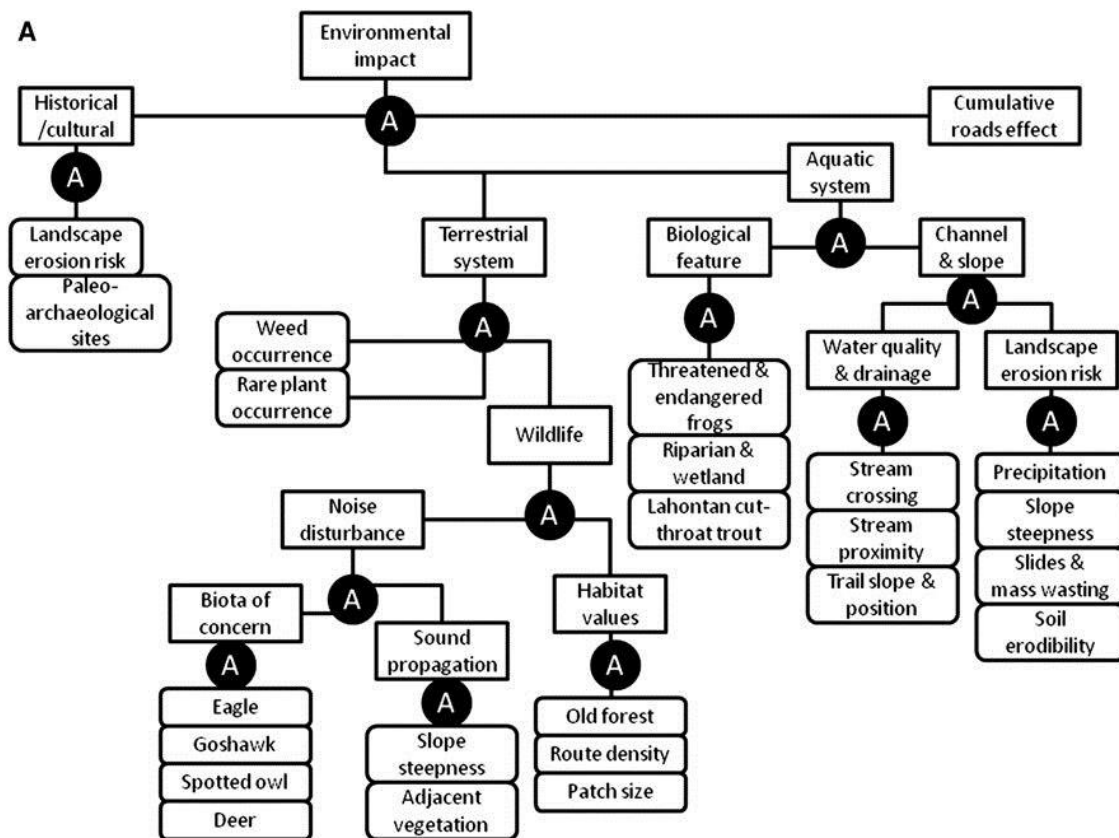


Figure 2: A knowledge base of contributions of various environmental conditions to the concept “environmental impact” [of motorized trails]. Rectangles indicate concepts, circles indicate Boolean logic operators, and rounded rectangles indicate sources of environmental data. (Reprinted from Shilling et al. 2012)

The Wilderness Society in 2012 also developed a GIS decision support tool called “RoadRight” that identifies high risk road segments to a variety of forest resources including water, wildlife, and roadlessness (The Wilderness Society 2012, The Wilderness Society 2013). The GIS system is designed to provide information that will help forest planners identify and minimize road related environmental risks. See the summary of and user guide for RoadRight that provides more information including where to access the open source software.¹⁵

¹⁵ The Wilderness Society, 2012. Rightsizing the National Forest Road System: A Decision Support Tool. Available at <http://www.landscapecollaborative.org/download/attachments/12747016/Road+decommissioning+model+-overview+2012-02-29.pdf?version=1&modificationDate=1331595972330>.

The Wilderness Society, 2013.
RoadRight: A Spatial Decision Support System to Prioritize Decommissioning and Repairing Roads in

Best management practices (BMPs)

BMPs have also been developed to help create more sustainable transportation systems and identify restoration opportunities. BMPs provide science-based criteria and standards that land managers follow in making and implementing decisions about human uses and projects that affect natural resources. Several states have developed BMPs for road construction, maintenance and decommissioning practices (e.g., Logan 2001, Merrill and Cassaday 2003, USDA Forest Service 2012b).

Recently, BMPs have been developed for addressing motorized recreation. Switalski and Jones (2012) published, *“Off-Road Vehicle Best Management Practices for Forestlands: A Review of Scientific Literature and Guidance for Managers.”* This document reviews the current literature on the environmental and social impacts of off-road vehicles (ORVs), and establishes a set of Best Management Practices (BMPs) for the planning and management of ORV routes on forestlands. The BMPs were designed to be used by land managers on all forestlands, and is consistent with current forest management policy and regulations. They give guidance to transportation planners on where how to place ORV routes in areas where they will reduce use conflicts and cause as little harm to the environment as possible. These BMPs also help guide managers on how to best remove and restore routes that are redundant or where there is an unacceptable environmental or social cost.

References

- AASHTO. 2012. Adapting Infrastructure to Extreme Weather Events: Best Practices and Key Challenges. Background Paper. AASHTO Workshop. Traverse City, Michigan, May 20, 2012. Available at: http://climatechange.transportation.org/pdf/adapt_background5-20-12.pdf.
- Adams, J.C., and S.F. McCool. 2009. Finite recreation opportunities: The Forest Service, the Bureau of Land Management, and off-road vehicle management. *Natural Areas Journal* 49: 45–116.
- Anderson, H.M., C. Gaolach, J. Thomson, and G. Aplet. 2012. Watershed Health in Wilderness, Roadless, and Roaded Areas of the National Forest System. *Wilderness Society Report*. 11 p.
- Battin J., M.W. Wiley, M.H. Ruckelshaus, R.N. Palmer, E. Korb, K.K. Bartz, and H. Imaki. 2007. Projected impacts of climate change on salmon habitat restoration. *Proceedings of the National Academy of Sciences of the United States of America* 104: 6720–6725.
- Baxter, C.V., C.A. Frissell, and F.R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: implications for management and conservation. *Transactions of the American Fisheries Society* 128: 854–867.
- Baxter, G. 2002. All terrain vehicles as a cause of fire ignition in Alberta forests. *Advantage* (Publication of the Forest Engineering Research Institute of Canada) 3(44): 1-7.

National Forests User Guide. RoadRight version: 2.2, User Guide version: February, 2013. Available at <http://www.landscapecollaborative.org/download/attachments/18415665/RoadRight%20User%20Guide%20v22.pdf?api=v2>

- Beazley, K., T. Snaith, F. MacKinnon, and D. Colville. 2004. Road density and the potential impacts on wildlife species such as American moose in mainland Nova Scotia. *Proceedings of the Nova Scotia Institute of Science* 42: 339-357.
- Benítez-López, A., R. Alkemade, and P.A. Verweij. 2010. The impacts of roads and other infrastructure on mammal and bird populations: a meta-analysis. *Biological Conservation* 143: 1307-1316.
- Beyer, H.L., R. Ung, D.L. Murray, and M.J. Fortin. 2013. Functional responses, seasonal variation and thresholds in behavioural responses of moose to road density. *Journal of Applied Ecology* 50: 286–294.
- Brehme, C.S., and J.A. Tracey, L.R. McClenaghan, and R.N. Fisher. 2013. Permeability of roads to movement of scrubland lizards and small mammals. *Conservation Biology* 27(4): 710–720.
- Bowles, A.E. 1997. Responses of wildlife to noise. In *Wildlife and recreationists: coexistence through management and research*. Edited by R.L. Knight and K.J. Gutzwiller. Island Press, Washington, DC. p. 109–156.
- Brody, A.J., and M.R. Pelton. 1989. Effects of roads on black bear movements in western North Carolina. *Wildlife Society Bulletin* 17: 5-10.
- Carnefix, G., and C. A. Frissell. 2009. Aquatic and Other Environmental Impacts of Roads: The Case for Road Density as Indicator of Human Disturbance and Road-Density Reduction as Restoration Target; A Concise Review. Pacific Rivers Council Science Publication 09-001. Pacific Rivers Council, Portland, OR and Polson, MT. Available at: <http://www.pacificrivers.org/science-research/resources-publications/road-density-as-indicator/download>
- Coffin, A. 2006. From roadkill to road ecology: A review of the ecological effects of roads. *Journal of Transport Geography* 15: 396-406.
- Crist, M.R., and B. Wilmer. 2002. *Roadless Areas: The Missing Link in Conservation*. The Wilderness Society, Washington D.C.
- Davenport, J., and T.A. Switalski. 2006. Environmental impacts of transport related to tourism and leisure activities. In: *The ecology of transportation: managing mobility for the environment*, editors: J Davenport and Julia Davenport. Dordrecht, Netherlands: Kluwer Academic Publishers. 333-360. Available at: http://www.wildlandscpr.org/files/uploads/PDFs/d_Switalski_2006_Enviro_impacts_of_transport.pdf
- DellaSala, D., J. Karr, and D. Olson. 2011. Roadless areas and clean water. *Journal of Soil and Water Conservation*, vol. 66, no. 3. May/June 2011.
- DeVelice, R., and J.R. Martin. 2001. Assessing the extent to which roadless areas complement the conservation of biological diversity. *Ecological Applications* 11(4): 1008-1018.

- Endicott, D. 2008. National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices. A Report Prepared by the Great Lakes Environmental Center for the Environmental Protection Agency, Office of Water, December 4, 2008. 259 pp.
- Edge, W.D., and C.L. Marcum. 1985. Movements of elk in relation to logging disturbances. *Journal of Wildlife Management* 49(4): 926–930.
- Fahrig, L., and T. Rytwinski. 2009. Effects of roads on animal abundance: an empirical review and synthesis. *Ecology and Society* 14(1): 21.
Available at: <http://www.ecologyandsociety.org/vol14/iss1/art21/>.
- Foltz, R.B. N.S. Copeland, and W.J. Elliot. 2009. Reopening abandoned forest roads in northern Idaho, USA: Quantification of runoff, sediment concentration, infiltration, and interrill erosion parameters. *Journal of Environmental Management* 90: 2542–2550.
- Forman, R. T. T., and A.M. Hersperger. 1996. Road ecology and road density in different landscapes, with international planning and mitigation solutions. Pages 1–22. IN: G. L. Evink, P. Garrett, D. Zeigler, and J. Berry (eds.), *Trends in Addressing Transportation Related Wildlife Mortality*. No. FLER- 58-96, Florida Department of Transportation, Tallahassee, Florida.
- Foreman, R.T.T., D. Sperling, J.A. Bissonette et al. 2003. *Road Ecology – Science and Solutions*. Island Press. Washington, D.C. 504 p.
- Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. In: Meehan, W.R., ed. *Influences of forest and rangeland management on salmonid fishes and their habitats*. Spec. Publ. 19. Bethesda, MD: American Fisheries Society. p. 297-323.
- Gaines, W.L., P. Singleton, and R.C. Ross. 2003. Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 p. Available at: <http://www.montanawildlife.com/projectsissues/Assessingthecumulativeeffectsoflinearrecreationroutesonwildlifehabitats.pdf>
- Gelbard, J.L., and S. Harrison. 2003. Roadless habitats as refuges for native grasslands: interactions with soil, aspect, and grazing. *Ecological Applications* 13(2): 404-415.
- Girvetz, E., and F. Shilling. 2003. Decision Support for Road System Analysis and Modification on the Tahoe National Forest. *Environmental Management* 32(2): 218–233
- Grant, A., C.R. Nelson, T.A. Switalski, and S.M. Rinehart. 2011. Restoration of native plant communities after road decommissioning in the Rocky Mountains: effect of seed mix composition & soil properties on vegetative establishment. *Restoration Ecology* 19: 160-169.
- Gucinski, M., J. Furniss, R. Ziemer, and M.H. Brookes. 2000. *Forest Roads: A Synthesis of Scientific Information*. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of

- Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.
Available at: <http://www.fs.fed.us/pnw/pubs/gtr509.pdf>.
- Hargis, C.D., J.A. Bissonette, and D.T. Turner. 1999. The influence of forest fragmentation and landscape pattern on American martens. *Journal of Applied Ecology* 36(1): 157–172.
- Hebblewhite, M., R.H. Munro, E.H. Merrill. 2009. Trophic consequences of postfire logging in a wolf-ungulate system. *Forest Ecology and Management* 257(3): 1053-1062.
- Holman, I.P., R.J. Nicholls, P.M. Berry, P.A. Harrison, E. Audsley, S. Shackley, and M.D.A. Rounsevell. 2005. A regional, multi-sectoral and integrated assessment of the impacts of climate and socio-economic change in the UK. Part II. Results. *Climatic Change* 71: 43-73.
- Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The effects of linear developments on wildlife: a review of selected scientific literature. Prepared for Canadian Association of Petroleum Producers. Arc Wildlife Services, Ltd., Calgary, AB. 115 p.
- Jensen W.F., T.K. Fuller, and W.L. Robinson. 1986. Wolf (*Canis lupus*) distribution on the Onterio-Michigan border near Sault Ste. Marie. *Canadian Field-Naturalist* 100: 363-366.
- Joslin, G., and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 p. Available at: <http://joomla.wildlife.org/Montana/index>
- Kasworm, W.F., and T.L. Manley. 1990. Road and trail influences on grizzly bears and black bears in northwest Montana. *International Conference on Bear Research and Management* 8: 79-84.
- Kerkvliet, J., J. Hicks, and B. Wilmer. 2008. Carbon Sequestered when Unneeded National Forest Roads are Revegetated. The Wilderness Society Briefing Memo. Available at: http://wilderness.org/sites/default/files/legacy/brief_carbonandroads.pdf.
- Lee, D., J. Sedell, B.E. Rieman, R. Thurow, and J. Williams. 1997. Broad-scale assessment of aquatic species and habitats. In: An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Edited by T.M. Quigley and S.J. Arbelbide. General Technical Report PNW-GTR-405. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. Vol III. p. 183–196.
- Lloyd, R., K. Lohse, and T.P.A. Ferre. 2013. Influence of road reclamation techniques on forest ecosystem recovery. *Frontiers in Ecology and the Environment* 11(2): 75-81.
- Loucks, C., N. Brown, A. Loucks, and K. 2003. USDA Forest Service roadless areas: potential biodiversity conservation reserves. *Conservation Ecology* 7(2): 5.
Available at: <http://www.ecologyandsociety.org/vol7/iss2/art5/>
- Logan, R. 2001. Water Quality BMPs for Montana Forests. Montana Department of Environmental Quality. Missoula, MT. 60p. Available at:

<https://dnrc.mt.gov/Forestry/Assistance/Practices/Documents/2001WaterQualityBMPGuide.pdf>

- Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. *Journal of Forestry* 81: 592-595.
- Mace, R.D., J.S. Waller, T.L. Manley, L.J. Lyon, and H. Zuuring. 1996. Relationships among grizzly bears, roads and habitat in the Swan Mountains, MT. *Journal of Applied Ecology*. 33: 1395-1404.
- Madej, M., J. Seney, and P. van Mantgem. 2013. Effects of road decommissioning on carbon stocks, losses, and emissions in north coastal California. *Restoration Ecology* 21(4): 439–446.
- Mattson, D.J., S. Herrero, R.G. Wright, and C.M. Pease. 1996. Science and management of Rocky Mountain grizzly bears. *Conservation Biology* 10(4): 1013-1025.
- McCaffery M., T.A. Switalski, and L. Eby. 2007. Effects of road decommissioning on stream habitat characteristics in the South Fork Flathead River, Montana. *Transactions of the American Fisheries Society* 136: 553-561.
- McGurk, B.J., and D.R. Fong, 1995. Equivalent roaded area as a measure of cumulative effect of logging. *Environmental Management* 19: 609-621.
- Mech, L D. 1989. Wolf population survival in an area of high road density. *American Midland Naturalist* 121: 387-389.
- Mech, L. D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1988. Wolf distribution and road density in Minnesota. *Wildlife Society Bulletin* 16: 85-87.
- Merrill, B.R., and E. Cassaday. 2003. Best Management Practices for Road Rehabilitation – Road – Stream Crossing Manual. California State Parks. Eureka, CA. 25p. Available at: http://www.parks.ca.gov/pages/23071/files/streamcrossingremovalbmp5_03.pdf
- Mladenoff, D.J., T.A. Sickley, R.G. Haight, and A.P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the Northern Great Lakes region. *Conservation Biology* 9: 279-294.
- Moore, T. 2007. [unpublished draft]. National Forest System Road Trends, Trends Analysis Submitted to Office of Management and Budget. United States Department of Agriculture, Forest Service, Engineering Staff, Washington Office, Washington, DC.
- National Fish, Wildlife and Plants Climate Adaptation Partnership (NFWPCAP). 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy. Association of Fish and Wildlife Agencies, Council on environmental Quality, Great Lakes Indian Fish and Wildlife Commission, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service. Washington, DC.

- Noss, R.F. 2001. Beyond Kyoto: forest management in a time of rapid climate change. *Conservation Biology* 15(3): 578-590.
- Ortega, Y.K., and D.E. Capen. 2002. Roads as edges: effects on birds in forested landscapes. *Forest Science* 48(2): 381-396.
- Ouren, D.S., C. Haas, C.P. Melcher, S.C. Stewart, P.D. Ponds, N.R. Sexton, L. Burris, T. Fancher, and Z.H. Bowen. 2007. Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources: U.S. Geological Survey, Open-File Report 2007-1353, 225 p.
- Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. *Annual Review of Ecology, Evolution, and Systematics* 37: 637-669.
- Quigley, T.M., and S.J. Arbelbide, tech. eds. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins: volume 1 and volume 3. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
Available at: http://www.fs.fed.us/pnw/publications/pnw_gtr405/.
- Reynolds, K. 1999. Netweaver for EMDS user guide (version1.1); a knowledge base development system. General technical Report PNW-GTR-471. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.
- Rhodes, J.J., McCullough, D.A., and F.A. Espinosa. 1994. A coarse screening process for evaluation of the effects of land management activities on salmon spawning and rearing habitat in ESA consultations. Tech. Rep. 94-4. Portland, OR: Columbia River Intertribal Fish Commission. 127 p.
- Rieman, B., D. Lee, G. Chandler, and D. Myers. 1997. Does wildfire threaten extinction for salmonids? Responses of Redband Trout and Bull Trout Following Recent Large Fires on the Boise National Forest, in Greenlee, J. M., Proceedings: First Conference on Fire Effects on Rare and Endangered Species and Habitats. Coeur d'Alene, Idaho. International Association of Wildland Fire. Fairfield, WA. p. 47-57.
- Robichaud, P.R., L.H. MacDonald, and R.B. Foltz. 2010. Fuel management and Erosion. In: Cumulative Watershed Effects of Fuels Management in the Western United States. USDA Forest Service RMRS-GTR-231. P. 79-100. Available at: http://www.fs.fed.us/rm/pubs/rmrs_gtr231/rmrs_gtr231_079_100.pdf
- Robinson, C., P.N. Duinker, and K.F. Beazley. 2010. A conceptual framework for understanding, assessing, and mitigation effects for forest roads. *Environmental Review* 18: 61-86.
- Rooney, T.P. 2006. Distribution of ecologically-invasive plants along off-road vehicle trails in the Chequamegon National Forest, Wisconsin. *The Michigan Botanist* 44:178-182

- Rost, G.R., and J.A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. *Journal of Wildlife Management* 43(3): 634–641.
- Rowland, M.M., M.J. Wisdom, B.K. Johnson, and M.A. Penninger. 2005. Effects of roads on elk: implications for management in forested ecosystems. Pages 42-52. IN: Wisdom, M.J., technical editor, *The Starkey Project: a Synthesis of Long-term Studies of Elk and Mule Deer*. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, KS.
- Schiffman, L. 2005. Archaeology, Off-Road Vehicles, and the BLM. Published online April 20, 2005. *Archeaology*.
Available at: <http://www.archaeology.org/online/features/southwest/>
- Semlitsch, R.D., T.J. Ryan, K. Hamed, M. Chatfield, B. Brehman, N. Pekarek, M. Spath, and A. Watland. 2007. Salamander abundance along road edges and within abandoned logging roads in Appalachian forests. *Conservation Biology* 21: 159-167.
- Shilling, F., J. Boggs, and S. Reed. 2012. Recreational System Optimization to Reduce Conflict on Public Lands. *Environmental Management* 50: 381–395.
- Strittholt, J., and D. Dellasala. 2001. Importance of Roadless Area Conservation in Forested Ecosystems: Case Study of the Klamath-Siskiyou Region of the United States. In *Conservation Biology* 15(6): 1742-1754.
- Switalski, T.A., J.A. Bissonette, T.H. DeLuca, C.H. Luce, and M.A. Madej. 2004. Benefits and impacts of road removal. *Frontiers in Ecology and the Environment*. 2(1): 21-28.
Available at: http://www.fs.fed.us/rm/pubs_other/rmrs_2004_switalski_t001.pdf
- Switalski, T.A., and C.R. Nelson. 2011. Efficacy of road removal for restoring wildlife habitat: black bear in the Northern Rocky Mountains, USA. *Biological Conservation* 144: 2666-2673.
- Switalski, T.A., and A. Jones. 2012. Off-road vehicle best management practices for forestlands: A review of scientific literature and guidance for managers. *Journal of Conservation Planning* 8: 12-24.
- The Wilderness Society. 2004. Landscape Connectivity: An Essential Element of Land Management. Policy Brief. Number 1.
- The Wilderness Society. 2012. Rightsizing the National Forest Road System: A Decision Support Tool. Available at:
<http://www.landscapecollaborative.org/download/attachments/12747016/Road+decommissioning+model+overview+2012-02-29.pdf?version=1&modificationDate=1331595972330>.
- The Wilderness Society. 2013. RoadRight: A Spatial Decision Support System to Prioritize Decommissioning and Repairing Roads in National Forests User Guide. RoadRight version: 2.2, User Guide version: February, 2013.

Available at:

<http://www.landscapecollaborative.org/download/attachments/18415665/RoadRight%20User%20Guide%20v22.pdf?api=v2>

Thiel, R.P. 1985. The relationships between road densities and wolf habitat in Wisconsin. *American Midland Naturalist* 113: 404-407.

Trombulak S., and C. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. *Conservation Biology* 14(1): 18-30.

USDA Forest Service. 1996a. National Forest Fire Report, 1994. Washington DC.

USDA Forest Service. 1996b. Status of the interior Columbia basin: summary of scientific findings. Gen. Tech. Rep. PNW-GTR-385. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; U.S. Department of the Interior, Bureau of Land Management. 144 p.

USDA Forest Service. 1998. 1991-1997 Wildland Fire Statistics. Fire and Aviation Management, Washington, D.C.

USDA Forest Service. 1999. Roads Analysis: Informing Decisions about Managing the National Forest Transportation System. Misc. Rep. FS-643. Washington, D.C.: USDA Forest Service. 222 p. Available at: http://www.fs.fed.us/eng/road_mgt/DOCSroad-analysis.shtml

USDA Forest Service. 2001a. Final National Forest System Road Management Strategy Environmental Assessment and Civil Rights Impact Analysis. U.S. Department of Agriculture Forest Service Washington Office, January 2001.

