CLOSING FOREST ROADS FOR HABITAT PROTECTION: A NORTHERN ROCKIES CASE STUDY

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Abstract

From 1994 to 1995, road closure effectiveness was evaluated at more than eight hundred road closure points in wildlife management areas on National Forest lands in Idaho, Wyoming, Montana, and Washington. Closure structures were documented by field inventories and assessed for presence/absence, functioning condition, and whether or not motorized use occurred beyond the structure. More than half of all road closures inventoried had evidence of motorized use beyond the closure points. Road closure devices such as gates or earth berms may be useful to allow management activities in restricted areas or for temporary closures, but in the long term they are not cost effective and do not reliably protect habitat security. Road removal offers a more effective method of treatment for protection and restoration of wildlife habitat areas.

Introduction

Beginning in 1994, the Predator Conservation Alliance (formerly known as Predator Project, POB 6733, Bozeman, MT 59771) "Roads Scholar Project" began conducting field-based inventories of forest road closure effectiveness on selected wildlife management units on public lands in the northern Rocky Mountains of the United States. Forest roads differ from highways in that they are typically unpaved and built with the primary purpose of transporting logs and other raw materials, rather than for efficient high-speed travel. There are currently more than 430,000 miles of road on U.S. National Forests (USDA-FS 1998).

National Forests throughout the region are required to create and adhere to open road density standards to effectively manage for viable populations of grizzly bear (*Ursus arctos horriblis*), elk (*Cervus elaphus*), lynx (*Lynx canadensis*) or other threatened, endangered, or sensitive species. In order to comply with road density standards, Forests typically rely upon temporary road closure devices such as steel gates or earthen berms to create "secure" habitat areas where motorized access is restricted.

Two earlier studies in northwestern Montana established that roads closed with gates, earth berms or other temporary devices were not consistently effective at excluding motorized use (Hammer 1986, Platt 1993). The first of these demonstrated that only 62% of the road closures on the Flathead National Forest were effective at keeping vehicles off of closed roads (Hammer 1986), while the later inventory found that only 52% of the road closures on the Kootenai National Forest effectively prevented motorized use (Platt 1993).

In an effort to expand upon these two, citizen-initiated studies, the Predator Conservation Alliance (PCA) conducted eighteen inventories in 1994 and 1995 to evaluate the ability of gates, berms and other closure methods to close roads effectively.

Roads play a significant role and affect the viability of species with very different needs in a variety of ways. Ungulates such as elk and deer are vulnerable to a range of road effects, from direct impacts such as vehicle collisions (roadkill), to increased hunting pressures as a result of road-based access, to noise disturbance from vehicles using roads (Sage et al. 1983, Lyon 1983). Bears, wolves, and other carnivores are susceptible to an even greater degree to these same impacts since they are singled out for control programs or by poachers, have relatively low reproductive rates, and have wide-ranging habitat requirements (Forman et al. 1996; Gibeau and Heuer 1996). Trout and other salmonids suffer from increased stream sediment loads due to roadbuilding, road use, and disturbed soils on roadbeds and roadcuts (Eaglin and Hubert 1993). Other animals, such as beetles, voles, or amphibians suffer from the habitat fragmentation caused by roads (Noss 1996). Shade dependent plants, neotropical songbirds, forest carnivores, and forest raptors such as owls and goshawks rely upon intact canopy and interior forest cover and have been shown to tolerate only limited road densities, habitat disturbances, and openings (Reed et al. 1996). Finally, edge-adapted species or exotic plants can make use of road corridors, disturbed soils on and near roadbeds, and vehicles to expedite invasions and colonization (Sheley et al. 1996; USDI-BLM 1993).

For all of these reasons, ecologists and land managers have increasingly turned to road and transportation management as a key in protecting biodiversity on National Forests in the United States.

Study Area

All but one of the inventory sites in the study are designated as grizzly bear management units (BMUs); the remaining site is a special management area established for elk. The size of the BMUs reflects the estimated home ranges of female grizzlies with cubs, and varies according to habitat. BMUs in the study ranged in size from 91 square miles in northern Idaho to 730 square miles in the Yellowstone Ecosystem, with a mean size of 272 square miles. The elk management area was of similar size at 278 square miles.