USDA Forest Service. 2010. Water, Climate Change, and Forests: Watershed Stewardship for a Changing Climate, PNW-GTR-812, June 2010, 72 p.
Available at: http://www.fs.fed.us/pnw/pubs/pnw_gtr812.pdf.

USDA Forest Service. 2011a. Adapting to Climate Change at Olympic National Forest and Olympic National Park. Forest Service Pacific Northwest Research Station General Technical Report, PNW-GTR-844, August 2011.
Available at: http://www.fs.fed.us/pnw/pubs/pnw_gtr844.pdf

USDA Forest Service. 2011b. National Roadmap for Responding to Climate Change. US Department of Agriculture. FS-957b. 26 p.
Available at: http://www.fs.fed.us/climatechange/pdf/Roadmap_pub.pdf.

USDA Forest Service. 2012a. Assessing the Vulnerability of Watersheds to Climate Change: Results of National Forest Watershed Vulnerability Pilot Assessments. Climate Change Resource Center.

USDA Forest Service. 2012b. National Best Management Practices for Water Quality Management on National Forest System Lands. Report# FS-990. 177p. Available at:

http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

- USDI Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT. 181p.
- USDI Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Coterminous United States; Final Rule. Federal Register Volume 64, Number 210 (Monday, November 1, 1999). p. 58922.
- USDI Bureau of Land Management. 2000. Strategic paper on cultural resources at risk. Bureau of Land Management, Washington, D.C. 18 p.
- USDI National Park Service. 2010. Climate Change Response Strategy. National Park Service Climate Change Response Program, Fort Collins, Colorado.
Available at: http://www.nature.nps.gov/climatechange/docs/NPS_CCRS.pdf.
- van Dyke, F.G., R.H. Brocke, H.G. Shaw, B.B Ackerman, T.P. Hemker, and F.G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. *Journal of Wildlife Management*. 50(1): 95–102.
- Wasser, S.K., K. Bevis, G. King, and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. *Conservation Biology* 11(4): 1019–1022.
- Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western Cascades, OR. *Water Resources Bulletin* 32: 1195-1207.
- Wemple, B.C., F.J. Swanson, and J.A. Jones. 2001. Forest Roads and geomorphic process interactions, Cascade Range, Oregon. *Earth Surface Process and Landforms* 26: 191-204.
Available at: <http://andrewsforest.oregonstate.edu/pubs/pdf/pub2731.pdf>
- Wilcove, D.S. 1990. The role of wilderness in protecting biodiversity. *Natural Resources and Environmental Issues*: Vol. 0, Article 7.
- Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy, and M.R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia basin: Broad-scale trends and management implications. Volume 1 – Overview. Gen. Tech. Rep. PNW-GTR-485. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Wydeven, A.P, D.J. Mladenoff, T.A. Sickley, B.E. Kohn, R.P. Thiel, and J.L. Hansen. 2001. Road density as a factor in habitat selection by wolves and other carnivores in the Great Lakes Region. *Endangered Species Update* 18(4): 110-114.

Attachments

Attachment 1: Wildfire and Roads Fact Sheet

Attachment 2: Using Road Density as a Metric for Ecological Health in National Forests: What Roads and Routes should be Included? Summary of Scientific Information



Photo: Lou Anegli Digital

Roaded Forests Are at a Greater Risk of Experiencing Wildfires than Unroaded Forests

- A wildland fire ignition is almost twice as likely to occur in a roaded area than in a roadless area. (USDA 2000, Table 3-18)
- The location of large wildfires is often correlated with proximity to busy roads. (Sierra Nevada Ecosystem Project, 1996)
- High road density increases the probability of fire occurrence due to human-caused ignitions. (Hann, W.J., et al. 1997)
- Unroaded areas have lower potential for high-intensity fires than roaded areas because they are less prone to human-caused ignitions. (DellaSala, et al. 1995)
- The median size of large fires on national forests is greater outside of roadless areas. (USDA 2000, Table 3-22)
- A positive correlation exists between lightning fire frequency and road density due to increased availability of flammable fine fuels near roads. (Arienti, M. Cecilia, et al. 2009)
- Human caused wildfires are strongly associated with access to natural landscapes, with the proximity to urban areas and roads being the most important factor (Romero-Calcerrada, et al. 2008)

For more information, contact Gregory H. Aplet, Ph.D., Senior Forest Scientist, at greg_aplet@tw.society.org or 303-650-5818 x104.

HUMAN ACTIVITY AND WILDFIRE

- Sparks from cars, off-road vehicles, and neglected campfires caused nearly 50,000 wildfire ignitions in 2000. (USDA 2000, Fuel Management and Fire Suppression Specialist Report, Table 4.)
- More than 90% of fires on national lands are caused by humans (USDA 1996 and 1998)
- Human-ignited wildfire is almost 5 times more likely to occur in a roaded area than in a roadless area (USDA 2000, Table 3-19).

There are 375,000 miles of roads in our national forests.



Photo: USDA Forest Service, Coconino National Forest

References

Arienti, M. Cecilia; Cumming, Steven G., et al. 2009. Road network density correlated with increased lightning fire incidence in the Canadian western boreal forest. *International Journal of Wildland Fire* 2009, 18, 970–982

DellaSala, D.A., D.M. Olson and S.L. Crane. 1995. Ecosystem management and biodiversity conservation: Applications to inland Pacific Northwest forests. Pp. 139-160 in: R.L. Everett and D.M. Baumgartner, eds. *Symposium Proceedings: Ecosystem Management in Western Interior Forests*. May 3-5, 1994, Spokane, WA. Washington State University Cooperative Extension, Pullman, WA.

Hann, W.J., et al. 1997. *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins: Volume II*, Ch. 3, p. 882

Romer-Calcerrada, Raul. 2008. GIS analysis of spatial patterns of human-caused wildfire ignition risk in the SW of Madrid (Central Spain). *Landscape Ecol.* 23:341-354.

Sierra Nevada Ecosystem Project. 1996. *Status of the Sierra Nevada: Sierra Nevada Ecosystem Project, Final Report to Congress Volume I: Assessment summaries and management strategies*. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources, University of California, Davis, CA.

USDA Forest Service. 1996. *National Forest Fire Report 1994*. Washington, D.C.

USDA Forest Service. 1998. *1991-1997 Wildland fire statistics*. Fire and Aviation Management, Washington, D.C.

USDA. 2000. *Forest Service Roadless Area Conservation Rule Final Environmental Impact Statement*, Ch. 3,.



**Attachment 2: Using Road Density as a Metric for Ecological Health in National Forests:
What Roads and Routes should be Included?
Summary of Scientific Information
Last Updated, November 22, 2012**

I. Density analysis should include closed roads, non-system roads administered by other jurisdictions (private, county, state), temporary roads and motorized trails.

Typically, the Forest Service has calculated road density by looking only at open system road density. From an ecological standpoint, this approach may be flawed since it leaves out of the density calculations a significant percent of the total motorized routes on the landscape. For instance, the motorized route system in the entire National Forest System measures well over 549,000 miles.¹ By our calculation, a density analysis limited to open system roads would consider less than 260,000 miles of road, which accounts for less than half of the entire motorized transportation system estimated to exist on our national forests.² These additional roads and motorized trails impact fish, wildlife, and water quality, just as open system roads do. In this section, we provide justification for why a road density analysis used for the purposes of assessing ecological health and the effects of proposed alternatives in a planning document should include closed system roads, non-system roads administered by other jurisdictions, temporary roads, and motorized trails.

Impacts of closed roads

It is crucial to distinguish the density of roads physically present on the landscape, whether closed to vehicle use or not, from “open-road density” (Pacific Rivers Council, 2010). An open-road density of 1.5 mi/mi² has been established as a standard in some national forests as protective of some terrestrial wildlife species. However, many areas with an open road density of 1.5 mi/mi² have a much higher inventoried or extant hydrologically effective road density, which may be several-fold as high with significant aquatic impacts. This higher density occurs because many road “closures” block vehicle access, but do nothing to mitigate the hydrologic alterations that the road causes. The problem is

¹ The National Forest System has about 372,000 miles of system roads. The forest service also has an estimated 47,000 miles of motorized trails. As of 1998, there were approximately 130,000 miles of non-system roads in our forests. Non-system roads include public roads such as state, county, and local jurisdiction and private roads. (USFS, 1998) The Forest Service does not track temporary roads but is reasonable to assume that there are likely several thousand miles located on National Forest System lands.

² About 30% of system roads, or 116,108 miles, are in Maintenance Level 1 status, meaning they are closed to all motorized use. (372,000 miles of NFS roads - 116,108 miles of ML 1 roads = 255,892). This number is likely conservative given that thousands of more miles of system roads are closed to public motorized use but categorized in other Maintenance Levels.

further compounded in many places by the existence of “ghost” roads that are not captured in agency inventories, but that are nevertheless physically present and causing hydrologic alteration (Pacific Watershed Associates, 2005).

Closing a road to public motorized use can mitigate the impacts on water, wildlife, and soils only if proper closure and storage technique is followed. Flow diversions, sediment runoff, and illegal incursions will continue unabated if necessary measures are not taken. The Forest Service’s National Best Management Practices for non-point source pollution recommends the following management techniques for minimizing the aquatic impacts from closed system roads: eliminate flow diversion onto the road surface, reshape the channel and streambanks at the crossing-site to pass expected flows without scouring or ponding, maintain continuation of channel dimensions and longitudinal profile through the crossing site, and remove culverts, fill material, and other structures that present a risk of failure or diversion. Despite good intentions, it is unlikely given our current fiscal situation and past history that the Forest Service is able to apply best management practices to all stored roads,³ and that these roads continue to have impacts. This reality argues for assuming that roads closed to the public continue to have some level of impact on water quality, and therefore, should be included in road density calculations.

As noted above, many species benefit when roads are closed to public use. However, the fact remains that closed system roads are often breached resulting in impacts to wildlife. Research shows that a significant portion of off-road vehicle (ORV) users violates rules even when they know what they are (Lewis, M.S., and R. Paige, 2006; Frueh, LM, 2001; Fischer, A.L., et. al, 2002; USFWS, 2007.). For instance, the Rio Grande National Forest’s Roads Analysis Report notes that a common travel management violation occurs when people drive around road closures on Level 1 roads (USDA Forest Service, 1994). Similarly, in a recent legal decision from the Utah District Court , *Sierra Club v. USFS*, Case No. 1:09-cv-131 CW (D. Utah March 7, 2012), the court found that, as part of analyzing alternatives in a proposed travel management plan, the Forest Service failed to take a hard look at the impact of continued illegal use. In part, the court based its decision on the Forest Service’s acknowledgement that illegal motorized use is a significant problem and that the mere presence of roads is likely to result in illegal use.

In addition to the disturbance to wildlife from ORVs, incursions and the accompanying human access can also result in illegal hunting and trapping of animals. The Tongass National Forest refers to this in its EIS to amend the Land and Resources Management Plan. Specifically, the Forest Service notes in the EIS that Alexander Archipelego wolf mortality due to legal and illegal hunting and trapping is related not only to roads open to motorized access, but to all roads, and that *total road densities* of 0.7-1.0 mi/mi² or less may be necessary (USDA Forest Service, 2008).

As described below, a number of scientific studies have found that ORV use on roads and trails can have serious impacts on water, soil and wildlife resources. It should be expected that ORV use will continue to

³ The Forest Service generally reports that it can maintain 20-30% of its open road system to standard.

some degree to occur illegally on closed routes and that this use will affect forest resources. Given this, roads closed to the general public should be considered in the density analysis.

Impacts of non-system roads administered by other jurisdictions (private, county, state)

As of 1998, there were approximately 130,000 miles of non-system roads in national forests (USDA Forest Service, 1998). These roads contribute to the environmental impacts of the transportation system on forest resources, just as forest system roads do. Because the purpose of a road density analysis is to measure the impacts of roads at a landscape level, the Forest Service should include all roads, including non-system, when measuring impacts on water and wildlife. An all-inclusive analysis will provide a more accurate representation of the environmental impacts of the road network within the analysis area.

Impacts of temporary roads

Temporary roads are not considered system roads. Most often they are constructed in conjunction with timber sales. Temporary roads have the same types environmental impacts as system roads, although at times the impacts can be worse if the road persists on the landscape because they are not built to last.

It is important to note that although they are termed temporary roads, their impacts are not temporary. According to Forest Service Manual (FSM) 7703.1, the agency is required to "Reestablish vegetative cover on any unnecessary roadway or area disturbed by road construction on National Forest System lands within 10 years after the termination of the activity that required its use and construction." Regardless of the FSM 10-year rule, temporary roads can remain for much longer. For example, timber sales typically last 3-5 years or more. If a temporary road is built in the first year of a six year timber sale, its intended use does not end until the sale is complete. The timber contract often requires the purchaser to close and obliterate the road a few years after the Forest Service completes revegetation work. The temporary road, therefore, could remain open 8-9 years before the ten year clock starts ticking per the FSM. Therefore, temporary roads can legally remain on the ground for up to 20 years or more, yet they are constructed with less environmental safeguards than modern system roads.

Impacts of motorized trails

Scientific research and agency publications generally do not decipher between the impacts from motorized trails and roads, often collapsing the assessment of impacts from unmanaged ORV use with those of the designated system of roads and trails. The following section summarizes potential impacts resulting from roads and motorized trails and the ORV use that occurs on them.

Aquatic Resources

While driving on roads has long been identified as a major contributor to stream sedimentation (for review, see Gucinski, 2001), recent studies have identified ORV routes as a significant cause of stream sedimentation as well (Sack and da Luz, 2004; Chin et al.; 2004, Ayala et al.; 2005, Welsh et al.; 2006). It has been demonstrated that sediment loss increases with increased ORV traffic (Foltz, 2006). A study by

Sack and da Luz (2004) found that ORV use resulted in a loss of more than 200 pounds of soil off of every 100 feet of trail each year. Another study (Welsh et al., 2006) found that ORV trails produced five times more sediment than unpaved roads. Chin et al. (2004) found that watersheds with ORV use as opposed to those without exhibited higher percentages of channel sands and fines, lower depths, and lower volume – all characteristics of degraded stream habitat.

*Soil Resources*⁴

Ouren, et al. (2007), in an extensive literature review, suggests ORV use causes soil compaction and accelerated erosion rates, and may cause compaction with very few passes. Weighing several hundred pounds, ORVs can compress and compact soil (Nakata et al., 1976; Snyder et al., 1976; Vollmer et al., 1976; Wilshire and Nakata, 1976), reducing its ability to absorb and retain water (Dregne, 1983), and decreasing soil fertility by harming the microscopic organisms that would otherwise break down the soil and produce nutrients important for plant growth (Wilshire et al., 1977). An increase in compaction decreases soil permeability, resulting in increased flow of water across the ground and reduced absorption of water into the soil. This increase in surface flow concentrates water and increases erosion of soils (Wilshire, 1980; Webb, 1983; Misak et al., 2002).

Erosion of soil is accelerated in ORV-use areas directly by the vehicles, and indirectly by increased runoff of precipitation and the creation of conditions favorable to wind erosion (Wilshire, 1980). Knobby and cup-shaped protrusions from ORV tires that aid the vehicles in traversing steep slopes are responsible for major direct erosional losses of soil. As the tire protrusions dig into the soil, forces far exceeding the strength of the soil are exerted to allow the vehicles to climb slopes. The result is that the soil and small plants are thrown downslope in a “rooster tail” behind the vehicle. This is known as mechanical erosion, which on steep slopes (about 15° or more) with soft soils may erode as much as 40 tons/mi (Wilshire, 1992). The rates of erosion measured on ORV trails on moderate slopes exceed natural rates by factors of 10 to 20 (Iverson et al., 1981; Hinckley et al., 1983), whereas use on steep slopes has commonly removed the entire soil mantle exposing bedrock. Measured erosional losses in high use ORV areas range from 1.4-242 lbs/ft² (Wilshire et al., 1978) and 102-614 lbs/ft² (Webb et al., 1978). A more recent study by Sack and da Luz (2003) found that ORV use resulted in a loss of more than 200 lbs of soil off of every 100 feet of trail each year.

Furthermore, the destruction of cryptobiotic soils by ORVs can reduce nitrogen fixation by cyanobacteria, and set the nitrogen economy of nitrogen-limited arid ecosystems back decades. Even small reductions in crust can lead to diminished productivity and health of the associated plant community, with cascading effects on plant consumers (Davidson et al., 1996). In general, the deleterious effects of ORV use on cryptobiotic crusts is not easily repaired or regenerated. The recovery time for the lichen component of crusts has been estimated at about 45 years (Belnap, 1993). After this time the crusts may appear to have regenerated to the untrained eye. However, careful observation will reveal that the 45 year-old crusts will not have recovered their moss component, which will take an additional 200 years to fully come back (Belnap and Gillette, 1997).

⁴ For a full review see Switalski, T. A. and A. Jones (2012).

*Wildlife Resources*⁵

Studies have shown a variety of possible wildlife disturbance vectors from ORVs. While these impacts are difficult to measure, repeated harassment of wildlife can result in increased energy expenditure and reduced reproduction. Noise and disturbance from ORVs can result in a range of impacts including increased stress (Nash et al., 1970; Millspaugh et al., 2001), loss of hearing (Brattstrom and Bondello, 1979), altered movement patterns (e.g., Wisdom et al. 2004; Preisler et al. 2006), avoidance of high-use areas or routes (Janis and Clark 2002; Wisdom 2007), and disrupted nesting activities (e.g., Strauss 1990).

Wisdom et al. (2004) found that elk moved when ORVs passed within 2,000 yards but tolerated hikers within 500 ft. Wisdom (2007) reported preliminary results suggesting that ORVs are causing a shift in the spatial distribution of elk that could increase energy expenditures and decrease foraging opportunities for the herd. Elk have been found to readily avoid and be displaced from roaded areas (Irwin and Peek, 1979; Hershey and Legee, 1982; Millspaugh, 1995). Additional concomitant effects can occur, such as major declines in survival of elk calves due to repeated displacement of elk during the calving season (Phillips, 1998). Alternatively, closing or decommissioning roads has been found to decrease elk disturbance (Millspaugh et al., 2000; Rowland et al., 2005).

Disruption of breeding and nesting birds is particularly well-documented. Several species are sensitive to human disturbance with the potential disruption of courtship activities, over-exposure of eggs or young birds to weather, and premature fledging of juveniles (Hamann et al., 1999). Repeated disturbance can eventually lead to nest abandonment. These short-term disturbances can lead to long-term bird community changes (Anderson et al., 1990). However when road densities decrease, there is an observable benefit. For example, on the Loa Ranger District of the Fishlake National Forest in southern Utah, successful goshawk nests occur in areas where the localized road density is at or below 2-3 mi/mi² (USDA, 2005).

Examples of Forest Service planning documents that use total motorized route density or a variant

Below, we offer examples of where total motorized route density or a variant has been used by the Forest Service in planning documents.

- The Mt. Taylor RD of the Cibola NF analyzed open and closed system roads and motorized trails together in a single motorized *route* density analysis. Cibola NF: Mt. Taylor RD Environmental Assessment for Travel Management Planning, Ch.3, p 55.
http://prdp2fs.ess.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5282504.pdf.
- The Grizzly Bear Record of Decision (ROD) for the Forest Plan Amendments for Motorized Access

⁵ For a full review see: Switalski, T. A. and A. Jones (2012).

Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (Kootenai, Lolo, and Idaho Panhandle National Forests) assigned route densities for the designated recovery zones. One of the three densities was for Total Motorized Route Density (TMRD) which includes open roads, restricted roads, roads not meeting all reclaimed criteria, and open motorized trails. The agency's decision to use TMRD was based on the Endangered Species Act's requirement to use best available science, and monitoring showed that both open and closed roads and motorized trails were impacting grizzly. Grizzly Bear Plan Amendment ROD. Online at cache.ecosystem-management.org/48536_FSPLT1_009720.pdf.

- The Chequamegon-Nicolet National Forest set forest-wide goals in its forest plan for both open road density and total road density to improve water quality and wildlife habitat.

I decided to continue reducing the amount of total roads and the amount of open road to resolve conflict with quieter forms of recreation, impacts on streams, and effects on some wildlife species. ROD, p 13.

Chequamegon-Nicolet National Forest Land and Resource Management Plan Record of Decision. Online at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5117609.pdf.

- The Tongass National Forest's EIS to amend the forest plan notes that Alexander Archipelago wolf mortality due to legal and illegal hunting and trapping is related not only to roads open to motorized access, but to all roads, and that *total road densities* of 0.7-1.0 mi/mi² or less may be necessary.

Another concern in some areas is the potentially unsustainable level of hunting and trapping of wolves, when both legal and illegal harvest is considered. The 1997 Forest Plan EIS acknowledged that open road access contributes to excessive mortality by facilitating access for hunters and trappers. Landscapes with open-road densities of 0.7 to 1.0 mile of road per square mile were identified as places where human-induced mortality may pose risks to wolf conservation. The amended Forest Plan requires participation in cooperative interagency monitoring and analysis to identify areas where wolf mortality is excessive, determine whether the mortality is unsustainable, and identify the probable causes of the excessive mortality.

More recent information indicates that wolf mortality is related not only to roads open to motorized access, but to all roads, because hunters and trappers use all roads to access wolf habitat, by vehicle or on foot. Consequently, this decision amends the pertinent standard and guideline contained in Alternative 6 as displayed in the Final EIS in areas where road access and associated human caused mortality has been determined to be the significant contributing factor to unsustainable wolf mortality. The standard and guideline has been modified to ensure that a range of options to reduce mortality risk will be considered in these areas, and to specify that total road densities of 0.7 to 1.0 mile per square mile or less may be necessary. ROD, p 24.

Tongass National Forest Amendment to the Land and Resource Management Plan Record of Decision and Final EIS. January 2008. http://tongass-fpadjust.net/Documents/Record_of_Decision.pdf

References

- Anderson, D.E., O.J. Rongstad, and W.R. Mytton. 1990. Home range changes in raptors exposed to increased human activity levels in southeastern Colorado. *Wildlife Bulletin* 18:134-142.
- Ayala, R.D., P. Srivastava, C.J. Brodbeck, E.A. Carter, and T.P. McDonald. 2005. Modeling Sediment Transport from an Off-Road Vehicle Trail Stream Crossing Using WEPP Model. American Society of Agricultural and Biological Engineers, 2005 ASAE Annual International Meeting, Paper No: 052017.
- Belnap, J. 1993. Recovery rates of cryptobiotic crusts: inoculant use and assessment methods. *Great Basin Naturalist* 53:89-95.
- Belnap, J. and D.A. Gillette. 1997. Disturbance of biological soil crusts: impacts on potential wind erodibility of sandy desert soils in SE Utah. *Land Degradation and Development* 8: 355-362.
- Brattstrom, B.H., and M.C. Bondello. 1979. The effects of dune buggy sounds on the telencephalic auditory evoke response in the Mojave fringe-toed lizard, *Uma scoparia*. Unpublished report to the U.S. Bureau of Land Management, California Desert Program, Riverside, CA. 31p.
- Chin, A., D.M. Rohrer, D.A. Marion, and J.A. Clingenpeel. 2004. Effects of all terrain vehicles on stream dynamics. Pages:292-296 in Guldin, J.M. technical compiler, Ovachita and Ozark Mountains Symposium: ecosystem management research. General technical report SRS-74. Ashville, NC: USDA, FS, Southern Research Station.
- Davidson, D.W, W.D. Newmark, J.W. Sites, D.K. Shiozawa, E.A. Rickart, K.T. Harper, and R.B. Keiter. 1996. Selecting Wilderness areas to conserve Utah's biological diversity. *Great Basin Naturalist* 56: 95-118.
- Dregne, H.E. 1983. Physical effects of off-road vehicle use. Pages 15-30 in R.H. Webb and H.G. Wilshire. *Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions*. Springer-Verlag, New York.
- Foltz, R.B. 2006. Erosion from all terrain vehicle (ATV) trails on National Forest lands. The American Society of Agricultural and Biological engineers (ASABE). Paper# 068012. St. Joseph, MI.
- Frueh, LM. 2001. Status and Summary Report on OHV Responsible Riding Campaign. Prepared by Monaghan and Associates for the Colorado Coalition for Responsible OHV Riding. Available at http://www.wildlandscpr.org/files/CO%20OHV%20Focus%20Group%20StatusSummaryReport_1.pdf.

Gucinski, H., M. J. Furniss, R. R. Ziemer, and M. H. Brookes. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. <http://www.fs.fed.us/pnw/pubs/gtr509.pdf>

Hamann, B., H. Johnston, P. McClelland, S. Johnson, L. Kelly, and J. Gobielle. 1999. Birds. Pages 3.1-3.34 in Joslin, G. and H. Youmans, coordinators Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana.

Hershey, T.J., and T.A. Legee. 1982. Elk movements and habitat use on a managed forest in north-central Idaho. Idaho Department of Fish and Game. 32p.

Hinckley, B.S., Iverson, R.M. and B. Hallet. 1983. Accelerated water erosion in ORV-use areas. Pages 81-96 in Webb, R.H. and H.G. Wilshire, editors, Environmental Effects of Off-Road Vehicles. Springer-Verlag, New York.

Irwin, L.L., and J.M. Peek. 1979. Relationship between road closure and elk behavior in northern Idaho. Pages 199-205 in Boyce, M.S. and L.D. Hayden-Wing, editors, North American Elk: Ecology, Behavior, and Management. Laramie, WY: University of Wyoming.

Iverson, R.M., Hinckley, B.S., and R.H. Webb. 1981. Physical effects of vehicular disturbance on arid landscapes. Science 212: 915-917.

Janis, M.W., and J.D. Clark. 2002. Responses of Florida panthers to recreational deer and hog hunting. Journal of Wildlife Management 66(3): 839-848.

Lewis, M.S., and R. Paige. 2006. Selected Results From a 2006 Survey of Registered Off-Highway Vehicle (OHV) Owners in Montana. Responsive Management Unit Research Summary No. 21. Prepared for Montana Fish, Wildlife and Parks. <http://fwp.mt.gov/content/getItem.aspx?id=19238>

Millspaugh, J.J. 1995. Seasonal movements, habitat use patterns and the effects of human disturbances on elk in Custer State Park, South Dakota. M.S. Thesis. Brookings, SD: South Dakota State University.

Millspaugh, J.J., G.C. Brundige, R.A. Gitzen, and K.J. Raedeke. 2000. Elk and hunter space-use sharing in South Dakota. Journal of Wildlife Management 64(4): 994-1003.

Millspaugh, J.J., Woods, R.J. and K.E. Hunt. 2001. Fecal glucocorticoid assays and the physiological stress response in elk. Wildlife Society Bulletin 29: 899-907.

Misak, R.F., J.M. Al Awadhi, S.A. Omar, and S.A. Shahid. 2002. Soil degradation in Kabad area, southwestern Kuwait City. Land Degradation & Development. 13(5): 403-415.

Nakata, J.K., H.G. Wilshire, and G.G. Barnes. 1976. Origin of Mojave Desert dust plumes photographed from space. *Geology* 4(11): 644-648.

Nash, R.F., G.G. Gallup, jr., and M.K. McClure. 1970. The immobility reaction in leopard frogs (*Rana pipiens*) as a function of noise induced fear. *Psychonomic Science* 21(3): 155-156.

Ouren, D.S., Haas, Christopher, Melcher, C.P., Stewart, S.C., Ponds, P.D., Sexton, N.R., Burris, Lucy, Fancher, Tammy, and Bowen, Z.H., 2007, Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources: U.S. Geological Survey, Open-File Report 2007-1353, 225 p.

Pacific Rivers Council. 2010. Roads and Rivers 2: An Assessment of National Forest Roads Analyses. Portland, OR <http://pacificrivers.org/science-research/resources-publications/roads-and-rivers-ii/download>

Pacific Watershed Associates. 2005. Erosion Assessment and Erosion Prevention Planning Project for Forest Roads in the Biscuit Fire Area, Southern Oregon. Prepared for Pacific Rivers Council and The Siskiyou Project. Pacific Watershed Associates, Arcata, California. <http://pacificrivers.org/files/post-fire-management-and-sound-science/Final%20Biscuit%20PWA%20Report.pdf>

Phillips, G.E. 1998. Effects of human-induced disturbance during calving season on reproductive success of elk in the upper Eagle River Valley. Dissertation. Fort Collins, CO: Colorado State University.

Preisler, H.K., A.A. Ager, and M.J. Wisdom. 2006. Statistical methods for analyzing responses of wildlife to human disturbance. *Journal of Applied Ecology* 43: 164-172.

Rowland, M.M., M.J. Wisdom, B.K. Johnson, and M.A. Penninger. 2005. Effects of roads on elk: implications for management in forested ecosystems. Pages 42-52. IN: Wisdom, M.J., technical editor, The Starkey Project: a Synthesis of Long-term Studies of Elk and Mule Deer. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, KS.

Sack, D., and S. da Luz, Jr. 2003. Sediment Flux and Compaction Trends on Off-Road Vehicle (ORV) and other Trails in an Appalachian Forest Setting. *Physical Geography* 24 (6): 536-554.

Snyder, C.T., D.G. Frickel, R.E. Hadley, and R.F. Miller. 1976. Effects of off-road vehicle use on the hydrology and landscape of arid environments in central and southern California. U.S. Geological Survey Water-Resources Investigations Report #76-99. 45p.

Switalski, T. A. and A. Jones. 2012. Off-road Vehicle Best Management Practices for Forestlands: A Review of Scientific Literature and Guidance for Managers. *Journal of Conservation Planning*. Vol. 8 (2014). Pages 12 – 24.

USFWS, Nevada Fish and Wildlife Office. 2007. 12-Month Finding on a Petition to List the Sand Mountain Blue Butterfly (*Euphilotes pallescens* ssp. *arenamontana*) as Threatened or Endangered with Critical Habitat. Federal Register, Vol. 72, No. 84. See pages 24260-61. <http://www.wildlandscpr.org/denial-petition-list-sand-mountain-blue-butt...>

USDA Forest Service (USFS) 1994. Rio Grande National Forest Roads Analysis Process Report. See pages 76-77 and 118.

USDA Forest Service. (USFS) 1998. National Forest System Roads and Use. Available online at http://www.fs.fed.us/eng/road_mgt/roadsummary.pdf.

USDA Forest Service. (USFS) 2008. Tongass National Forest Amendment to the Land and Resource Management Plan Record of Decision and Final EIS. http://tongass-fpadjust.net/Documents/Record_of_Decision.pdf

Vollmer, A.T., B.G. Maza, P.A. Medica, F.B. Turner, and S.A. Bamberg. 1976. The impact of off-road vehicles on a desert ecosystem. *Environmental Management* 1(2):115-129.

Webb, R.H., Ragland, H.C., Godwin, W.H., and D. Jenkins. 1978. Environmental effects of soil property changes with off-road vehicle use. *Environmental Management* 2: 219-233.

Webb, R.H.. 1983. Compaction of desert soils by off-road vehicles. Pages 51-79 in: Webb, R.H. and Wilshire, H.G., editors, *Environmental Effects of Off-Road Vehicles*. Springer-Verlag, New York.

Welsh, M.J., L.H. MacDonald, and E. Brown, and Z. Libohova. 2006. Erosion and sediment delivery from unpaved roads and off-highway vehicles (OHV). Presented at AGU fall meeting. San Francisco, CA.

Wilshire, H.G., G.B. Bodman, D. Broberg, W.J. Kockelman, J. Major, H.E. Malde, C.T. Snyder, and R.C. Stebbins. 1977. Impacts and management of off-road vehicles. The Geological Society of America. Report of the Committee on Environment and Public Policy.

Wilshire, H.G., Nakata, J.K., Shipley, S., and K. Prestegard. 1978. Impacts of vehicles on natural terrain at seven sites in the San Francisco Bay area. *Environmental Geology* 2: 295-319.

Wilshire, H.G. 1980. Human causes of accelerated wind erosion in California's deserts. Pages 415-433 in D.R. Coates and J.B. Vitek, editors, *Thresholds in Geomorphology*. George Allen & Unwin, Ltd., London.

Wilshire, H.G. 1992. The wheeled locusts. *Wild Earth* 2: 27-31.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy, and M.R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the

interior Columbia basin: Broad-scale trends and management implications. Volume 1 – Overview. Gen. Tech. Rep. PNW-GTR-485. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. <http://www.fs.fed.us/pnw/pubs/gtr485/gtr485vl.pdf>

Wisdom, M.J., H.K. Preisler, N.J. Cimon, and B.K. Johnson. 2004. Effects of off-road recreation on mule deer and elk. Transactions of the North American Wildlife and Natural Resource Conference 69.

Wisdom, M.J. 2007. Shift in Spatial Distribution of Elk Away from Trails Used by All-Terrain Vehicles. Report 1, May 2007, USDA Forest Service, Pacific Northwest Research Station, La Grande, OR.

Phone log 11/17/06 (Dan Brewer Steve Phillips)

Steve indicated that with these new plans the key issue we could do for bull trout is to deal with the existing roads system. Steve indicated that we need a mechanism to obligate the Forest into doing the right thing a MOU or something. Roads behind gates and berms continues to be an impact to bull trout and wct, currently we keep replacing culverts on roads. This has become a huge issue case in point the recent rain events. Often time it's pointed out that pulling culverts is expensive and the timber folks would like to keep these roads for future use.

Although these are legitimate concerns un-maintained roads and culverts will fail and the lack of maintenance put other resources at risk. So the decision to leave a culverts and roads behind a gate or berm is really a decision to increase the risk a losing a population of fish degrade water quality the has been shown over and over again in the literature. This has been an issue the Service and FS bio's have been warning the decisions makers about since Moose Fire, and now with the recent rain events this very issue is playing itself out. The Flathead had at least 7 major culvert failures, and after this last storm I would expect that number to increase.

Meeting notes Seeley Lake 11/30/06 T&C Reporting

Steve would like to address the T&C broadly and then “dial in” on the things that need a more specific focus:

All most all of the fire related BOs contain similar T&Cs . So for BOs that have:

BMP T&Cs: Steve will provide a map of the road segments that received BMPs, and provide additional narrative on what BMPs were field reviewed (similar to what the Bitterroot NF does). For example Steve Dan and Pat reviewed the Quinton Cr road on October 28 (?), 2006. The road BMPs appeared to be effective in reducing potential sediment delivery, no rilling was observed in the road bed, cross drains were functioning and road was well graveled minimizing potential surface erosion. We also reviewed a log landing site, at this site a large pond of standing water was observed, causing people to drive around expanding the roaded area, and could cause the road to slump and has the potential to deliver sediment to the stream.

Decom Road T&C: For decommissioning Steve would like to use the A19 reporting, but include a statement of if pipes are left in the road or not. I think this needs to be in a separate report for bull trout?

High Risk Pipes T&C: This is the primary issues affecting BT habitat in the FNF. Leaving pipes behind berms/gates was a major issue. In Moose we had several T&Cs to attempt to minimize this impact. For Westside the Forest was to identify which pipes are high risk (done) and fix high risk within a year (not done??). Forest will provide map of how many pipes are behind berms/gates. The Forest ID the high risk pipes but did not replace these within a year (we since had two major water events and pipe failure). The water events highlighted the issue and subsequent impacts of culverts. To address Steve would like to display on a map what was inventoried and what was treated and how and what remains. How do we address missing the mark not meeting this T&C. Currently the Service does not have the information to determine either way. The question is how far have we missed the mark (i.e., by not meeting the commitments in the BA has take occurred over and above that was assessed in the BO?) Steve will provide a map of bermed and to be bermed roads.

T&C Imp INFISH (Fish Barriers) Will provide map of barriers and barriers that were replaced (In Moose the upper Warner Creek pipe has not been fixed still in court).

T&C use the LAA Roads Programmatic form to report. We felt that the BMP map will address this. Steve will highlight any minimization that should have occurred that did not.

T&C “Tell use what your going to do by March 1” The intent of that was to demonstrate that BT needs/money was going to BT watersheds issue. This T&C was a fall out of analyzing the worst case scenario. Steve will report general hopes, the forest usually does not know what they are going to do in April.

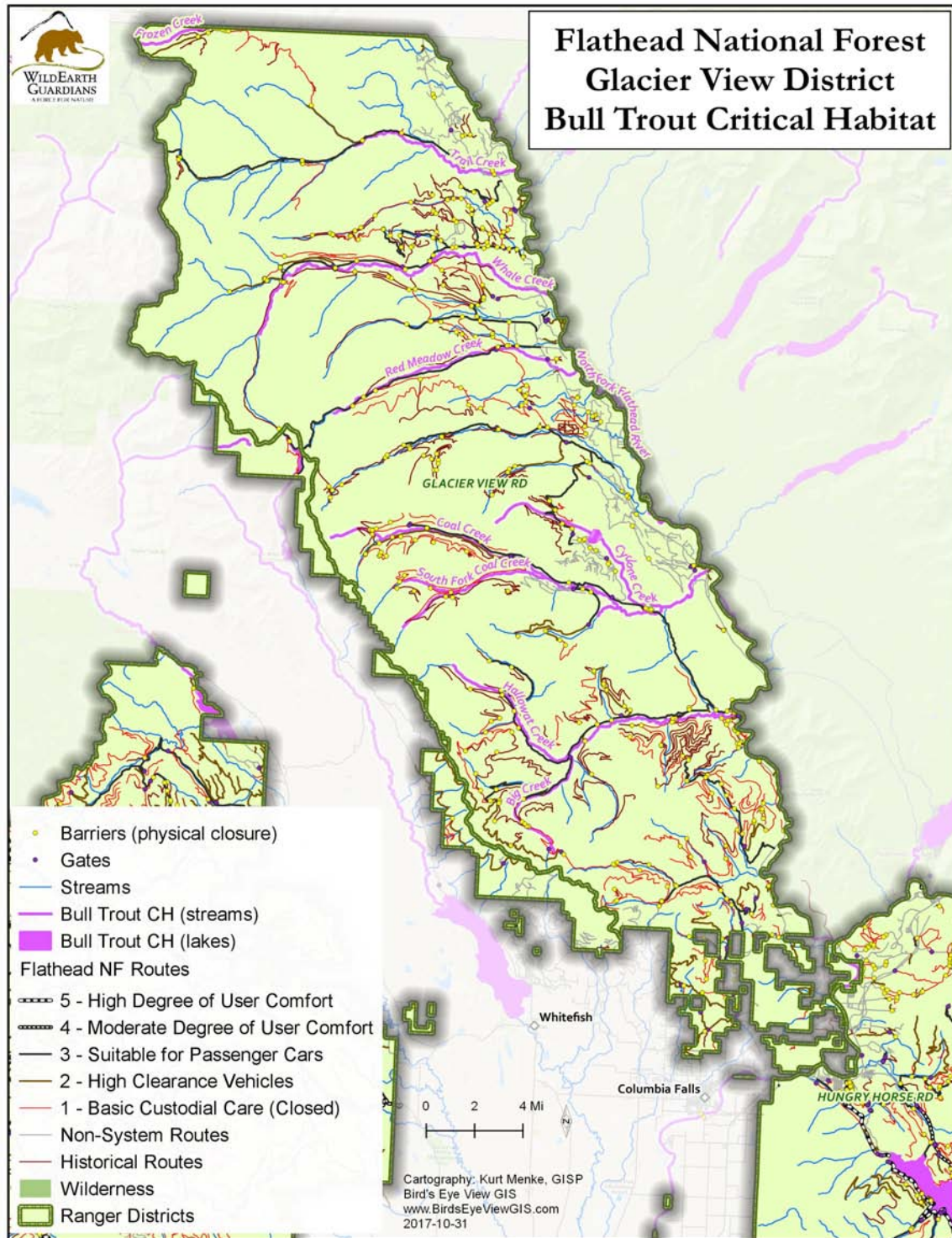
Project Status T&C several T&C ask this question. Steve will report general what's happen, focus on the thing what reduce sediment to reduce thing for bull trout. Again this is what happens when worst case scenario is analyzed, and numerous comments are given based on what is proposed (so when the proposed action changes usually harvest units dropped etc. then the other sometimes beneficial action are dropped which were analyzed as a long term beneficial effects (the example would be doing BMPs/culvert up grades on a section of road that access a harvest unit if the harvest unit is dropped than usually the improvement are dropped as well, weather these action occur or not effects the Baseline.

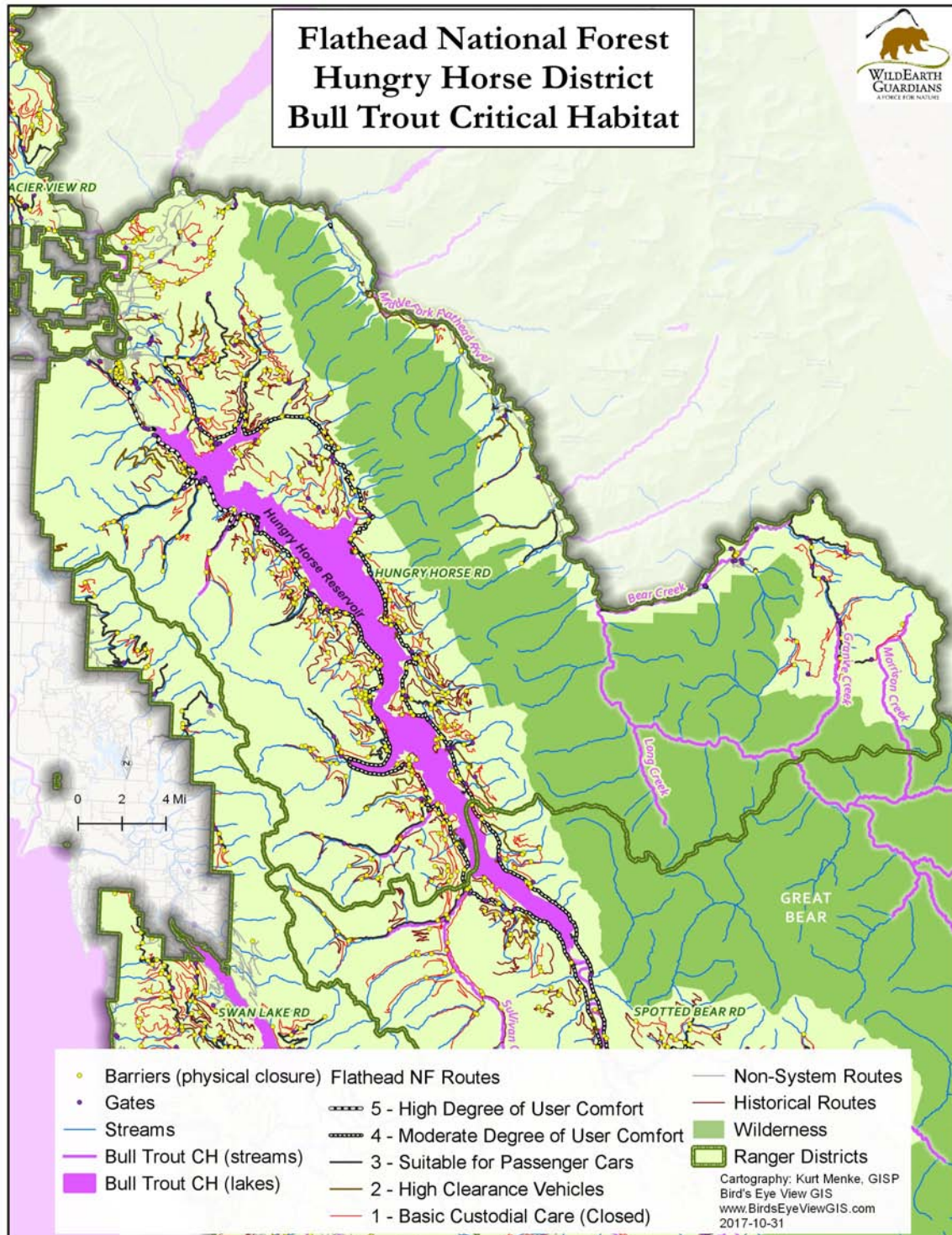
What we need to EMPHASIS. I think this is wear we have to get project specific. For Example Moose Fire 7 culvert left in Skookoleel drainage 5 on 316E and 2 on 5286) the Forest is to reduce the potential effects meaning up size INFISH...,

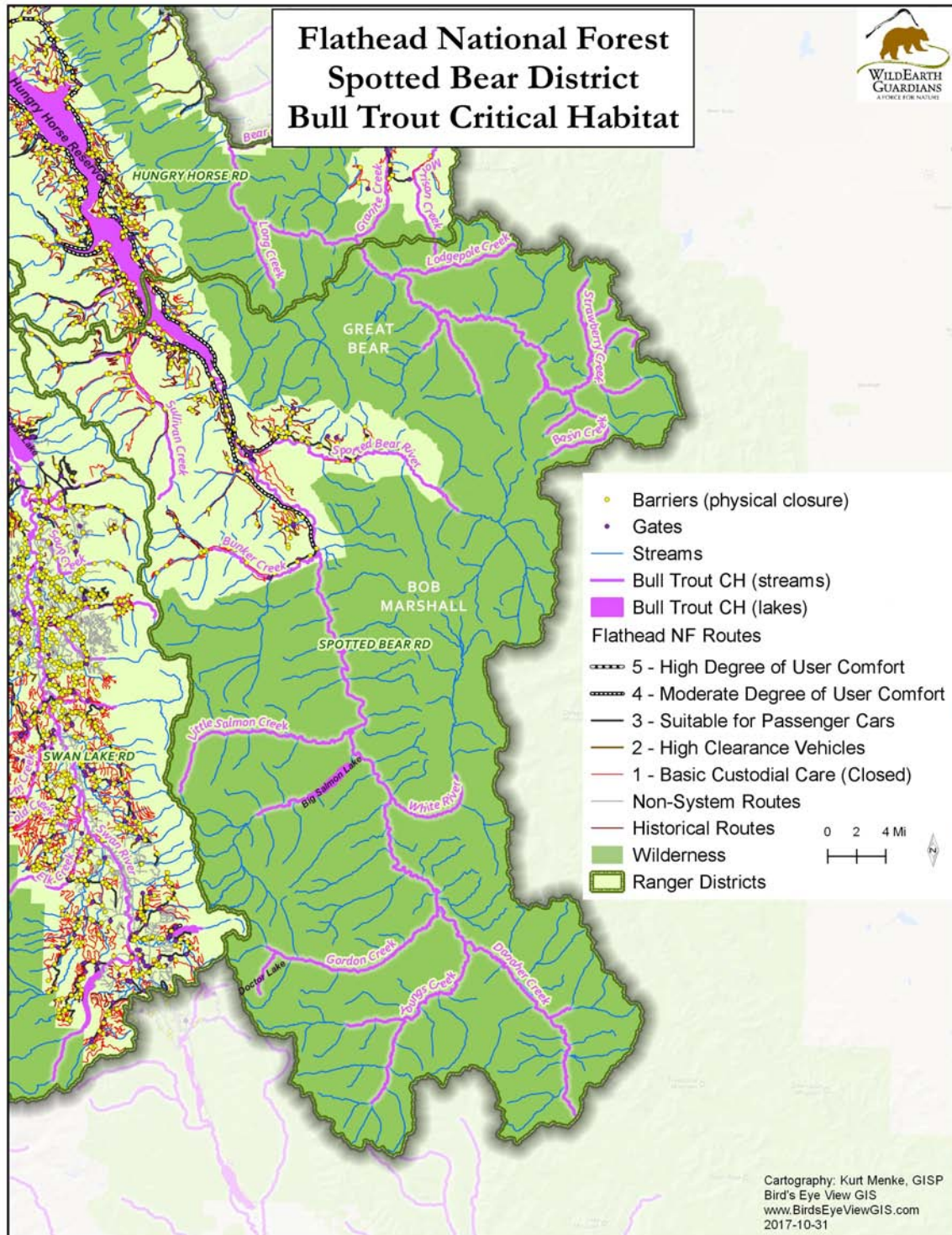
In December Steve will ID what needs to be emphasized. In mid Feb Steve would like share a draft report.