Eight of the study sites were located entirely or partially in Idaho, seven were in Montana, two were all or partially in Washington, and one was located in Wyoming. Six of the BMUs studied are part of the the Greater Yellowstone Recovery Area identified for grizzly bear population recovery, five BMUs each are in the Selkirk Recovery Area and the Cabinet-Yaak Recovery Area, and one BMU is in the Northern Continental Divide Recovery Area (see Table 1).

Table 1: Study Sites for 1994-1995 Road Closure Assessments

Recovery Area Name	# of Units Surveyed	State(s)
Greater Yellowstone	6	WY, ID, MT
Selkirk	5	WA, ID
Cabinet-Yaak	5	ID, MT
Northern Continental Divide	1	MT
Elk Wildlife Management Area	1	MT

Methods

Using road closure information obtained from U.S. Forest Service district office staff, legal closure orders, and current visitor travel plan maps, each closure point was visited in the field and assessed for presence, effectiveness, and evidence and type of use. At every closure point, an inventory data form was completed to record the status and condition of the closure structure. If a closure device was present, it was classified by type, rated for effectiveness based on whether an automobile or off-road vehicle could easily circumvent the closure device, and its condition was documented on the data sheet. All missing or ineffective closures were photographed and recorded.

Results

A total of 802 road closure sites were ground-truthed during the 1994 and 1995 surveys. Of the 802 closure points, 727 (91%) had structures in place as indicated by the Forest Service. At eighty-one locations, researchers were unable to find a closure device and roads remained available to motorized use. Steel post gates and earth berms were the most common road closure devices inventoried by RSP ground-truthers. Steel post gates were used for road closures at 416 (52%) of the closure locations, and 212 locations (26%) had earth berms in place as a physical barrier to motorized use. Other common devices included 48 instances (6%) of a post and sign stating the road was closed or restricted to motorized use, but no physical obstruction to vehicle passage; 21 ranch gates (3%) which differ from steel post gates by having steel bars that cover a grid over the entire surface of the gate; and 9 guardrail gates (1%) that were permanently anchored in the ground and do not swing open. The remaining locations with closures present used devices including slash and downed logs, large boulders, road obliteration, a post and chain, or a combination of several different devices (see Table 2).

Table 2: Road Closure Devices

Steel Gate	Post/Sign	Earth Berm	Rd. Oblit.	Post/Chain	Ranch Gate	Guardrail	Slash	Boulders	Other
416	48	212	2	1	21	9	3	4	5

Field researchers also evaluated road closure devices for effectiveness within a range of four categories: 1) Closure effectively excludes all vehicles; 2) Closure excludes vehicles over 50Ó in width but not off-road vehicles (ORVs); 3) Closure does not effectively exclude administrative use or any vehicle with a key or combination to the gate; and 4) Closure does not effectively exclude any vehicle.

Table 3 shows how the various closure devices were rated for closure effectiveness. For the purpose of this inventory, a gate or other closure was considered effective when it was fully in place and could not be circumvented by a vehicle of any size. ORV use was determined by tracks, obvious detours, or other clear signs of travel over or around a closure device. Where there was clear evidence of vehicle traffic beyond a closure point but there was no evidence of travel around or over the device, the closure was considered to be receiving administrative or other use, such as key access to a locked gate. Where closure devices were clearly not functioning as planned, did not block the roadway to standard vehicle passage, or had been vandalized, they were rated "Not Effective."

The ÒNo DeviceÓ category represents the number of locations which had closure devices according to the agency inventory, but upon field inspection proved to have no device in place.

Table 3: Closure Effectiveness by Device Type

Device Type	Effective	ORV Access	Admin./Other Use	Not Effective
Steel Gate	55	126	175	60
Earth Berm	121	50	0	41
Ranch Gate	20	0	0	1
No Device	0	0	0	81
Boulders	2	2	0	0
Post & Sign	7	6	0	35
Slash	2	1	0	0
Guardrail	3	4	0	2
Rd. Obliter.	1	1	0	0
Post & Chain	0	0	0	1
Other	2	2	1	0
TOTAL	213	192	175	221

Discussion

Many closure devices were not effective at preventing motorized use on roads designated 'closed' or 'restricted' for wildlife habitat protection. Only 27% of all the inventoried closure points fully closed the roads they were intended to block and showed no signs of motorized activity beyond the closure point. With apparent administrative use factored out, road closures still allowed unplanned motorized use on 51% of all roads inventoried during this two year survey.