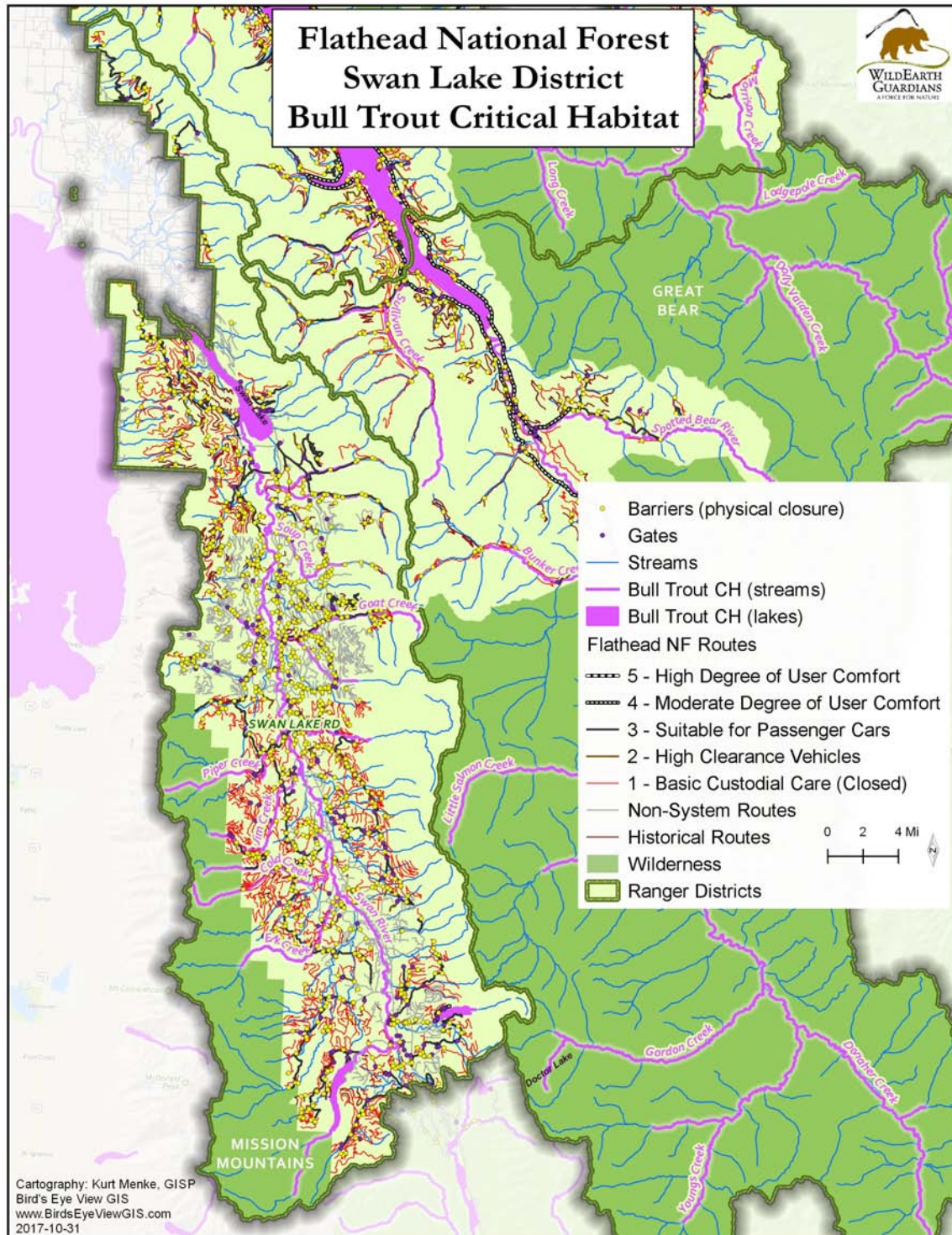
If its "decommissioned" there no pipes in the road unless its snowmobile Road ?

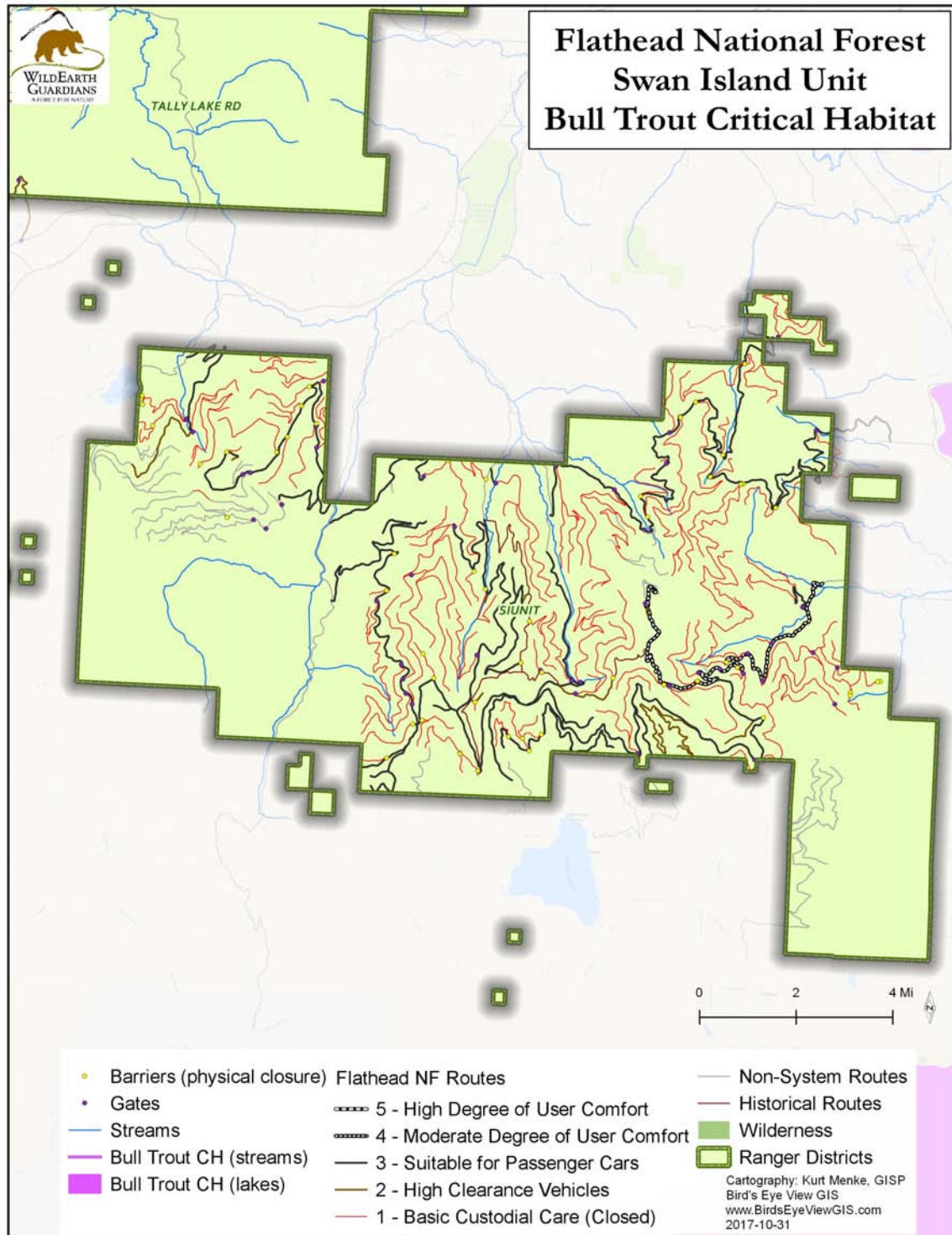
How are we going to handle reporting leaving pipes, would need to adjust the baseline?

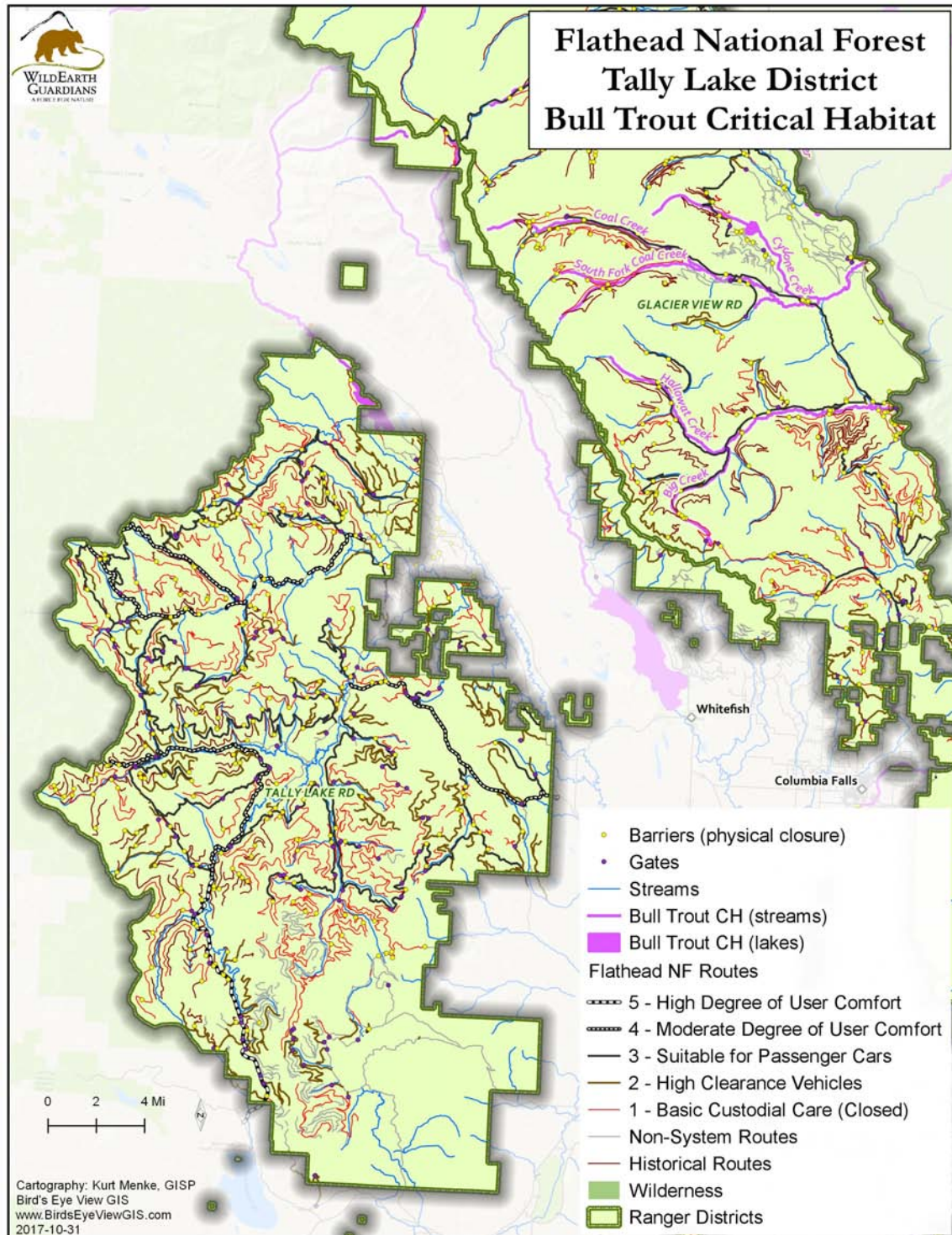


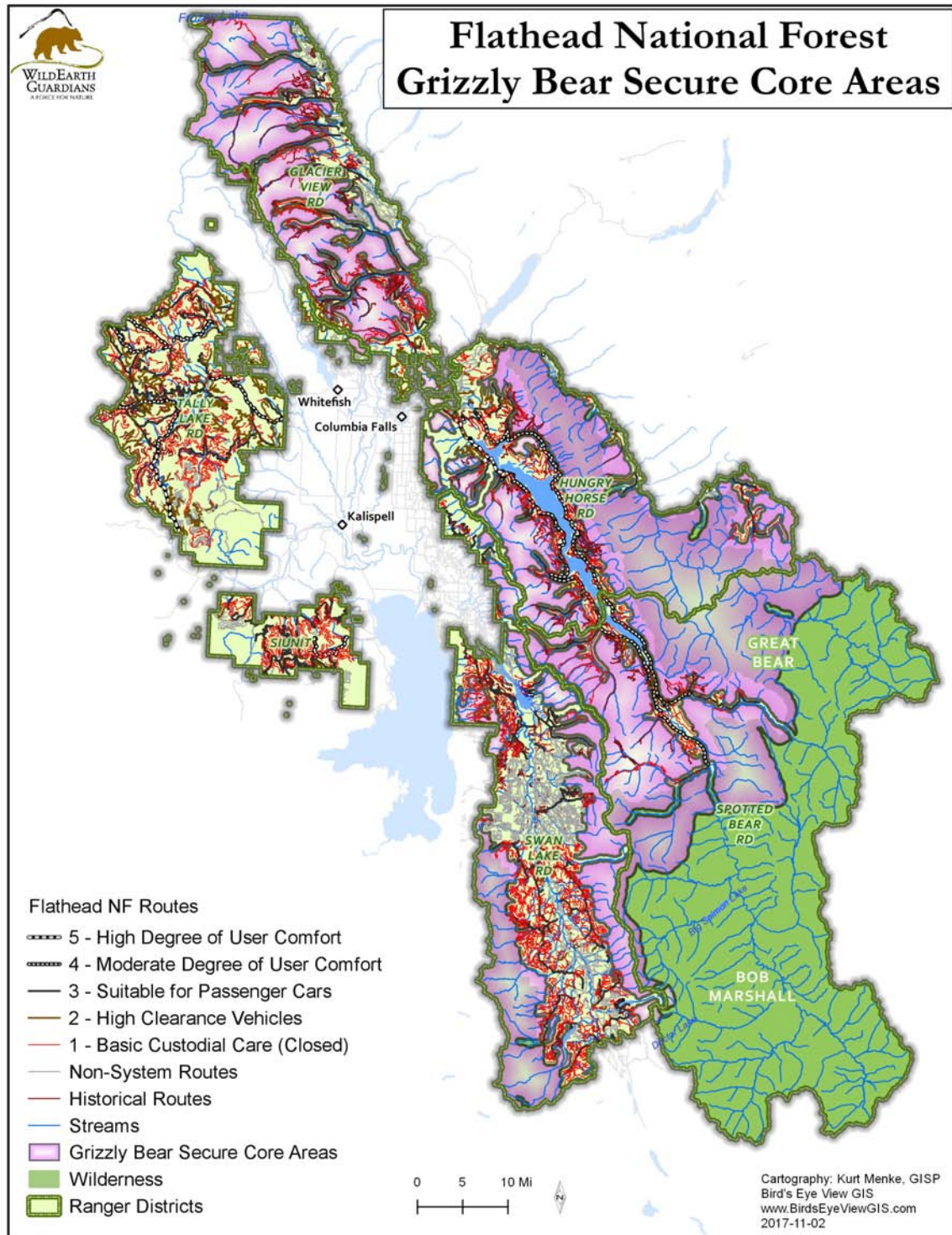












May 2016

Roads to Ruin: The Flathead National Forest Shirks Its Road Reclamation Duties

*by
Keith Hammer*

*Swan View Coalition
3165 Foothill Road
Kalispell, MT 59901
keith@swanview.org*



Easy-to-access culverts on open roads can blow out, like this one, while culverts on closed roads get inspected even less often. Though the Flathead National Forest has found up to half of its culverts on closed roads at high risk of failing, it has neither inspected them regularly nor removed them as promised. (Forest Service photo, Nokio Creek, 1999)

Executive Summary

In order to protect water quality and fish, the Flathead National Forest is required to either remove or monitor annually all culverts and bridges in roads closed in threatened bull trout habitat. Similarly, the Flathead is required to develop a monitoring plan for each road it chooses to simply close in providing Security Core habitat for threatened grizzly bear, rather than conducting the preferred reclamation by removing all stream-crossing structures.

Our investigation finds the Flathead has developed none of the required stream-crossing monitoring plans for roads closed to provide Security Core. Nor has it annually monitored stream-crossing structures on closed roads in bull trout habitat.

Though the Forest Service (FS) set forth these requirements and the need for them, the Flathead has failed to implement them. Rather than correct the problem, it has instead set upon a course to do away with such requirements - as culverts and bridges continue to fail on roads both open and closed to motor vehicles.

This report will discuss how the Flathead tracks its roads and stream-crossing structures, discuss how it does and does not monitor them, and provide examples of the consequences when it fails to adequately manage them. It will conclude with recommendations on how to get the effort back on track rather than abandon it to the detriment of fish, wildlife and taxpayers.



Reclamation of 60 miles of road in the Big Creek watershed removed culverts and restored native stream channels, like this reclaimed crossing. This resulted in Big Creek being the first watershed in Montana restored and removed from its list of watersheds "impaired" by logging and road-building. (Forest Service photo)

Why the Fuss About Roads and Culverts?

Grizzly bear research indicates bears are displaced by motorized vehicles and other human uses of bear habitat. They are displaced from habitat near roads, even roads closed by gates to motorized vehicles, due to vehicle trespass and non-motorized uses of the road behind the gate. Moreover, female bears raising young need 68% of their habitat to be essentially free of roads. [1]



MT Dept. Fish, Wildlife and Parks photo

Flathead Forest Plan Amendment 19 (A19) was issued in 1995 to incorporate this research and includes limits on Open Motorized Route Density (OMRD) and Total Motorized Route Density (TMRD) - and a required minimum of 68% Security Core. A gate can be placed on a road to reduce OMRD but the road must be reclaimed/decommissioned and removed from the road "system" in order to not count as a road and reduce TMRD. Road reclamation requires that all stream-aligned culverts and bridges be removed so they can't plug or fail during indefinite long-term closure.

While road reclamation is preferred to increase Security Core habitat, permanent road barriers like earthen berms are al-

lowed and culverts may remain, but a culvert "monitoring plan must be developed and its implementation assured." [2, 3]

Requirements for maintaining FS roads in bull trout habitat place even more emphasis on not leaving stream-crossing structures to fail behind road closure devices. Biological Opinions (BiOps) issued by Fish and Wildlife Service (FWS) require that all culverts behind gates and permanent barriers be monitored annually and that, if annual monitoring behind barriers "is not feasible, remove all stream crossing structures when the road is closed." The BiOps require the removal of all stream-crossing structures when roads are reclaimed, so annual inspections shouldn't be an issue. [4]

In other words, when done properly, road closures and reclamation benefit bears, other wildlife, water quality, fish, and the American taxpayer. The FS and FWS agree that road reclamation that removes all stream-crossing structures, as well as the ditch-relief culverts that channel ditch water under the road, "offers the greatest long-term benefit by reducing sediment delivery, reducing the risk of culvert failure, and the need for maintenance. [5]



Joel Sartore Nat. Geo. Stock w/ Wade Fredenburg photo

Are Culvert and Bridge Failures That Big a Problem?

FWS finds all abandoned culverts eventually fail. More broadly, plugging by stream bedload and woody debris was the most common cause in cited studies of culverts. Those smaller than 24" diameter accounted for 81% of the plugged culverts. [6]

Even a small stream in an 18" dia. culvert can do a lot of damage, as shown in our 2015 photos on this page of such a crossing on Pinnacle Ridge Road 1673. Steep streams like this tributary move bedload downhill. It in this case entirely fills the culvert catch basin, plugs the culvert, and sends the stream over the road where it carries away the road fill and fine sediments that can choke trout spawning beds.

The author witnessed this same culvert plugged with bedload and failing in 1973



Road 1673 looking upstream at plugged catchment.

as an employee of the Flathead National Forest. The Flathead reports roads have increased sediment levels in Pinnacle Creek nearly twelve-fold over natural levels! [7]

Large culverts like the 54" dia. culvert pictured on the cover of this report can still

overflow. The one pictured sent 1,000 cubic yards of road fill downstream. [8] A rust line greater than one-third the height of the culvert indicates this culvert was undersized and at increased risk of failure. [9]

Bridges are not immune to washing out, especially during high flows in Spring or with rain falling on fresh snow. A 1990 report by the Flathead documents \$319,000 in necessary repairs to roads, culverts and bridges in the South Fork Flathead and Spotted Bear areas damaged during a rain-on-snow event in November 1989. [10]

As A19 was being written, Montana Department of Fish, Wildlife and Parks (MDFWP) used a helicopter to survey culverts on closed roads in the South Fork Flathead and Spotted Bear area, finding 52 culverts par-



Road 1673 looking downstream at road-fill erosion.

tially plugged or undermined and 13 culverts that had failed in bull trout streams. [11] Such findings are among the reasons A19 and FWS's Road Maintenance BiOps include requirements to either remove culverts from closed roads or monitor them regularly to prevent blowouts. [12]

How Aware is the Forest Service of this Problem?

The Forest Service is well aware of the problems associated with roads, culverts and bridges. Following is what the Forest Service wrote in its 2014 Biological Assessment (BA) of road-related activities in bull trout habitat:

“Existing roads are considered a primary source of sediment related impacts to bull trout in developed watersheds (USFS 1998, page 38), and the degraded baseline conditions caused by roads and sediment were part of the rationale for listing bull trout as threatened. . .

The road related activities addressed in this BA . . . are necessary to . . . reduce the risk of damage to watersheds realizing that significant environmental events are likely to occur. . .

The activities described in this BA can occur on a routine basis . . .

The BTCS [Bull Trout Conservation Strategy] recognized that road interactions and activities associated with roads are a high concern. Road densities have been demonstrated as an effective proxy for departure from historic condition, the state of current condition, and ostensibly past management (Rieman et al. 2000). The correlation of higher road densities with fewer bull trout is repeated throughout the planning area, the Columbia River Basin, and other areas where native fisheries and land management issues overlap (Ripley et al. 2005, Quigley and Arbelbide 1997, Riggers and Mace 1997). . .

Road related activities include maintaining the driving surface, reducing the environ-

mental impacts of existing roads, and decommissioning roads. . .

Appendix E addresses how roads placed in a closed or stored status, or decommissioned, are to be treated. . .

Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected will be considered for removal. These have an increased risk for failure by reducing awareness of potential maintenance needs. The accumulation of debris has the potential to obstruct culverts and other road drainage structures. Without maintenance and periodic cleaning, these structures can fail, resulting in sediment production from the road surface, ditch, and fill slopes. The design criteria to address drainage structures left behind gates and berms require annual monitoring of these structures. This programmatic BA recognizes that as the number of closed roads grows (as anticipated), the burden of annual inspection will increase. . .

In the recent past these land management units have maintained an average of approximately 19 percent of the open road system, or 3727 miles each year . . . The overall condition of the existing road network and amount of maintenance needed to maintain the entire road network is unknown. . .

Road decommissioning will result in long-term benefits by reducing sediment sources, reducing the risk of culvert failure, and eliminating the need for maintenance.”

[13, parenthesis in original, emphasis added; 14].

So the Forest Service Must be Pursuing Road Decommissioning to Eliminate Culverts and Maintenance Costs?

Rather than continuing to embrace its road decommissioning obligations, the Flathead's decommissioning program has come nearly to a standstill. [15] FWS initially required the Flathead to meet its A19 OMRD objectives within 5 years and its TMRD and Security Core within 10 years as mandatory terms and conditions of its 1995 BiOp. [16] When the Flathead failed to meet those conditions, FWS began issuing BiOps allowing the Flathead to simply make some bit of progress as it plans timber sales and other projects. [17]

When the Flathead began revision of its current (1986) Forest Plan in 2006, it proposed to halve its timber sale

program and the "suitable timber base" acreage supporting it. This was partly due to recognizing the Flathead was receiving only 15% of the funds needed to properly maintain its road system, which was built primarily for logging access, and that it needed to continue decommissioning up to 500 miles of road over the coming decade to further reduce impacts to fish and wildlife. [14; 18; 19]

The 2006 Forest Plan revision effort was suspended, then taken up again in late 2013. The Flathead's 2014 Planning Assess-

ment concludes "During the past two decades, appropriated funding for roads construction and maintenance has decreased. . . The overall trend affecting the Flathead NF transportation system is that budgets for repairs and maintenance are expected to continue to decrease . . . [20]

Regardless of failing budgets, the Flathead's 2015 Proposed Forest Plan would



Road decommissioning removes culverts, restores streambed gradients, removes road fill, and stabilizes slopes. Paul Harvey photo

increase the suitable timber base half-again over the 2006 proposal, requiring more roads be retained for logging access. It would do away with further implementation of the A19 road management program and treat grizzly bear as a

species no longer protected by the Endangered Species Act. [21]

Similarly, the Flathead's 2014 Travel Analysis Report finds only 54 miles of its 3,518-mile road system should be decommissioned, in spite of A19's legally required objectives for grizzly bear never being met to provide the promised bear habitat security. The TAR also portends a shift to "storing" roads rather than decommissioning them, claiming that storing a road is cheaper, largely because the culverts need not be removed for "storage." [22]

Is the Delay in Road Decommissioning Hurting Anything?

Here, in part, is what the Flathead wrote FWS about the effects to bull trout of its delayed implementation of A19's road closure and decommissioning objectives:

"The delay in achieving the implementation schedule has resulted in roads existing on the landscape longer than anticipated. . .



A blown-out culvert in the long-closed Bunker Creek Road 549 in 2014, upstream of bull trout critical habitat.

In 2007, 30 miles [of closed roads] were surveyed and 9 failed culverts were found and about 50% of the culverts were at a high risk of failure. It is estimated that there are about 760 miles of bermed roads on the Forest and until these roads are surveyed, it is reasonable to state that conditions exist on them that could contribute sediment to stream networks downstream. . .

These surveys do not exist for every road [so we] infer from the surveys that have occurred that the retention of roads have resulted in unwanted culvert failures or debris slumps that have entered streams and have impacted bull trout habitat. . .

Retention of these roads and lack of maintenance has resulted in culvert failures that

have contributed sediment into bull trout waters . . . and is 'likely to adversely affect' bull trout. . .

If the A19 objectives were achieved we would have more roads that would have been reclaimed (i.e. culverts removed, stream channels restored, road surface water barred and treatment that would put that road in a self-maintaining state) and fewer potential effects. Decommissioning . . . would result in a long-term reduction of sediment and improve watershed and stream conditions." [23, emphasis added]

Shown on this page are just two of the problems we found behind the closure berm on Bunker Creek Road 549 the last two summers, in a bull trout watershed. [24]



Wildfire burned this Road 549 bridge over Bunker Creek in 2015, stranding 3 bridges and 30 culverts beyond!

Then Certainly Culverts are Being Removed or Monitored!

Though the Forest Service is well aware of the damage being caused by failing culverts, culvert failures remain a common occurrence. Though it long ago set forth its own requirements for monitoring culverts annually on closed roads in bull trout watersheds, and FWS agreed it must do so, it has not done so. [4; 5; 24; 25; 26]

Though the Flathead required that it either remove culverts or develop a monitoring plan for each road it closes with a berm to provide grizzly bear Security Core habitat, the Flathead has not prepared a single such monitoring plan! [2, 27] This even though it has bermed or simply abandoned several hundred roads to increase Security Core (and even more to lower TMRD). [28]

The Flathead, like other National Forests, uses an INFRA database to track culverts, bridges and other travel route infrastructure. The 2015 INFRA data it provided us lists 14,460 culverts and 231 bridges on its National Forest System Roads (NFSR). Not all culverts are listed in INFRA, however, especially smaller diameter culverts. [29]

The failure to include smaller culverts in INFRA compounds the problem of trying to track culverts at risk of blowing out. This is especially true given that studies show

81% of plugged culverts are less than 24" diameter. [6] The culvert size issue aside, we found the 2015 INFRA data extremely inconsistent in tracking problem culverts and those that had been replaced due to problems. [24; 30]

In short, the Flathead does not know with certainty how many culverts it has, where they are all located, what condition they are in, or which have failed. This lack of culvert surveys and adequate database make it difficult to determine the Forest-wide and system-wide effects on water quality and fish.



Monitoring culverts on closed roads is not an easy task, which is why it is best to remove them instead.

Indeed, the Flathead finds "If road surveys existed on every road system, we would be better able to determine if culverts have failed on closed roads and what the associated affects would be on streams and bull trout."

[23] The Forests in Western Montana in 2014 were left to conclude "The overall condition of the existing road network and amount of maintenance needed to maintain the entire road network is unknown." [5]

Rather than proposing to significantly reduce the size of its road system to be more fiscally and environmentally responsible, the Flathead intends to make it larger by beginning to rebuild roads it previously decommissioned! [Appendix A; 31]

What's the Problem?

It has become increasingly clear the FNF simply doesn't want to take full responsibility for either removing culverts from closed roads or inspecting them annually to insure they do not plug and fail - as required by the programmatic bull trout BiOp. While the FNF, when challenged, recently agreed to an annual culvert monitoring program in its Chilly James Restoration Project, it simultaneously claims it need not do this elsewhere in bull trout habitat. [26]

This is akin to how the FNF failed to implement its programmatic A19 road closure and decommissioning objectives, leaving 126 miles of road decommissioning scheduled but never implemented and much of the Forest never scheduled to meet A19 objectives. [15, 17] Now the FNF is trying to cheat A19, leaving unattended culverts in "impassable" and other "stored" or abandoned roads from which culverts were promised to be removed! [32]

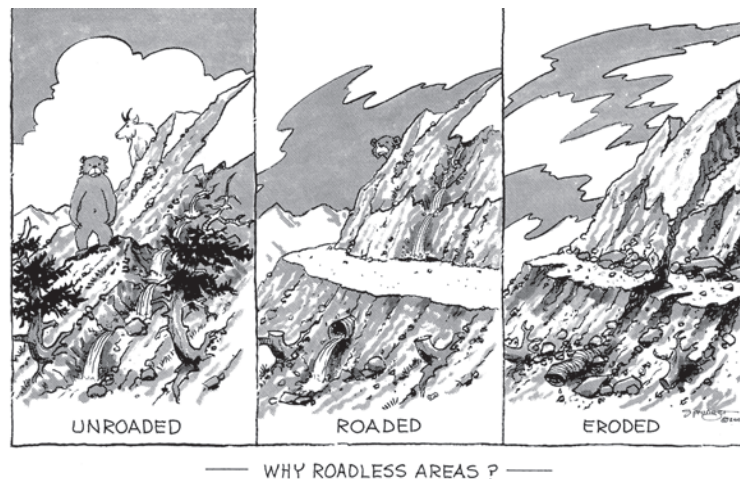
While the FNF claims A19 has since 1995 allowed it to not count "impassable" or "stored" roads in TMRD, it only began doing so in 2012. [33, 34] When pressured, the FNF now states there "is no forest policy concerning [stored road] treatments and TMRD calculations" and that it is up to the District Ranger whether or not to include "stored" roads in TMRD. [35]

In a broader context, the Forest Service appears to be favoring politics over science and trying to keep its admittedly bloated road system. Whereas its initial directive to arrive at a "minimum road system" clearly "points to a smaller road system," subsequent directives and travel planning like that on the FNF show that the road system may instead get even larger. [36]

The agency's recently released Ecosystem Restoration Policy could not be more telling. The word "road" appears not at all in

the policy, as though roads do not compromise ecosystem resilience and we needn't do anything about them to restore damaged ecosystems. [37]

Such notions run contrary to the primary findings of the



Interior Columbia Basin Ecosystem Management Project, which essentially found that ecosystems with roads and management were generally less resilient than those remaining roadless and without management. Many studies caution that trying to restore ecosystems through more management could do more harm than good. [38]

Simply put, the Forest Service is retaining its bloated road system so it can argue for more funds to feign "restoration" by logging, thinning, and burning in ways that require retention of the very roads that cause and enable the ecosystem damage! [37, 38]

Aren't Collaborative Groups Coming to the Rescue?

Unfortunately, collaborative groups have been used on the FNF to promote the myth that the primary problem with forest ecosystems is that there are too many trees rather than too many logging roads. In spite of plentiful scientific research and advice to the contrary, some collaborative groups have outright lied that logging is needed to restore forests and then argued that stream-aligned culverts be left in “reclaimed/decommissioned” roads.

The collaborative group Flathead Common Ground was launched on the FNF by Defenders of Wildlife, National Wildlife Federation and Intermountain Forest Industries Association. An invited panel of scientists reviewed the collaborative’s “ecologically driven” logging proposal and reported back in 1997.

The panel did not agree that the logging was ecologically driven and concluded “the desire to harvest timber products should be explicitly recognized here as the driving force.” The panel also found it was “unclear the extent to which road closure entails gating only, gating plus culvert removal, or reclamation/obliteration.” [39]

The collaborative’s final proposal nonetheless still called its logging “ecologically driven.” DOW and NWF in particular re-

fused to abide by A19’s requirement that all stream-aligned culverts be removed from the 120 miles of road the FNF said needed to be reclaimed in the Paint-Emery Project area. Indeed, they argued against it. [40]

The Collaborative Forest Landscape Restoration Program (CFLRP) says plenty about logging as restoration but barely mentions decommissioning existing roads. [41] This bias is similarly reflected in its accom-

plishments. Its 5-year report finds CFLRP exceeding its logging goals but falling far short in removing roads and the weeds they spread. [42]

The Southwest Crown Collaborative (SWCC), which is partly funded by

CFLRP, on 9/11/12 recorded the FNF Supervisor as saying the Swan Lake Ranger District “has already decommissioned 800 miles of roads due to grizzly bears, so there aren’t as many opportunities today” for decommissioning. [43] Swan View Coalition showed this to be in error and the District Ranger subsequently agreed only 74 miles have been decommissioned in the District - about half of that in the SWCC area. [44]

Meanwhile, other collaborators are urging Congress to fund them and to ignore those who may have a better grip on the facts and resort to litigation when necessary. [45]



The Southwest Crown Collaborative visits a completed logging unit in the Meadow Smith timber sale in 2012.

In Plain Language, What's Going On?

The Forest Service complains it doesn't get enough funding to maintain its roads yet refuses to significantly reduce its road network. Instead it simply blocks more roads shut to save on maintenance while largely ignoring the culverts and bridges on those closed roads as though they'll maintain themselves. [46, 47]

When it does get funding for road maintenance, it skims 55% off the top of that and uses it instead for "timber support." [48] Though timber sales are supposed to then help maintain the roads used to haul the logs, a vicious downward spiral is set in motion as timber sales are used to justify more roads and roads are used to justify more timber sales! [49]

The conservation community has helped lobby Congress to provide funds to repair or decommission roads via the Legacy Roads and Trails Program. [50] This once independent budget line item, however, has now been combined with other budget sources into an Integrated Resource Restoration budget line item. This makes it harder to insure that money to fix or decommission roads is not instead used to accomplish logging targets and other logging-as-restoration objectives - concerns expressed by the Forest Service itself. [51]

On the FNF, its choices for decades have been crystal clear, especially in bull trout habitat: either remove all the culverts from closed roads or commit to monitoring and maintaining them annually. This it has not done, nor has it met similar requirements when closing roads to provide grizzly bear Security Core habitat. As roads, culverts and bridges continue to wash out and collapse, as pictured on this page and page 7, it becomes even harder to monitor culverts

and bridges stranded further up the road. [52]



Water collecting in the ditch of this closed road contributed to mass failure into Sullivan Creek, a key bull trout spawning stream.

The FNF is attempting a revisionist history of A19, as though it did not require "reclaimed" roads to be treated as "decommissioned" roads to be removed from the road

system. Its increasing reliance instead on simply calling roads "impassable" and "stored" to decrease road densities reneges on promises it made its biologists, the courts and the American public. [53]

No National Forest should need the additional force of law afforded threatened and endangered species to make it do the right thing. Simple common sense and fiscal responsibility indicate the Forest Service needs to decommission a significant portion of its road system in order to adequately manage the remainder in an ecologically sound manner. [54]

Recommendations

Based on our investigations, we recommend the following to the Forest Service:

1. Continue A19 as an integrated road management program and reduce the Suitable Timber Base and Allowable Sale Quantity accordingly, as proposed in 2006. [55]

2. Recognize that A19 dovetails with requirements for managing roads in bull trout habitat and the agency's duty to arrive at an environmentally and fiscally sustainable "minimum road system."



The last three miles of Bunker Creek Road 549 was decommissioned under Clinton's 1998 Clean Water Action Plan. Here a bridge was removed at Warrior Creek.

3. Apply the road closure, reclamation and culvert monitoring programs developed for bull trout and grizzly bear across the entire Flathead National Forest, so the benefits are extended to all fish and wildlife and are not dependent upon Endangered Species Act listings and protections. [56]

4. Inventory all stream-crossing structures on the Forest and include them in the INFRA database, in a manner that insures inspections, problems and repairs are fully accounted for and easily traceable. [57]

5. Commit to the annual inspection and necessary cleaning of all stream-crossing structures. If this is unrealistic, reduce the size of the road system to a size that is realistic. [58]

6. Quit skimming 55% off the top of road maintenance funds for "timber support" and put it directly to work maintaining roads where needed most. [59]

7. Recognize that calling logging and other vegetative treatments requiring roads "restoration" is at odds with considerable science and at odds with ecosystem restoration requiring the removal of roads. [60]

8. Recognize removing culverts from roads is cheaper than maintaining them in the long term. [61]

9. Work with the public to secure funding and independent budget line items for decommissioning roads - and keep them independent line items. [62]

10. Recognize litigation is as important as collaboration in helping guide the agency. [63]

"The simplicity of A19 and its ability to permanently secure areas for grizzly bears makes it a powerful tool in the conservation of the grizzly bear."

Dr. Bruce McLellan, Dr. M. A. Sanjayan
and Dr. Nova Silvy
9/19/2000

Acknowledgements

The author wishes to acknowledge the assistance of Flathead Forest Supervisor Chip Weber and members of his staff as we conducted our investigations and submitted numerous Freedom of Information Act requests for data and documents. Michele Dragoo was of particular help as she handled the FOIA requests and collected various documents from District offices as well as the Supervisor's office. Our thanks extend to those who helped get the documents to Michele Dragoo.

We met several times with Rob Carlin, Kathy Ake and Trisha Cassner and wish to thank them for their efforts to answer our questions and to provide INFRA and other infrastructure data to us in formats we could use in Excel and Google Earth.

We also wish to thank Spotted Bear District Ranger Deb Mucklow, Ron Krueger and other FNF staff who followed up on our numerous reports of plugged or partially plugged culverts, in some cases removing the debris before further damage could occur and in others confirming our discovery of culverts where they were thought not to exist.

Disclaimer and Need for Further Study

This investigation and report were made without the benefit of full access to the INFRA database. It nonetheless reports on a handful of the problems found by comparing INFRA data using Excel and Google Earth to field observations. Space here does not allow a discussion of every problem found. We reserve for another time a discussion of the stream-aligned culverts found in decommissioned, "impassable/stored" and other roads where they should not exist either by definition, requirement, common sense, or because they were specifically reported as having been removed.

With full access to the INFRA data and its database capabilities, more could be gleaned concerning the adequacy of the data and its ability or inability to indicate where culverts and bridges have been stranded beyond culverts and bridges that have been removed by act or nature. Such further study could also produce recommendations for improving how INFRA could track the history of each structure and when it was last inspected, cleaned, identified as a problem, repaired, or scheduled for further action.

Notes and Sources

1. See generally Fish and Wildlife Service's 1/6/95 Biological Opinion on Flathead Forest Plan Amendment 19, as amended 2/17/95, for the biological rationale adapting research to Forest Plan objectives and standards, including the BiOp's Incidental Take Statement. Kemper McMaster, Field Supervisor, Montana Field Office.
2. Flathead Forest Plan Amendment #19: Allowable sale quantity and objectives and standards for grizzly bear habitat management. Decision Notice signed 3/1/95 by Joel Holtrop, Flathead Forest Supervisor. See also Amendment 19 Appendix D: Forest Plan Appendix TT Definitions and implementation direction for restricted roads, reclaimed roads, and security core areas.
3. For more information regarding how Amendment 19 has been dovetailed with the work of the Inter-agency Grizzly Bear Committee and implemented on the Flathead National Forest, see Keith Hammer's white paper "Only decommissioned roads removed from the Forest Development Road System may be omitted from calculations of Total Motorized Route Density on the Flathead National Forest. Dated 6/4/15 and updated by addendum 2/7/16. This white paper is also included as Appendix A to this report.
4. Biological Opinion on the effects to bull trout and bull trout critical habitat from the implementation of proposed actions associated with road-related activities that may affect bull trout and bull trout critical habitat in Western Montana. Jodi Bush, Field Supervisor, Ecological Services Montana Field Office of Fish and Wildlife Service. April 15, 2015. The 2015 BiOp follows similar BiOps dated 4/26/99, 8/1/01, and 4/29/08. All these BiOps, and the Forest Service Biological Assessments they respond to, express concerns about continued failure of culverts. The 8/1/01 BiOp and all that follow require the annual inspection of culverts on closed roads.
5. Biological Assessment of Road related activities that affect bull trout and bull trout critical habitat in Western Montana. Prepared by USDA Forest Service Northern Region and UDI Bureau of Land Management Missoula Field Office. Dated 5/5/14, revised 12/15/14.
6. Biological Opinion on the Effects of the Moose Post-Fire Project on bull trout. U.S. Fish and Wildlife Service, Montana Field Office. Dated 11/14/02. Citing Copstead, R. L. and D. K. Johansen. 1998. Water/road interaction: examples from three flood assessment sites in Western Oregon. USDA Forest Service, San Dimas Technology and Development Center, San Dimas, California.
7. Due to a switchback in Pinnacle Ridge Road 1673, another 18" dia. culvert carries the same small stream under the road immediately uphill of the crossing shown in the photos. While the upper culvert was not failing in 1973 when the author inspected it then as a Forest Service employee, its catch basin was filled with bedload and the culvert was overflowing the road when inspected on 6/26/15, sending more bedload and road fill downhill to fill the catchbasin at the lower crossing and contributing to its failure also.

The Flathead's August 1993 DEIS for the Middle Fork Ecosystem Management Project, reported another "recent culvert washout and repair" in the Pinnacle Creek watershed, but did not specify exactly where. The DEIS did note lower Pinnacle Creek was in the worst condition of all streams in the Project area. It noted a 1,177% increase in sediment over natural conditions and concluded "The existing sediment yield increase is from roads. Roads will continue to generate sediment indefinitely unless they are restored to pre-road condition."

When Road Management Objectives for this road were established in 2009, the two 18" dia. culverts weren't even listed as existing, let alone included under "Special Maintenance Criteria Details." A Forest Service Avalanche Ranger reported the 2015 failures in late winter and both culverts with a history of failure on the small tributary to Pinnacle Creek are reported to have since been replaced with 48" dia. culverts.

8. Counting culverts: An assessment of integrated road and culvert management on the Flathead National Forest. Keith Hammer. December 2000. Available at <http://www.swanview.org/reports/Culvert-Report.pdf>

9. Culvert Monitoring Form 5/2005 provided by the Flathead National Forest on 2/5/16.

10. See Note 8, citing Flathead NF Flood Damage report to the Regional Forester, 4/4/90.

11. See Note 8, citing MDFWP survey report to Flathead NF by Tom Weaver, 12/18/95.

12. See Notes 2 and 4.

13. See Note 5.

14. In preparation for revision of the Flathead, Lolo and Bitterroot Forest Plans, Forest Service fisheries biologists in 2000 conducted “baseline bull trout risk assessments.” These risk assessments were made on a 6th Code Hydrologic Unit Code (HUC6) basis and detailed among other things the miles of roads and streams in each HUC, the density of roads, the proximity of those roads to the streams, and the number stream crossings by roads.

We analyzed this risk data and found, based on road density and its location relative to streams, that the Flathead National Forest rated 70% of its HUC6 sub-watersheds to be Functioning at Risk or Functioning at Unacceptable Risk to bull trout. It found 30% of the sub-watersheds Function Appropriately. Our analysis of the data is presented in our May 2004 report “Watersheds at Risk: Roads threaten bull trout on the Bitterroot, Flathead and Lolo National Forests.” The report is available at:

http://www.swanview.org/reports/Watersheds_at_Risk_report.pdf

We also applied a “Road:Stream Ratio” analysis to this same HUC6 data. We found that only 23% of the HUC6 sub-watersheds within the Flathead National Forest boundary remain roadless and that, on the whole, the developed sub-watersheds had 20% more miles of road than streams (9,092 miles of road compared to 7,607 miles of streams). We also found that 92% of the developed sub-watersheds had road densities in excess of levels where most bull trout populations occur and in excess of recommended standards for grizzly bear recovery. This analysis is detailed in our April 2003 report “Off the Charts: Roads outnumber streams in developed Flathead watersheds.” The report is available at:

http://www.swanview.org/reports/Off_the_Charts_report.pdf

15. The Flathead National Forest tracks its Road Decommissioning Projects in a spreadsheet updated annually. These are roads intended to be decommissioned, removed from the “road system,” and tracked instead as “historic” roads once the decommissioning work and re-vegetation become effective. The spreadsheet also tracks decisions to decommission roads where the decommissioning has not yet occurred.