Steel gates with key or combination locks are the most common closure device. There is an inherent problem with the effectiveness of locked gates even when the gate is, by design and condition, totally functional (i.e., the gate is fully in place and cannot be circumvented by any vehicle). These gated roads are susceptible to use by people who have either a key or combination to the gate, and who then drive their vehicle past an otherwise effectively closed gate. This access to an otherwise effectively closed road is either for administrative use of the road by agency personnel, or accomplished by someone who has acquired (legally or illegally) the key or combination to that gate. While this planned use can often be controlled and incorporated into management plans, agency officials have found it difficult to document and control illegal use of roads beyond locked (or inadvertently unlocked) gates. Even discounting all possible administrative use, 46% of the steel gates inventoried were either being detoured by ORVs or were not effective for standard vehicles.

Earth berms, though more permanent and less susceptible to administrative motorized use than gates, were also largely ineffective at excluding motor vehicle travel. Primarily due to flaws in placement or construction, 43% of the earth berms in the study sites did not prevent motorized passage.

In general, the more permanent measures of road obliteration, large boulders, slash piles, or a combination of these methods proved most effective at preventing motorized use beyond closure points. Fortified ranch gates, which have a grid of metal rods from ground level to the top of the structure and thereby are impossible to slip through or underneath with a motor vehicle, were also found to be very effective devices. Ranch gates were most often found closing access into private lands and connected to well-maintained fencelines.

With a low level of effectiveness and annual vandalism costs to road closure devices on many Forest Service ranger districts reaching $5,000-$10,000 and higher, there are strong ecological, social, and economic arugments for implementing permanent road closure methods, such as removal and obliteration, slash and boulders, and permanent ranch and guardrail style gates. With temporary or less formidable structures, such as steel gates and earthern berms, wildlife habitat is not being protected in a reliably secure condition and motor vehicle access is not being well controlled or monitored by many land managers.

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References Cited

Eaglin, G.S. and W.A. Hubert. 1993. Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. North American Journal of Fish. Management 13: 844-846.

Forman, R.T.T, D.S. Friedman, D. Fitzhenry, J.D. Martin, A.S. Chen, and L.E. Alexander. 1996. Ecological effects of roads: Toward three summary indices and an overview for North America. Habitat Fragmentation and Infrastructure. Canters, K., ed. Ministry of Transport, Public Works and Water Management, Delft, Netherlands.

Gibeau, M.L. and K. Heuer. 1996. Effects of Transportation Corridors on Large Carnivores in the Bow River Valley, Alberta. In Trends in Addressing Transportation Related Wildlife Mortality. Report FL-ER-58-96, Florida Department of Transportation, Tallahassee, FL.

Hammer, Keith J. 1986. An On-site Study of the Effectiveness of the U.S. Forest Service Road Closure Program in Management Situation One Grizzly Bear Habitat, Swan Lake Ranger District, Flathead National Forest, Montana. Swan View Coalition, Kalispell, MT.

Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry 81: 592-595.

Noss, R. 1996. The Ecological Effects of Roads. Road-Ripper's Handbook, ROAD-RIP, Missoula, MT.

Platt, Thomas M. 1993. Cabinet-Yaak Grizzly Bear Ecosystem: 1992 Forest Service Road Closure Program Compliance Inventory. Alliance for the Wild Rockies, Missoula, MT.

Reed, R.A., J. Johnson-Barnard and W.L. Baker. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. Conservation Biology 10: 1098-1106.

Sage, R.W., W.C. Tierson, G.F. Mattfield, and D.F. Behrend. 1983. White-tailed deer visibility and behavior along forest roads. Journal of Wildlife Management 47: 940-962.

Sheley, R., M. Manoukian and G. Marks. 1996. Preventing Noxious Weed Invasion. Rangelands, 18 (3): 100-101.

U.S. Department of Agriculture-Forest Service. 1998. Administration of the Forest Development Transportation System. Advance Notice of Proposed Rulemaking, [3410-11] 36 CFR Part 212 [RIN AB-67-0095].

U.S. Department of the Interior-Bureau of Land Management. 1991. Noxious Weeds: A Growing Concern.