The 2/18/16 spreadsheet concludes decisions have been made since 1992 to decommission 889 miles of road; that 162 of those miles needed no work as they were naturally re-vegetated, that 601 of those miles needed work and were actively decommissioned, but that 126 of those miles remain in the road system and have not been decommissioned as planned. The spreadsheets and other Flathead documents show that the Flathead decommissioned an average of 43 miles of road per year from 2003 - 2013 [see Note 19, below] while decommissioning only 12 miles total in 2014 and 2015.

As discussed in Appendix A to this report, where A19 used the term “reclaimed,” the A19 EA made clear that reclaimed roads would also be removed from the road system, also known as “decommissioned.”

16. See the Incidental Take Statement in Fish and Wildlife Service’s 1/6/95 Biological Opinion on Flathead Forest Plan Amendment 19, as amended 2/17/95. Kemper McMaster, Field Supervisor, Montana Field Office.

17. FWS's 2015 BiOps and Incidental Take Statements regarding the Forest-wide effects of Amendment 19 to grizzly bear [see Note 15] were replaced by successive BiOps and Incidental Take Statements on 10/25/05 and 1/31/14 to address revised A19 implementation schedules. Currently, FWS prohibits the Flathead from making any net increase in OMRD or TMRD or any net decrease in Security Core; to abide by any access management implementation schedules made a part of individual projects; and to otherwise proceed "with reductions of access densities and increases in core as authorized by project decisions without time tables, as funding allows." This is followed by the Conservation Recommendation that the Flathead "Continue to manage access on the Forest to maintain or achieve lower road densities . . . low road densities would also benefit other wildlife and public resources. Low road densities may result in lower maintenance costs that free up funding for other resource needs."

18. US Forest Service Western Montana Planning Zone. 2004. Analysis of the management situation for the Bitterroot, Flathead and Lolo National Forests. 3/2/2004. Missoula, MT

19. Flathead National Forest. 2006. Proposed Land Management Plan. April 2006.

20. Flathead National Forest. 2014. Assessment of the Flathead National Forest - Part 2. April 2014.

21. Flathead National Forest. 2015. Proposed Action - Revised Forest Plan. March 2015.

22. Flathead National Forest. 2014. Travel Analysis Report for Flathead National Forest. The final TAR includes the same economic analysis as the draft TAR and suffers from the same flaws described in Swan View Coalition's comments on the draft TAR.

Namely, the TAR: 1) compares the cost of decommissioning to the cost of ML-1 road maintenance, not to the true costs of properly "storing" a road with no risk of culvert or bridge failures and no need for maintenance, falsely concluding "You can store the road forever cheaper than decommissioning" and 2) presumes that the road will be rebuilt or reconditioned in the future, making decommissioning appear all the more costly and short-circuiting the whole purpose of the TAR in helping determine which roads should never be rebuilt in order to arrive at a fiscally and environmentally sustainable "minimum road system."

Our full comments on and other documents related to the draft TAR can be found at:

http://www.swanview.org/articles/newsletter-alerts/help_decommission_old_logging_roads_that_are_trashing_the_environment/194

23. Flathead National Forest. 2010. Fisheries Biological Assessment: Amendment 19 objectives and standards for grizzly bear habitat management revised implementation schedule. Pat Van Eimeren - Flathead National Forest Fisheries Biologist. 6/2/10.

24. Bunker Creek Road 549 (and its spur Middle Fork Road 2820) have been closed yearlong to protect wildlife habitat since 3/26/96, initially with a gate and then with an earth berm at Milepost (MP) 3.7 on Road 549. In 1998 and 1999, Road 549 was decommissioned above its junction with Road 2820, from MP 9.7 to its end MP 12.9, using funds provided by President Clinton's 1998 Clean Water Action Plan, which called for the decommissioning of 5,000 miles of road a year by 2002 on federal lands. (See Note 15. The Clean Water Action Plan is at <https://www.epa.gov/aboutepa/president-clinton-announces-clean-water-action-plan>)

Bunker Creek, below its confluence with Middle Fork Creek, has since been designated bull trout "critical habitat." The Road 549 bridge burned in 2015 and pictured on page 7 of this report is 50 yards upstream from the confluence with Middle Fork Creek and the beginning of downstream "critical habitat." The bridge debris and the worst of the slumping road fill has since been removed.

Similarly, the burned bridge is 50 yards from the junction with Road 2820 and 175 yards from the decommissioned portion of Road 549. We surveyed the decommissioned portion of Road 549 in 2014. This appears to be a good job of decommissioning and not a single bridge or culvert remains.

Road 2820, on the other hand, has relied on the earth berm on Road 549 for its closure to motor vehicles and had motorcycle tracks evident during our visit in 2014. According to the Flathead's INFRA database, which is used Forest Service-wide to track travel route infrastructure, Road 2820 still has 3 bridges and 30 culverts in place. (The Flathead in 2015 provided us with Excel spreadsheets and Google Earth KML files containing INFRA and other data relative to National Forest System Roads, decommissioned/historic/non-system roads, "impassable" NFSR roads, road barriers, road gates, existing culverts and bridges, and disposed/removed culverts and bridges on the Flathead).

When we requested pursuant to the Freedom of Information Act (FOIA) all culvert inspection plans and forms for Road 2820, the only ones provided were 12 stream-bearing culvert inspection forms from a 2010 survey, along with the survey log noting the cleaning of additional cross-drain culverts. Although this is a bull trout watershed, no requisite annual culvert inspections were provided. Although this is a bermed road in grizzly bear Security Core, no requisite monitoring plan for the road and culverts was ever prepared. The 2010 survey reported three plugged and failed stream-bearing culverts, another half-dozen partially plugged culverts cleaned during the survey, and rated half of the dozen stream-bearing culverts as medium or high risk of blockage or failure.

On 8/28/14 we found two of these Road 2820 culverts again partially plugged with woody debris and noted one had overflowed and sent part of the roadbed downstream toward Middle Fork Creek. We alerted the District Ranger, who sent a couple employees up with hand tools to clean the woody debris out.

On 8/28/14 we also encountered a Forest Service employee and "Call When Needed" backhoe contractor digging out the failed 24" dia. culvert at MP 6.2 in Road 549, as pictured on page 7 of this report, and laying in a second 24" dia. culvert alongside it. The 2015 INFRA data shows two culverts now at this location, but no remarks to indicate one of them had failed or why a second culvert was necessary. A 2010 culvert survey log for Road 549 indicates this culvert was at that time a "washout, deposition upstream of road, downstream side of road washout is 5-10 ft deep."

We alerted this 8/28/14 crew, which had temporarily removed the earth berm closure to get equipment in to make the repair at MP 6.2, to a 4' dia. culvert at MP 6.9 that was nearly completely plugged with logs and bed load and would likely fail with the next big storm or Spring runoff. They ran the backhoe up the road and cleaned the culvert inlet, heading off another culvert failure and sediment load into Bunker Creek. The 2015 INFRA data contains no remarks that this culvert nearly failed and needed cleaning in 2014. Nor does the 2015 INFRA data note the 2010 culvert survey log indicated the crew had at that time cleared the culvert of all but "large immovable logs," which are perhaps among the logs that trapped bedload against the culvert inlet as shown in our 2014 photo below, left. The small remaining hole into the 4' dia. culvert inlet was smaller than a volleyball. The culvert pictured on the right is provided for comparison and is a Forest Service photo of a 4' dia. culvert blowing out in 2014 behind a gate on Emery Creek Road 546.



We requested pursuant to the FOIA all culvert inspection plans and forms for Road 549. The only ones provided for the road behind the closure berm were 2 stream-bearing culvert inspection forms from a 2010 survey, along with the survey log. The 2010 survey log accounts for only 36 of the 51 culverts that the 2015 INFRA data list as existing behind the closure berm. Although this is a bull trout watershed, no requisite annual culvert inspections were provided. Although this is a bermed road in grizzly bear Security Core, no requisite monitoring plan for the road and culverts was ever prepared.

25. Through a series of FOIA requests and meetings with FNF staff spanning from November 2014 through February 2016, we learned that annual monitoring of stream-crossing culverts behind road closures in bull trout habitat is not being conducted Forest-wide. When we asked for such culvert monitoring records for five specific closed roads in bull trout habitat, FNF could provide no annual inspection reports for those roads. Though we were provided INFRA road infrastructure data for FNF culverts and bridges, we were informed the INFRA data would not show when a culvert was last inspected (personal communication with Kathy Ake and Trisha Kassner, 6/24/15) - which it indeed does not.

26. The FNF insists “The Forest is not required to monitor every stream crossing in every bull trout watershed across the forest [and the annual culvert monitoring requirement on closed roads does not apply until] a project utilizes the programmatic [Biological] Opinion.” (Chilly James Restoration Project Decision Notice and Finding of No Significant Impact, Appendix 4 Response to Public Comments, Richard Kehr, 4/15/16).

On the other hand, the Chilly James DN cited above then continues: “Roads with stream crossings that are closed by a berm or gate in bull trout watersheds in the project area will have annual culvert monitoring and reporting as required by the bull trout biological opinion . . . The Chilly James project is very similar to work described in the 2015 programmatic Biological Opinion for road-related work . . . However the project does have more actual activity (number of cross-drains to be cleared and culverts removed) than normally allotted and thus a stand-alone Biological Opinion was prepared.”

The Chilly James DN essentially claims that the annual culvert monitoring requirement in the programmatic BiOp does not apply until the Forest Service says it does. We will let the referenced 2008 Biological Opinion speak for itself, along with its 2015 updated Biological Opinion (see Note 4 and page 3 of this report). Similarly, we will let the Forest Service’s Biological Assessment prepared for the 2015 update speak for itself (see Note 5 and the summary of the BA provided on page 5 of this report).

27. On 7/15/15, we submitted a FOIA request and asked the FNF to provide copies of all the culvert monitoring plans required for each road closed, rather than decommissioned, to provided grizzly bear Security Core habitat - as required by A19 since 1995. In his FOIA response dated 9/22/15, FNF Supervisor Chip Weber responded: “as was mentioned in our August 6th meeting, there are no monitoring plans as you requested in your July 15th request.”

28. We utilized INFRA data and Google Earth kml road files provided by the FNF to determine how many roads have been simply closed, rather than decommissioned, to increase grizzly bear Security Core habitat. Bermed ML-1 roads numbered 228, Impassable TMRD roads numbered 48, and Impassable Not TMRD roads numbered 45, for a total of 321 roads. [See Appendix A to this report for a discussion of ML-1 and Impassable roads]. For comparison purposes, 435 of FNF’s decommissioned roads also serve to increase Security Core.

29. Personal communication with Kathy Ake and Trisha Kassner, 6/24/15. Our Counting Culverts report in 2000 estimated 80,000 culverts may exist on the FNF. The report is accessible via Note 8.

30. The INFRA data provided by the FNF included 14,460 culverts. In the “Remarks” data column, only 110 culverts were mentioned as having problems and similarly, though not the same culverts, 110 were mentioned as having been replaced. This appears to be a gross under-representation of problem culverts, given some individual culvert surveys have reported up to 65 failed or failing culverts on the handful of

roads surveyed (see Notes 11 and 24, for example). If there exists a portion of the INFRA database that better tracks problem culverts, we were not provided nor made aware of it by the FNF.

31. Though FNF's implementation of A19 road decommissioning has been sluggish, it has recently come nearly to a standstill. While the FNF proposed in 2006 to decommission up to another 500 miles of road, assessments in the past couple of years call for only 54 miles of road decommissioning ever and the elimination of A19 altogether (see page 6 of this report). More recently, FNF logging proposals like the Trail Creek Fire Salvage Project have begun proposing to rebuild previously decommissioned roads, bring them back into the roads "system" and keep them there - to the detriment of water quality, fish and wildlife (see pages 11 - 14 of Appendix A to this report).

32. A particularly egregious example of leaving unattended culverts in "impassable" roads is the recently "waterproofed" Raghorn Road 10802 in the Coal Creek watershed, which is "critical habitat" for bull trout and an "impaired" Water Quality Limited Stream. Road 10802 was among many roads initially scheduled for decommissioning in 1992 but for which implementation languished for decades. Finally, a 2010 decision was issued to remove all 13 culverts from the "long abandoned" Road 10802. But in 2012 only three culverts were removed, stranding numerous stream-crossing culverts beyond! More details can be found on pages 12-14 of Appendix A to this report.

33. Protocol paper for motorized access analyses application rule. Draft NCDE Grizzly Bear Conservation Strategy Appendix 5. Kathy Ake. February 2013.

34. 2012 Annual Flathead National Forest Plan Amendment 19 implementation monitoring report and responses to Amendment 19 revised implementation schedule terms and conditions. June 2013. Flathead National Forest. This announcement that the FNF was not including many "impassable" roads in calculations of TMRD coincides with the significant slowdown in the FNF's road decommissioning, which is required by A19 to remove a road from TMRD calculations. Decommissioning dropped from an average of 43 miles per year to only 6 miles per year (see Note 15).

35. See the Chilly James DN cited in Note 26. In its Appendix 4 Response to Comments, the DN more fully states: "There is no forest policy concerning ISS treatments and TMRD calculations. Roads and specific treatments are assessed by the Interdisciplinary Team at the project area scale as described in the EA. Whether or not a road will be managed to meet 'reclaimed' status under Amendment 19 and contribute or not contribute towards TMRD is specifically addressed within the EA . . ."

This District-level discretion was confirmed by Mark Ruby during an informal Objection resolution meeting for the Chilly James Restoration Project on 4/5/16, stating that the District Ranger has the discretion to either include or not include an ISS road that otherwise meets "reclaimed" status (though not removed from the transportation "system" and considered decommissioned) in TMRD calculations. For more detail on ISS, impassable, reclaimed, and decommissioned roads and their inclusion in or exclusion from calculations of TMRD, see Appendix A to this report.

In short, it does little good to have a well-written program like A19 or the programmatic bull trout BiOp for road-related activities if it is going to be cherry-picked and rendered piecemeal at every project. Rather than a program, this is called "making it up as we go along."

36. Deputy Chief Joel Holtrop's 11/10/10 directive for implementing Travel Management, Implementation of 36 CFR 212, Subpart A stated that the travel management process "points to a smaller road system." Deputy Chief Leslie Weldon on 3/29/12 replaced Holtrop's directive and, among other things, removed the phrase "points to a smaller road system." The FNF is now proposing to reconstruct previously decommissioned roads and keep them in the road system (see Note 31).

37. Forest Service Ecosystem Restoration Policy. RIN 0596-AC82. Notice of Final Directive. Thomas Tidwell. 4/18/16 as reported in the Federal Register, Vol. 81, No. 81, 4/27/16, pages 24785-24793. The Policy notes

"Ecosystem restoration can be achieved by a range of management activities, such as forest thinning to reduce tree density, prescribed fire to reduce fuel buildup, replacing culverts to better connect streams, or fencing to restrict disturbances." No mention is made of removing culverts or roads to restore ecosystems. The policy goes on to promote tree- and carbon-removing "forest treatments" with the expectation that "more carbon will continue to be sequestered than would otherwise occur without the treatment" - while acknowledging "research on whether restoration increases carbon stocks is inconclusive."

38. See our annotated bibliography at http://www.swanview.org/reports/Annotated_Bibliography.pdf. The first nine pages contend with roads. For convenience, we include several relevant citations here:

"High integrity [forests] contain the greatest proportion of high forest, aquatic, and hydrologic integrity of all [] are dominated by wilderness and roadless areas [and] are the least altered by management. [] Low integrity [forests have] likely been altered by past management [] are extensively roaded and have little wilderness." (U. S. Forest Service. 1996. Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins. General technical report PNW-GTR-382. September 1996. Pages 108, 115 and 116).

"High road densities and their locations within watersheds are typically correlated with areas of higher watershed sensitivity to erosion and sediment transport to streams. Road density also is correlated with the distribution and spread of exotic annual grasses, noxious weeds, and other exotic plants. Furthermore, high road densities are correlated with areas that have few large snags and few large trees that are resistant to both fire and infestation of insects and disease. Lastly, high road densities are correlated with areas that have relatively high risk of fire occurrence (from human caused fires), high hazard ground fuels, and high tree mortality." (U. S. Forest Service. 1996b. Status of the Interior Columbia Basin: Summary of Scientific Findings. General technical report PNW-GTR-385. November 1996. Page 85).

"Proposed efforts to reduce fuel loads and stand densities often involve mechanical treatment and the use of prescribed fire. Such activities are not without their own drawbacks -- long-term negative effects of timber harvest activities on aquatic ecosystems are well documented . . .

Species like bull trout that are associated with cold, high elevation forests have probably persisted in landscapes that were strongly influenced by low frequency, high severity fire regimes. In an evolutionary sense, many native fishes are likely well acquainted with large, stand-replacing fires . . .

Attempts to minimize the risk of large fires by expanding timber harvest risks expanding the well-established negative effects on aquatic systems as well. The perpetuation or expansion of existing road networks and other activities might well erode the ability of populations to respond to the effects of fire and large storms and other disturbances that we cannot predict or control . . .

Watersheds that support healthy populations may be at greater risk through disruption of watershed processes and degradation of habitats caused by intensive management than through the effects of fire." (An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins, Volume 3 (ICBEMP); pages 1340-1342).

"Fire and the associated hydrologic effects can be characterized as pulsed disturbances as opposed to the more chronic 'press' effects linked to permanent roads or extended timber harvest activities . . . It also is not clear that attempts to manipulate the structure and processes of whole ecosystems (i.e. beneficially manipulate the fire regime) can ever be successful . . . The perpetuation or expansion of existing road networks, and other activities might well erode the ability of populations to respond to the effects of large scale storms and other disturbances that we clearly cannot change." (Bruce Reiman, Danny Lee, Gwynne Chandler and Deborah Meyers. 1997. Does Wildfire Threaten Extinction for Salmonids? Responses of Redband Trout and Bull Trout Following Recent Large Fires on the Boise National Forest. USDA Forest Service, Intermountain Research Station; Boise, Idaho. 1997.)

“Rehabilitation of road-miles cannot be accomplished alone by gating, berming, or otherwise blocking the entrance to a road permanently or temporarily, or seasonally closing roads, but will require obliteration, recontouring, and revegetating.” (U.S. Fish and Wildlife Service Regions 1 and 6. 1998a. Biological Opinion for the Effects to Bull Trout from Continued Implementation of Land and Resource Management Plans and Resource Management Plans as Amended by the Interim Strategy for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada (INFISH), and the Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). 8/14/98.

39. University of Montana Science Advisory Committee letter to Intermountain Forest Industry Association’s Brendan Moynahan and Defenders of Wildlife’s Hank Fisher regarding its review of Flathead Common Ground’s Draft Proposal. Daniel Pletscher. 1/3/97.

40. Flathead Common Ground [Final] Recommendations. 2/24/97.

In an 8/4/99 email response to criticism from Swan View Coalition and others, National Wildlife Federation’s Tom France and Sterling Miller, along with Defenders of Wildlife’s Hank Fisher, state that leaving some stream-aligned culverts in roads to be reclaimed/decommissioned would save the FNF money, acknowledge NWF and DOW don’t know “how many culverts would be left and what their locations are,” agree “a watershed inventory should have been completed,” and yet conclude leaving unidentified stream-aligned culverts “poses little risk to fish populations.” They concluded this would “achieve important security for grizzly bears sooner rather than later, both in Paint Emery and across the entire forest.”

Indeed, only a few months earlier, the FNF decided to attempt this “let’s not and say we did” approach to A19 road reclamation in its 5/6/99 “Implementation Note #13.” Swan View Coalition and others filed notice they would sue and reminded the FNF of its A19 duties to remove all stream-aligned culverts from reclaimed roads in order to protect water quality and fish as it secured bear habitat. FNF rescinded Note 13, stating “We talked it over with our attorneys and we decided they [Swan View Coalition and Friends of the Wild Swan] were right.” This matter is more thoroughly discussed on page 7 of Appendix A to this report.

41. The CFLRP is set forth in Title IV of the Omnibus Public Land Management Act of 2009, available at: <https://www.gpo.gov/fdsys/pkg/PLAW-111publ11/pdf/PLAW-111publ11.pdf>

42. Collaborative Forest Landscape Restoration Program 5-Year Report. USDA Forest Service. FS-1047. March 2015. Available at: https://gallery.mailchimp.com/1947d6cd971c70f8ef837d21a/files/CFLR_5_Year_Report_USFS_lowres_4_6_15.pdf

43. Initial meeting notes of the 9/11/12 SWCC Executive Committee, prior to updating/correction on 12/11/12.

44. Keith Hammer email to Chip Weber and the SWCC, dated 11/28/12 re: the SWCC meeting notes cited in Note 43, above. Richard Kehr email to Matthew Koehler, dated 8/4/15. Keith Hammer email to Richard Kehr and the SWCC, dated 8/11/15. Keith Hammer’s 8/11/15 email attached a letter to the SWCC, which included a Google Earth map using FNF road data layers to demonstrate the plethora of roads in the Swan Valley from which to choose for decommissioning. This letter and map are available at: http://www.swanview.org/reports/SLRD_Road_Decommissioning.pdf

45. Joint letter from 43 Montana collaborators to Senator Steve Daines. Julia Altemus, Montana Wood Products Association, et al. 1/14/15. Available at: http://www.swanview.org/reports/FinalPartnersLetter_1_14_15_Final.pdf

The above letter is also included in a packet of information prepared by Keith Hammer on 9/27/15 detailing “How Congress and the Forest Service are Paying Collaborative Partners.” The packet includes links to the SWCC web site, which lists its collaborative partners and provides a listing of CFLRP and other funds

provided some of those partners, often in exchange for little more than an in-kind contribution in labor worth one-fifth the amount of cash the partner may receive from the federal government. This packet is available at: http://www.swanview.org/reports/Full_Packet_2.pdf

46. Flathead National Forest. 2014. Travel Analysis Report for Flathead National Forest. Page 5: “Current and projected funding is far reduced from the funding needed to maintain the needed road system. . . Approximately 3,465 miles of roads [are] ‘likely needed for future use’ [and] 55 miles of road were identified as ‘likely not needed for future use’.”

47. Legacy Roads and Trails Program FAQs: “The Forest Service generally has the funding to maintain 20% of our road network each year. In 2011, the Forest Service maintained 16% of its road network [and] decommissioned 581 miles” of its 375,000 mile road network. Available at http://www.fs.fed.us/restoration/Legacy_Roads_and_Trails/faqs.shtml

48. Flathead National Forest. 2014. Travel Analysis Report for Flathead National Forest: Appendix E.

49. The Forest Service has a long history of using taxpayer “capital investment” funds to build roads into remote areas where the timber industry refused to bid on the timber, often multiple times. Our “A Tale of Two Subsidies” details two such “hard money” projects totaling \$840,000 to build 27 miles of new road and reconstruct 14 miles of existing roads when no timber sale bids were received. The Bent Flat and Sunset Beaver roads were built into sensitive areas, including grizzly bear habitat, and it was subsequently necessary to decommission some of these roads. In the Bent Flat area, FNF is now proposing to rebuild 7 miles of previously decommissioned roads to log trees burned in 2015. See pages 10-11 of Appendix A to this report for more about the Trail Creek Fire Salvage Project. “A Tale of Two Subsidies” is available at: http://www.swanview.org/reports/A_Tale_of_Two_Subsidies.pdf

50. See Note 47 for source.

51. Evaluating the Integrated Resource Restoration Line Item: Results from Phase 1. 2014. Ecosystem Workforce Program Working Paper #47. Courtney Schultz, Katherine Mattor and Cassandra Moseley. Spring 2014. Available at http://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/WP_47.pdf

52. INFRA data provided by the FNF indicates there are 24 culverts remaining in Sullivan Creek Road 547 above the 2014 mass failure at MP 3.5, with 5 of them larger than 18” diameter. FNF on 2/5/26 could provide only 4 culvert monitoring reports for this road in a bull trout watershed, rather than the requisite annual reports. The reports provided were written after the mass failure that occurred in 2014. A 3’ dia. culvert at MP 4.26 was rated as “high risk” because it had a rust line greater than one-third the height of the culvert, had floatable debris upstream and is located less than 600 feet above a bull trout spawning reach. An old wooden bridge over Sullivan Creek and more culverts on Road 2801 are also stranded beyond the mass failure on Road 547.

The FNF has refused to decommission Road 547 and claims the mass failure was a natural occurrence caused by Sullivan Creek eating away at the toe of the slope. This even though the toe of the slope remains largely in place, still supporting some of the slumped hillside, and the apex of the slump is located in the road bed. When inspected in 2015, the apex has further collapsed, removing the entire width of the road bed. Links to our requests that all culverts and bridges be removed above the mass failure, FNF’s response, and relevant new articles are available at:

http://www.swanview.org/articles/whats-new/help_decommission_old_logging_roads_that_are_trashing_the_environment/194

See Note 24 for information on the culverts and bridges stranded beyond the burned bridge in Bunker Creek Road 549, as pictured on page 7 of this report.

53. See Appendix A to this report, particularly pages 2-3, which explain how the A19 EA accounted for reclaimed roads miles by removing them from the road system, which is also the definition of a decommis-

sioned road. See also pages 6-7 of Appendix A, which describe the conditions placed on A19 by the Forest's fisheries biologist (and later incorporated into A19's Appendix D).

Though the FNF reported to the Flathead Basin Commission and others that it "decommissioned" South Coal Ridge Road 1604, it instead has retained it in its road system as an "impassable/stored" road not included in the calculation of TMRD. The Flathead Basin Commission makes clear in a footnote: "Decommissioning of a Forest Service road means that it will be removed from the official transportation system." FNF hydrologist Craig Kendall confirms the road has been "decommissioned" by removing culverts and installing 75 water bars along the road surface, noting that "sediment delivery is expected to be reduced from an annual average of 558 lbs to 8.5 lbs in locations where ditch lengths are reduced from 500 feet to 50 feet . . . due primarily to shortening of ditch lengths by constructing water bars." (Final Report: Coal Creek Restoration Project. DEQ Contract No. 205042. Flathead Basin Commission. 7/30/08).

Google Earth KML road files and INFRA data provided by the FNF, however, show Road 1604 has been retained in the road system as a "stored" Maintenance Level 1 road not included in calculations of TMRD, rather than removed from the system as "decommissioned." This is important because it signals an intent on the part of the FNF to rebuild the road in the future, which would remove the water bars and largely negate the reductions in sediment delivery to Coal Creek intended to meet the Coal Creek TMDL, a plan intended to help remove Coal Creek from the list of streams "impaired" by sediment. Coal Creek is also suffering low bull trout spawning success.

Google Earth KML road files provided by the FNF indicate 110 road segments are considered "impassable" and are not included in calculations of TMRD. Another 174 road segments are considered "impassable" and are included in calculations of TMRD. Roads in either category of "impassable road" may exist in grizzly bear Security Core. All "impassable" roads are retained in the "system" as Maintenance Level 1 "stored" roads.

54. See Note 47. The FAQ responses include the following: "The 'Travel Management' analysis effort that is currently under way will help the Forest Service identify how to best 'right-size' our vast road network . . . The Forest Service recognizes that a significant number of roads need to be removed to bring the road system down to a manageable, maintainable system that still meets the needs of the agency and forest users."

55. The FNF led an effort by the Interagency Grizzly Bear Committee NCDE Subcommittee to replace A19's road reclamation, permanent road barriers and Security Core habitat with an approach dependent instead on road gates and Seasonally Secure Areas that fluctuate as gates are swung open and shut. This "Proposed Approach" was submitted for peer review and the reviewers found the "simplicity of A19 and its ability to permanently secure areas for grizzly bears makes it a powerful tool in the conservation of the grizzly bear in the NCDE . . . The proposed approach's added complexity unfortunately necessitated several additional assumptions, some of which are tenuous . . . we caution against any relaxation of establishing permanently secure areas . . ." Dr. Bruce McLellan, Dr. M. A. Sanjayan and Dr. Nova Silvy. 2000. Peer review of the motorized access management strategies for grizzly bear habitat in the Northern Continental Divide Ecosystem. 9/19/2000.

Moreover, and as detailed on page 3 and in Appedix A to this report, FNF's fisheries biologists insured that A19 road closures and reclamation to benefit grizzly bears would also protect water quality and fish by requiring all stream-aligned culverts be removed from reclaimed roads and all culverts in closed roads be either removed or inspected regularly. Indeed, page 12 of the A19 Decision Notice summarizes its multiple-resource benefits as follows: "Motorized access restrictions and road reclamation will provide other benefits in addition to increased habitat security for grizzly bears. Decreased motorized access density will improve the habitat effectiveness for numerous species of wildlife, including wolves, fisher, lynx, elk, wolverine, and marten. Motorized access restrictions will change hunting opportunities from roaded to unroaded in some portions of the Forest. This is expected to increase the proportion of older bulls and bucks in elk and deer populations. Road reclamation, while likely causing some short-term increases in sediment, will in the long-term improve water quality and fish habitat by reducing fine sediment and stream channel erosion." (See Note 2).

56. The replacement of failed culverts in westslope cutthroat trout habitat and subsequent requirements that they then be monitored annually is not without precedent on the FNF. A Decision Memo for several Emery Creek Culvert Replacements, for example, notes Emery Creek “has one of the highest densities of [westslope cutthroat] trout tributary to Hungry Horse Reservoir.” It also documents the failure of a 4’ dia. culvert “during the 2014 spring runoff,” as pictured in this report, in the lower right of Note 24. (Emery Creek Culvert Replacements Decision Memo. Robert Davies. 8/25/14).

Montana Dept. of Fish, Wildlife and Parks issued Stream Protection Act “124” Permits for these culvert replacements on several Emery Creek tributaries, requiring that the new culverts be inspected annually, post-runoff and/or during runoff “to insure that the new pipe arch is effectively moving water and debris and that any new failures are avoided.” (Leo Rosenthal. MDFWP Stream Protection Act 124 Permits dated 9/22/14 for Remington Creek, 9/22/14 for Royal Creek, and 10/9/14 for Emery Creek).

57. Culvert inspection reports currently occupy some 45 file cabinet drawers on the FNF. A similar or larger number of file drawers contain information on bridges, road engineering and road work contracts. (Personal communication with Michele Dragoo and Rob Carlin, 8/6/15). Only in rare instances was culvert inspection information included in the INFRA data provided us by the FNF. Moreover, we were told that INFRA would not indicate the date of the last culvert inspection (see Note 25).

It is important that stream-crossing structures be fully inventoried and their inspection and repair tracked in a searchable database. This would help, among other things, to identify culverts like those that repeatedly failed in Pinnacle Ridge Road 1673 due to significant bedload movement and undersized culverts (see page 4 of this report). Pinnacle Ridge Road 1673 is a seasonally open road, so its not like these culverts never get driven by or can’t be inspected from the comfort and convenience of a motor vehicle. Indeed, the focus on monitoring culverts on closed roads per A19 and the bull trout BiOps for road-related activities is intended to address the issue of more difficult inspection and less likely discovery of plugged culverts. This should not be construed to indicate that stream-crossing structures on open roads don’t plug and fail and hence need not be inspected annually.

58. See note 57.

59. See page 11 of this report and Note 48.

60. See pages 9 and 10 of this report and Note 38.

61. FNF’s Allen Rowley in 1998 told the Missouian newspaper that it is cheaper to reclaim a road than continually maintain it (see our Counting Culverts report via Note 8). In proposing road “storage” for 9 miles of road in a manner that would remove all stream-aligned culverts, Swan Lake Ranger District notes “Rather than investing in BMPs [Best Management road maintenance Practices] now, it is more cost-efficient to remove any potential impact it has to aquatic resources up front [and be] placed in a condition that does not require maintenance.” (Request for public input: Chilly James Restoration Project. Richard Kehr. 2/14/14.)

62. See page 11 of this report.

63. Were it not for lawsuits filed by Swan View Coalition and others, the 1986 Flathead Forest Plan would have built 75 miles of road per year until its already abundant 4,000 miles of roads was increased to 6,000. Because the 1986 Plan did not have adequate road density standards and all five Ranger Districts reported they could not produce the Allowable [Timber] Sale Quantity [ASQ] without violating the Plan’s grizzly bear standards, we went to court. The court told the agency to rework its Plan to provide adequate grizzly bear security and the FNF wrote A19. Besides the motorized access management discussed in the report, A19 also lowered FNF’s ASQ from 100 MMBF/year to 54, although only 10MMBF of that reduction was due to grizzly bear standards and the rest was due to improved planning for the protection of old growth forests, elk winter range, whitetail deer winter range, etc. (See Note 2). A more detailed accounting of these lawsuits is provided in our Counting Culverts report accessible via Note 8 of this report.

A19 was precedent-setting. A19's form of managing motorized access was applied to the other National Forests in the NCDE, though it is unfortunate the culvert removal and monitoring requirements were not. Because of those culvert removal requirements, the FNF has demonstrated and been able to claim progress in making things better for threatened bull trout. The FNF has consequently reclaimed/decommissioned 763 miles of road and has only built 13 miles of road in roadless areas since 1986. Especially when considered within the context of broader agency initiatives like the Roadless Rule and Travel Planning Rule, A19 has made it easier for the FNF to adjust to initiatives aimed at minimizing roads and their environmental effects. How much of this progress would have been made without litigation?

More recently, Swan View Coalition and others filed a lawsuit against the Glacier Loon Fuels Reduction and Forest Health Project. In it they also challenged the continued logging of now-federal former Plum Creek lands by The Nature Conservancy for Plum Creek without the full application of A19, federal law and ESA consultation requirements. When the Court said Plum Creek and TNC must apply all federal law, they chose instead to cancel their "timber supply agreement." So the FS is no longer constrained from decommissioning former Plum Creek roads until the agreement would have expired in 2018 or until logging cleanup by TNC was completed as late as 2021. As a result, the Chilly James Restoration Project will begin decommissioning roads in the "impaired," Water Quality Limited Jim Creek in Summer 2016. (See *Swan View Coalition v Weber*, CV 13-129-M-DWM, Court Order dated 9/25/14. See also the Chilly James Decision Notice cited in Note 26).

Litigation could have been avoided. The FNF could have followed the plain language of A19 and the law and perhaps the SWCC would have rallied around it. But the FNF instead refused. Swan View Coalition and others were there in SWCC meetings and letters urging compliance, but it took a lawsuit instead. The bottom line is that old Plum Creek roads in a heavily damaged watershed can be decommissioned in Summer 2016 because a lawsuit helped clear that path. The Forest Service needs to acknowledge the essential constructive path, checks and balances provided by litigation rather than demonize those who work to enforce land management laws and help insure collaborative groups have access to accurate information.

Photo Credits

The photos used in this report are by Keith Hammer/Swan View Coalition unless otherwise noted in the text or caption.

Appendix A

Keith Hammer's white paper "Only decommissioned roads removed from the Forest Development Road System may be omitted from calculations of Total Motorized Route Density on the Flathead National Forest, dated 6/4/15 and updated by addendum 2/7/16, begins on the following page.

Swan View Coalition *Nature and Human Nature on the Same Path*



3165 Foothill Road, Kalispell, MT 59901

swanview.org & swanrange.org

ph/fax 406-755-1379

Only Decommissioned Roads Removed from the Forest Development Road System May be Omitted from Calculations of Total Motorized Route Density On the Flathead National Forest

Keith Hammer

June 4, 2015

Updated by Including Addendum

February 7, 2016

Executive Summary

This paper is written in response to attempts by the Flathead National Forest and the Draft NCDE Grizzly Bear Conservation Strategy to omit from calculations of Total Motorized Route Density (TMRD) roads that may be impassable to motorized vehicles but have not been adequately decommissioned and removed from the Forest Development Road System (System).

The administrative record and the plain language of Flathead Forest Plan Amendment 19 (A19) show that a road must be reclaimed/obliterated/decommissioned (hereafter "Reclaimed") and removed from the System before it is no longer considered a road that must be included in calculations of TMRD.

TMRD standards require road reclamation and removal of the road from the System, while Security Core standards do not. Road reclamation is A19's preferred method of increasing Grizzly Bear Security Core because it simultaneously protects water quality and fish through required culvert removals and other hydrologic stabilization work. Reclamation of roads is not absolutely required in Security Core and roads restricted by berms, boulders or dense vegetation may suffice, provided "a monitoring plan to detect any erosion or culvert blockage problems" is implemented.

The A19 administrative record does not support the notion that a road can remain in the System as a road and yet not be counted as a road in calculations of TMRD. As long as the road remains in the System, even if placed in Intermittent Stored Service (ISS) or any other "storage" or "impassable" category, it is considered a road and must be included in the calculation of total road miles and TMRD.

Current and past attempts to exclude System roads from calculations of TMRD appear to arise from interpretations like those guided by the ill-fated and short-lived Implementation Note #13 in 1999 - which ran counter to the A19 administrative record.

Rather, implementation must be guided by the plain language of Amendment 19, as clarified by its Appendix D definitions and the administrative record discussed below.

Amended EA for Amendment 19

The essential question of whether open and restricted roads need to be reclaimed and removed from the System in order to meet TMRD and other A19 standards was resolved, according to the Flathead National Forest, in the Amended A19 Environmental Assessment and its Appendix D. This Appendix was also issued as Appendix D to A19 and as Flathead Forest Plan Unbound Appendix TT. In the Amended EA's Response to Public Comments, the Flathead responds:

Total motorized access density objectives must be met after including open and restricted motorized roads and trails, except for those that have been reclaimed . . . In response to comments that the definitions of restricted and reclaimed roads and core areas did not adequately express our intent, additional text . . . has been included as Appendix D [and] would be incorporated into the Forest Plan as Unbound Appendix TT.

(Forest Plan Amendment 19 Amended Environmental Assessment. February 1995. Page 107.) The Amended EA continues in its Response to Public Comments:

Comment(s): The preferred alternative should make clear that meeting the Total Motorized Access Density (TMAD) objective will require reclaiming open and restricted roads.

Response: Chapter III of the EA describes the miles of road reclamation and road restrictions estimated to result from implementation of each alternative. In addition, Appendix D has been added to the EA. This Appendix defines in detail "reclaimed road" and "restricted road."

(Forest Plan Amendment 19 Amended Environmental Assessment. February 1995. Page 133.) Indeed Chapter III of the Amended EA, in describing the chosen Alternative 3C, concludes:

To meet the standards and short-term objectives in MS-1 and MS-2 areas, approximately 350 miles of open roads and 125 miles of currently restricted roads would need to be reclaimed in the short term (5 years). To meet long term (10 years) standards and objectives, another 175 miles of already-restricted roads would need to be reclaimed.

(Forest Plan Amendment 19 Amended Environmental Assessment. February 1995. Page 95.)

Also, apparently in response to public comments including ours, the Amended A19 EA reworked Figures 22 and 23 to reflect the reclamation of Chapter III's estimated 475 miles of road and their removal from the road System to meet the 5-year A19 standards. Figure 23 shows no category for "stored" or "impassable" System roads that would not

be counted in calculating TMRD. Reclaimed roads are accounted for in the reduction of total road miles in the System.

In other words, if it remains a System road, it gets counted as a road. That this common sense understanding predated A19 is confirmed by Figure 22's notation of 420 miles of roads that were in 1990 "obliterated and removed from the forest inventory."

Amendment 19 and Interagency Grizzly Bear Committee Definitions

The A19 process and the Interagency Grizzly Bear Committee (IGBC) process on which it is based include the same three classifications of roads: Open, Restricted, and Reclaimed. Neither includes a category for "stored" or "impassable" roads that remain on the System yet would not be counted as roads in calculations of TMRD.

In part the definitions of Restricted and Reclaimed roads are as follows, first from A19:

RESTRICTED ROAD . . .

A road on which motorized vehicle use is restricted during the entire non-denning period. The road requires physical obstruction and motorized vehicle use in the non-denning period is legally restricted by order . . .

Outside of security core areas, motorized administrative use is acceptable at low intensity levels . . .

All restricted roads will be included in calculating total motorized access route density . . .

RECLAIMED ROAD . . .

A reclaimed road has been treated in such a manner so as to no longer function as a road or trail and has a legal closure order until reclamation is effective. This can be accomplished through one or a combination of treatments including: recontouring to original slope, placement of natural debris, or revegetation with shrubs or trees . . .

Administrative use of reclaimed roads may not occur . . .

The entire road will receive treatment such that maintenance or entries to maintain "road drainage" is not needed. This will require removal of culverts or other water passage structures that are aligned with stream channels. In most cases this will also require that road related sediment sources be repaired and the road reworked to eliminate ditch water flow without the aid of cross drain culverts . . .

Reclaimed roads that fully satisfy the definition of a reclaimed road will not be included in calculations of open road density, total motorized access density, or

security core area. Roads that have been treated, but that do not yet fully satisfy the definition of a reclaimed road will be included in calculations for total motorized access route density . . .

The acceptable lag time for the treatment to become effective and the expected persistence of people to continue to use a road should dictate the amount and type of initial, and perhaps follow-up, treatment required . . .

(Flathead Forest Plan Appendix TT; a.k.a. Appendix D to Amendment 19.)

Now, according to the IGBC:

Reclaimed/Obliterated Road -- a route which is managed with the long term intent for no motorized use, and has been treated in such a manner so as to no longer function as a road. An effective means to accomplish this is through one or a combination of several means including: recontouring to original slope, placement of logging, or forest debris, planting of shrubs or trees, etc. . .

Total Motorized Route Density calculations will include open roads, restricted roads, roads not meeting all restricted or obliterated criteria, and all motorized trails.

(Interagency Grizzly Bear Committee Task Force Report: Grizzly Bear / Motorized Access Management; Interagency Grizzly Bear Committee; July 29, 1998; emphasis added.)

Protocol Papers for Amendment 19 and the IGBC Task Force Report

Protocol Papers prepared for both A19 and the IGBC Task Force over the years consistently document the use of only the initial three classifications of roads: Open, Restricted, and Reclaimed. None include a category for roads to remain in the System yet not be counted in calculations of TMRD:

. . . each road was classified as open, restricted, or reclaimed.

(Kathy Ake and Nancy Warren. 9/1/94 updated 2/17/95.) In 2001, the Protocol Paper provides a bit more specific definition of road, as follows, but repeats the three allowed classifications of roads:

Definitions are based upon the IGBC Motorized Access Management report with verbal clarification from individual committee members (see Amendment 19 project file) . . .

ROAD . . . All created or evolved routes that are >500 feet long (minimum inventory standard for the Forest Service INFRA data base), which are or were reasonably and prudently drivable with a conventional passenger car or pickup. Within the three classes below . . . OPEN ROAD . . . RESTRICTED ROAD . . . RECLAIMED/OBLITERATED ROAD.

(Protocol paper. Kathy Ake; 11/20/01; emphasis added).

Even the 2013 draft Protocol Paper Kathy Ake prepared as Appendix 5 to the Draft NCDE Grizzly Bear Conservation Strategy starts off on the right foot by clarifying that:

Sometimes referred to as a reclaimed or obliterated road, a historical road has been treated in such a manner so as to no longer function as a road or trail, and the road is no longer considered part of the agency's road system.

When the 2013 Protocol Paper begins discussing the Draft Grizzly Bear Conservation Strategy, however, it introduces a new and fourth classification of roads as "Closed Yearlong Impassable" (hereafter "Impassable"):

Similar to historical roads, roads that are naturally revegetated, have the entrance obliterated for >0.1 miles, or have the bridge or large >4ft culvert removed are also not included in the analyses, i.e. they do not count in OMRD or TMRD, nor are they buffered in the Secure Core analysis. These roads are impassable by any vehicle (passenger car, truck, 4WD vehicle, ATV, motorcycle, etcetera). These roads are still on the system. Revegetated roads defined as so grown-in that they are no longer drivable. The vegetation is such that it is easier to walk on the side-hill as opposed to down the center of the road bed.

(Protocol Paper for Motorized Access Analyses Application Rule. Draft NCDE Grizzly Bear Conservation Strategy Appendix 5. Kathy Ake. February 2013.)

This new, fourth classification of roads is introduced to the public for the first time in the 2013 draft Grizzly Bear Conservation Strategy while simultaneously stating it "Has been incorporated this way since IGBC motorized access or Flathead NF's A19 started." This interpretation is not supported by the administrative record.

In an 8/18/94 letter to the A19 Interdisciplinary Team Leader, Flathead Forest Wildlife Biologist Nancy Warren documented her clarification on this very issue with members of the IGBC Motorized Access Task Force:

Is it correct to classify all bermed, barricaded, tank-trapped, or overgrown (to just a path) roads as restricted roads, even though they may not be "reasonably and prudently driveable with a conventional passenger or pickup", even though use by all-terrain vehicles may not be restricted?

Tom Puchlerz [IGBC Task Force Chair] indicated that the intent was to classify as "restricted" roads that could easily be re-opened by removing a barricade or tank trap. If the road was so overgrown or rough that reconstruction would be needed [and] if there were no access, then it would be classified as reclaimed/obliterated. Tom Wittinger and Chris Servheen agreed with this interpretation.

(Nancy Warren to Jim Morrison; letter dated 8/18/94; emphasis added).

The IGBC Task Force did not suggest a new, fourth classification of road. Nancy Warren instead reports that, if the road is so overgrown and rough as to require reconstruction to become passable again, it should be classified as Reclaimed. The Flathead's A19, however, requires among other things that all stream-bearing culverts be removed from that road and that it be removed from the System in order to be fully Reclaimed.

Moreover, as detailed above and summarized below, the A19 administrative record does not support use of a fourth classification of Impassable road. In response to public comment, the Amended A19 EA estimates the miles of open road that will need to be closed to motor vehicles and the miles of open and already restricted roads that will need to be reclaimed to meet A19 standards. Nowhere does it mention that roads can be simply rendered "impassable" and retained as part of the System while not being counted in calculations of TMRD.

Nor do any of the Protocol Papers prior to 2013 highlight that "impassable" roads can simply be omitted from calculations of TMRD. Nor does either the 1994 or 1998 IGBC Task Force Report say or allow this. Indeed, they make it clear that a road must meet all of the criteria for a Reclaimed road to not be counted in calculations of TMRD. Simply put, under A19, an Impassable road that remains on the road System is a Restricted road and must be counted in calculations of TMRD until it has all of its stream-bearing culverts and bridges removed, fully meets all other Reclaimed road criteria, and is removed from the System.

Road Treatments Required by the Amendment 19 Fisheries Biological Evaluation

A19 reluctantly allows stream-bearing culverts and bridges to remain behind berms, concrete and boulder barriers on Restricted roads in Security Core, provided "a monitoring plan to detect any erosion or culvert blockage problems" is implemented. However, A19 expressly requires that all those stream crossing structures be removed from Reclaimed roads that will no longer be included in calculations of TMRD. This is due in large part to the Fisheries Biological Evaluation for A19:

Implementation of the preferred alternative would result in the following: . . .

Direction for reclaiming/obliterating roads including removal of culverts which greatly reduces the risk of future sedimentation problems resulting from culvert failure on reclaimed roads.

Direction for restricted roads in core habitat areas to implement road drainage treatments similar to reclaimed roads, or to develop and implement a monitoring plan to detect any erosion or culvert blockage problems . . .

The determination [of effects on fish] assumes incorporation of the proposed definitions and minimum treatment requirements for reclaimed and restricted roads.

(Biological Evaluation for Bull Trout, Cutthroat Trout, and Shorthead Sculpin: Potential Effects from Implementing Amendment 19, Alternative 3 to the Forest Plan. Donald E. Hair. 2/4/95.)

The Fisheries Biological Evaluation, like all the other A19 and IGBC documents, contends with the effects of Open roads, Restricted roads, and Reclaimed roads. It does not mention a fourth classification of Impassable roads, let alone say that they are considered separate from Restricted roads. Nor does it say Impassable roads can be excluded from calculations of TMRD while leaving stream-bearing culverts to blow out behind an obliterated entrance, the first already blown-out or otherwise removed >4ft culvert, or in a roadbed grown thick with vegetation but still harboring stream-bearing culverts.

Indeed, this fourth classification of Impassable roads appears to have all the trappings of an under-the-radar, end-run around the clear language and requirements of A19. We don't doubt the Flathead has done this. We simply disagree that this is allowed by A19 - for all the reasons provided above.

Implementation Note #13

On May 6, 1999 the Flathead issued Implementation Note #13 under the guise of clarifying A19's Appendix D definitions. It in fact contradicted them, in part by allowing stream-bearing culverts to remain in Reclaimed roads in violation of the conditions of the Fisheries Biological Assessment and the plain language of A19.

Swan View Coalition and Friends of the Wild Swan on September 23, 1999 filed a 60-day notice of intent to file suit under the Endangered Species Act and the Forest Supervisor rescinded Implementation Note #13 on November 19, 1999. Flathead Forest spokesman Allen Rowley was quoted in the November 24, 1999 Missoulian: "We talked it over with our attorneys and we decided they (conservation groups) were right."

So here we are in 2014 with the Flathead claiming it can simply render or find a road impassable, keep it on its road System, not remove all stream-bearing culverts, and yet not count it in calculations of TMRD either. (Personal communication with Kathy Ake 10/15/14 and Kathy Ake's Appendix 5 to the draft Grizzly Bear Conservation Strategy.) Indeed, connected Roads #10753 and #10754 in the Flathead's Canyon Creek drainage have seven washed out culverts, have never been adequately repaired or reclaimed, and yet are not included in the Flathead's calculation of TMRD. (Terms and Conditions Monitoring Report: Bull Trout Biological Opinions for Post-fire Salvage Operations, Flathead National Forest, 2007-2009; Craig Kendall; October 28, 2009; Appendix A Summary of Road and Culvert Surveys - checked against "Impassable" road data files provided by Kathy Ake 1/27/15). A19 certainly did not intend for the Flathead to allow culverts to blow out and to then take credit for the reduction in TMRD as though the blown-out roads had been properly reclaimed!

Leaving culverts to potentially blow out in roads not counted in TMRD would have been allowed by Implementation Note #13. It appears the Flathead formally rescinded Note #13, then went ahead and implemented portions of its intent anyway - in clear

violation of the plain language of A19 and in spite of assurances by the Forest Supervisor that the plain language of Flathead Forest Plan Appendix TT / A19 Appendix D would be implemented:

... I have reviewed the language of LRMP Implementation Note #13 and the existing Forest Plan Appendix TT and have determined to rescind Implementation Note #13 to avoid any confusion or misunderstanding with the implementation of Appendix TT . . . The definitions and direction contained in Appendix TT will be used by the Flathead National Forest unless and until the Forest Plan is subsequently amended or revised and any consultation obligations are satisfied with the U.S. Fish and Wildlife Service.

(Letter of Supervisor Cathy Barbouletos to attorney Dan Rohlf. 11/19/99.)

No such amendments or revisions have taken place and Appendix TT/D remains the law of A19. A19's requirements to protect fish are not at odds with its requirements to protect grizzly bear. A19's requirements to remove stream-bearing culverts from Reclaimed roads and to regularly inspect and clean culverts on Restricted roads are indeed common sense measures required by Fish and Wildlife Service in numerous biological opinions regarding bull trout. Rather than graciously comply with the multiple-species requirements of A19, it appears the Flathead has instead employed a shrouded classification of Impassable road to reportedly benefit bears while ducking corresponding requirements to protect water quality, bull trout and other aquatic life.

The Flathead's Road Decommissioning Spreadsheet

The Flathead's Road Decommissioning Spreadsheet lists "Road Decommissioning Projects" since A19 was first issued in 1995. It tracks five categories of Reclaimed roads:

Category 1 - System roads reclaimed and moved to Historic but still monitor for A19

Category 2 - System roads reclaimed and moved to Historic = revegetated - no monitoring

Category 3 - Roads reclaimed and left as System roads, still monitor for A19

Category 4 - Moved to Historic, naturally revegetated, no contract work needed, no monitoring

The fifth category is "Only Has Decision," meaning reclamation plans have yet to be implemented on those miles of road.

This spreadsheet shows clearly that the goal is to remove Reclaimed Roads from the System as the reclamation treatments become effective. Interestingly, all roads from Category 3 were shifted to other categories in 1999, the same year as the short-lived Implementation Note #13, and it has remained at zero road miles ever since.

A19 allows only three classifications of roads. Open and Restricted roads must be included in calculations of TMRD and only Reclaimed roads are excused from those calculations. Like all the other documents in the A19 administrative record, the spreadsheet does not contain a classification or category for Impassable roads excused from calculations of TMRD while remaining on the System.

According to A19 and Appendix TT/D, the only roads excused from calculations of TMRD should be included in this spreadsheet of Reclaimed roads. But they aren't all included because a shrouded classification of Impassable roads exists, though contrary to A19. (Personal communication with Kathy Ake 10/15/14; Kathy Ake's Appendix 5 to the draft Grizzly Bear Conservation Strategy; and "Impassable" road data files provided by Kathy Ake 1/27/15.)

Conclusion

At every turn, A19 NEPA documents and the Flathead National Forest have pointed to Forest Plan Appendix TT/A19 Appendix D as the guiding light and requirements of A19. Appendix TT/D provides for only three classifications of roads: Open, Restricted, and Reclaimed. It provides no classification for Impassable roads. Under A19, if a road is rendered impassable by either an act of nature or by human intervention, it remains an Open or Restricted road until it meets all criteria for a Reclaimed road and is removed from the road System.

This interpretation describes the publicly observable practice of implementing A19. This interpretation has been the Forest Service's direct response to public comments raising these very questions since 1995. This interpretation is consistent with the Forest Service itself asking these very questions of the IGBC Motorized Access Task Force. This is also the only interpretation of Appendix TT/D supported by the A19 administrative record.

The public discovery of the Flathead's shrouded category of Impassable roads that need not be included in calculations of TMRD came about only due to its disclosure in Appendix 5 of the 2013 Draft NCDE Grizzly Bear Conservation Strategy. Even then, its disclosure is largely obscured by footnotes attempting to detail the differences in motorized access management between the Flathead and the four other Forests in the NCDE - partly because the other Forests apparently do not require all stream-bearing culverts and bridges to be removed from Reclaimed roads.

Simply put, and for the reasons provided above, the Flathead must consider its Impassable roads to be Restricted or Open roads, include them in calculations of TMRD, and set about either repairing or reclaiming these roads to adequately protect water quality, fisheries and wildlife. It violates A19 and a wide variety of conservation laws for the Flathead to retain what at this juncture appears to be a "junk pile" of unattended old roads. It adds insult to injury to suggest that these roads are environmentally benign by implying they have been managed according to A19's standards for protecting water quality, fish and wildlife.

Addendum Added February 7, 2016

“Storing” Roads is Not the Functional Equivalent of “Decommissioning”

The preceding portions of this paper remain unchanged. The preceding explains why “impassable” roads can’t be omitted from Total Motorized Route Density (TMRD) under Forest Plan Amendment 19 (A19). This addendum explains why neither “impassable” nor “stored” roads are the functional equivalent of decommissioned roads. The Flathead is proposing to reconstruct previously decommissioned “non-system” road templates for logging, then place them back into the road “system” under “Intermittent Stored Service” (ISS) - as though ISS is the functional equivalent of “decommissioning.”

ISS is not the functional equivalent of decommissioning. Nor did the A19 Amended EA assess the effects of road reclamation/decommissioning as though roads removed from the road system would periodically be rebuilt, requiring culverts to be reinstalled and vegetation to be removed from the roadbed each time they are brought back into service under ISS.

The Flathead’s Trail Creek Fire Salvage Project proposal, for example, proposes to “construct approximately seven miles of new system roads on existing templates to access proposed harvest units and then place these seven miles, plus approximately an additional mile of road, into storage and classify the roads as intermittent stored service (ISS) roads following salvage harvest operations . . . to facilitate harvest activities and long-term resource management.” (Trail Creek Fire Salvage Project proposal released for public review by Spotted Bear District Ranger Debbie Mucklow via cover letter dated 1/26/16).

These roads would largely be rebuilt on “historic” road templates decommissioned and removed from the road system as recently as 2000 and 2004. (Personal communication with Matt Shaffer, FNF, and FNF’s 3/23/15 Road Decommissioning Projects spreadsheet). “Upon completion of the project, the first portion of the road would be recontoured to the original hillslope . . . Beyond the first portion of the road (200 - 600 feet) the roadway would be treated to discourage use including sporadic placement of natural debris where available and seeding or planting to encourage re-vegetation.” (Trail Creek Fire Salvage Project proposal released for public review by Spotted Bear District Ranger Debbie Mucklow via cover letter dated 1/26/16).

While the Trail Creek proposal says that the new road design would “favor rolling dips over culvert installation,” it does not say culverts will not be installed where necessary and it does not say that they would be removed post-project if they are installed. The proposal does make it clear that the road template would be brushed out and the road surface bladed to allow for log hauling.

The proposal does acknowledge it would need site-specific amendments to A19 to allow for summertime heavy equipment work on these road templates, which is not allowed in Security Core during the non-denning period for grizzly bears. The proposal

would then simply have the public and other agencies believe that post-project ISS is the functional equivalent of decommissioning and complies with A19.

As described on pages 3 and 4 of this paper, A19 requires that a reclaimed/ decommissioned road be “treated in such a manner so as to no longer function as a road or trail” and the IGBC further emphasizes “the long term intent for no motorized use.” To the contrary, ISS designation has the long-term intent of intermittent motorized use of the road and retains it in the road system. This is not the functional equivalent of a decommissioned road that is removed from the system precisely because the long term intent is to eliminate motorize use and render the road environmentally benign in the watershed. This is clearly evident in Amended EA’s assessment of the effects of A19 road decommissioning, particularly on pages 65-67:

Road reclamation can decrease rates of surface erosion by up to 95 percent . . . With road reclamation, culverts will be removed at stream crossings . . . The potential increase in sediment due to culvert removals and other ground disturbance will be balanced by an immediate decrease in peak flows and subsequent stream channel erosion due to dispersing runoff concentrated by the roads . . . Soil compaction on the reclaimed roads will gradually decrease as the roads revegetate with woody shrubs and conifer. After 50 - 100 years, these areas will have increased infiltration and productivity rates similar to undisturbed sites. Water quality and fisheries will improve from the road reclamation activities . . . culvert removal will reduce the risk of culvert failures . . . [and the A19 EA alternative proposing the fewest open roads and the greatest amount of Security Core] would improve watershed conditions more than all other alternatives.

What the A19 Amended EA did not do was assess decommissioned roads as if they were to be ISS roads intermittently used for logging access. While A19 requires that Security Core remain in place and effective for at least 10 years, it did not contemplate nor assess the effects of roads being decommissioned, rebuilt, then decommissioned again on a repeating basis of every 10 years or so, or simply at the whim of the Forest Service. Such a repetitive process clearly has significant negative impacts to vegetation, soils and water quality not contemplated nor assessed in A19. In Trail Creek and other projects, the Flathead is ignoring and shortchanging the benefits to soils, water quality and fish that were fully integrated into A19 grizzly bear security standards.

ISS and Road “Storage”

The Flathead’s Travel Analysis Process, as documented in the June 2014 Beaver Creek Analysis and elsewhere, defines ISS as “Closed to traffic. The road is in a condition that THERE IS LITTLE RESOURCE RISK IF maintenance IS NOT PERFORMED (self-maintaining). (FSH 5409.17-94-2).” (Emphasis in original). FSH 5409.17-94-2 in turn defines “Road Storage [as] The process/action of closing a road to vehicle traffic and placing it in a condition that requires minimum maintenance to protect the facility for future use.”

This is little more than Maintenance Level 1 “storage,” which is defined in the Flathead’s 2014 Forest-Wide Travel Analysis Report as follows:

These roads have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.

A19 road decommissioning requires that “drainage facilities” like stream-aligned culverts be removed, not maintained. A19 decommissioning also requires that “runoff patterns” be “reworked to eliminate ditch water flow without the aid of cross drain culverts,” not to maintain runoff patterns through culverts. (A19, Appendix D). Hence, again, ISS and other “stored” roads are not the functional equivalent of an A19 decommissioned road. Properly decommissioned roads, unlike those repeatedly reused, should pose no risk to a watershed, require no maintenance, and are allowed to re-vegetate. That re-vegetation not only deters human use of the old travel-way, it also over time de-compacts any road surface that was not mechanically de-compacted at the time of decommissioning.

The Problems with “Storage” and “Impassable” Exemplified

So, what could possibly go wrong in the Flathead’s pursuit of replacing road decommissioning with road “storage” and/or classifying roads “impassable?” In addition to misrepresentations made to the public and other agencies like Fish and Wildlife Service (FWS), plenty. Take Raghorn Road #10802 in the Coal Creek watershed as an example:

According to the Flathead’s 3/23/15 Road Decommissioning Projects spreadsheet, the Flathead decided to reclaim Road #10802 on 9/25/92 as a part of the North Coal Salvage Timber Sale. The Biological Assessment for this timber sale was supplemented on 4/15/94 and FWS concurred with its findings on 5/5/94, citing the same grizzly bear research and findings soon to be incorporated into A19 in 1995.

Given the importance of Coal Creek to bull trout and westslope cutthroat trout, the Flathead revisited the pre-A19 decisions for Road #10802 and two others in the watershed. The subsequent 7/27/10 decision by District Ranger Jimmy DeHerrera for these roads decided to remove all 15 culverts from the three roads, 13 of them on Road #10802, including all cross-drain culverts:

These actions are being proposed to protect important bull trout spawning areas. If these culverts fail during a storm event, unnecessary sediment would be transported downstream jeopardizing spawning and rearing habitat for fish and impacting water quality. A TMDL [Total Maximum Daily Load plan for an “impaired water body”] was also completed for Coal Creek in 2005 and road waterproofing was identified to alleviate sediment conditions in Coal Creek.”

On 6/21/2010, FWS concurred with the decision to remove all the culverts. Coal Creek was soon after designated Bull Trout Critical Habitat, adding additional Endangered Species Act prohibitions to damaging threatened bull trout habitat. In 2012, however, the Flathead considered the road “waterproofed” after removing only 3 culverts less than half way up the 3.69-mile-long Road #10802, leaving other culverts in place! (Waterproofing Rd. 10802 map and notes by Pat VanEimeran and John Littlefield, November 2012).

Several of the remaining culverts beyond those removed are stream-aligned and at least two of them were flowing water when I inspected them on 8/20/15! VanEimeran and Littlefield’s November 2012 notes cited above also document water flowing across and under the road at these locations!

The Flathead’s INFRA database and KML (Google Earth Keyhole Markup Language) road files provide by Kathy Ake in 2015 nonetheless classify the entire road as a Maintenance Level 1 “system” road that is “impassable” and hence not included in A19 calculations of TMRD. This even though the road is not impassable according to the “impassable” criteria Ake listed in the Draft Grizzly Bear Conservation Strategy (see page 5 of this paper): 1) the first portion is not naturally re-vegetated to the degree it hinders motorized or foot travel - in fact the brush was cut back, apparently to provide passage for the culvert-removal machinery in 2012, 2) the entrance to the road has not been obliterated, and 3) the three culverts removed were 36” diameter culverts that don’t meet the minimum 4’ culvert removal criteria to qualify as an impassable barrier.

When compared to Ake’s Conservation Strategy criteria, Road #10802 is not an “impassable” road but a bermed road. Under A19 this bermed road can be and is largely located in Security Core habitat. Though decommissioning the road is preferred under A19, a berm closure of restricted road in Security Core is allowed - provided the Forest develops and implements “a monitoring plan to detect any erosion or culvert blockage problems” on each such road. (Biological Evaluation for Bull Trout, Cutthroat Trout, and Shorthead Sculpin: Potential Effects from Implementing Amendment 19, Alternative 3 to the Forest Plan. Donald E. Hair. 2/4/95.)

Hair’s culvert monitoring requirement, above, is also repeated in A19’s Appendix D definition of a restricted road. In spite of this, the Flathead has not developed a single culvert-monitoring plan for any of the many score of bermed roads in Security Core, let alone for Raghorn Road #10802! (Chip Weber’s 9/22/15 response to Swan View Coalition’s 8/7/15 FOIA request).

Whether a bermed road or an “impassable” road, as made clear in this paper, Road #10802 must nonetheless be included in calculations of TMRD. And this brings us back to the plain language interpretation of A19: a road must have all stream-aligned culverts removed, all cross-drain culverts removed or rendered non-essential and harmless, and be removed from the road “system” before it is no longer a road counted in TMRD. Moreover, Road #10802 should have all of its culverts removed because the Flathead promised the public and FWS that it would do so in National Environmental Policy Act and ESA consultation documents!

Raghorn Road #10802 is but one example of what goes wrong when the Flathead fails to follow the plain language of its own Forest Plan and road decommissioning decisions. Instead of a decommissioned road that no longer functions as a road or trail, Road #10802 can be easily walked or ridden on a mountain bike or driven for at least the first mile by violating the berm closure in/on a motorized vehicle. Bears and other wildlife are left with easier human access into their habitat than promised and bull trout are left with culverts that remain ticking time bombs instead of having been removed as promised. FWS has concluded:

Culverts left in place behind gated and bermed roads . . . pose a risk to bull trout . . . Whatever the design life, any crossing structure would have a 100% chance of failure over its installation life if it is not removed after the road is abandoned.

(FWS's Montana Field Office, Biological Opinion on the Effects of the Moose Post-Fire Project on Bull Trout, 11/14/2002).

Conclusion

The public is left with little reason to trust the Flathead as it repeatedly attempts to end run A19's fiscally responsible program to restore grizzly bear habitat security in a way that provides the same benefits to other wildlife and fish. If the Flathead wants to change A19, it needs to issue a major Forest Plan amendment with full public disclosure and involvement. It cannot lawfully or ethically change A19 by simply claiming that "impassable" and ISS "system" roads are not really roads, are equivalent to decommissioned roads removed from the "system," and need not be included in TMRD.

Pre Meeting Notes: By Dan Brewer. For the meeting with Steve Phillips of the Flathead National Forest (Seeley Lake Ranger District 11/30/06),

Background:

I have been reviewing the Biological Opinions (BO) issued to the FNF in recent years. This is a difficult task as several different biologist authored these documents (Kat Jay Kellie Leslie).

Since 2002 the FNF has been issued 8 BO's for Bull Trout (8 BOs in 4 years). Each BO contained several terms and conditions to minimize impacts to bull trout, in all the FNF has about 102 term and conditions for on-going projects concerning bull trout. Taken in sum this appears to be lot of terms and conditions, however 5 of the 8 BOs were post fire "fast track" consultations. These fast track BOs contain the majority of the T&Cs. This was the result of receiving information and changes to the proposed actions up until the week before the BO was issued in many cases. As a result these BOs tend to contain numerous information requests concerning the what's and how's of implementation, as numerous assumptions were made in the BO analysis about what would occur. This is the repercussion of developing a project based on worst case scenario.

Of the 6 BOs that involved timber harvest and road related actions 63 of the 87 T&Cs attempted to address road and road related issues (culvert removal, upgrades, BMP work of monitoring these activities). That's 72% of the T&C were related to roads.

During the time frame of these 8 consultations 2 larger consultations were occurring A19 and A24. These consultations had the potential to affect bull trout habitat as well. During the Moose Fire BMP/Post Fire consultation the issue of leaving culverts behind berms and gates for snowmobile's and other reasons first arose (10/01/02 email Leslie Kubin, meeting notes, etc.). At that time the Service was informed that A24 was in the process of handling the potential adverse effects to bull trout habitat that could occur outside the Moose project area. At the project level (Moose Post Salvage/BMP) Forest committed to monitor culverts behind gates and berms (September 19, 2002 letter from the Forest) and reduce the amount of fill over the culvert, up size the culverts and armor as necessary. This effort also included a monitoring program and risk assessment. The initial assumptions were that the number of culverts that failed was low, and therefore the amount of culverts at risk of failure was low, between 10 to 15 %. This was largely based on expert opinion. However the most recent culvert risk assessment data suggests that the % of culvert at high risk of failure is closer to 40%. Monitoring would minimize take.

In 2006 the Forest reported that the risk/potential for culvert failure was much higher than previously thought during the Moose Fire Consultation and closer to 40% this is far above the assumed 10-15 % used in the Moose Fires Consultation.

In considering this information the Service has concerns about the impacts of culvert management on bull trout across bull trout waters across the FNF. Culvert that are

behind gates and berms typically do not receive “default maintenance” (the type of maintenance that occurs from everyday use) which would only minimize the impact of undersized pipes.

The Issues associated with leaving culverts behind berms was identified in the Moose Fires and Moose BMP projects and extends outside those project areas.

The recent weather events and subsequent culvert failures have highlighted the issue with roads and culverts. Not all natural events can be anticipated and even under the best road management conditions weather events can still lead to culvert and road failure. Hence the argument for low road density area's, to minimize impacts to the aquatic environment from both chronic and pulse events.