

# IMPACTS OF OFF-ROAD VEHICLES ON NATIVE VEGETATION

Native Plant Society of New Mexico

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*"What a country chooses to save is what a country chooses to say about itself."* □

Mollie Beattie, Director, U.S. Fish and Wildlife Service from 1993-1996

## **Introduction**

### **I. Native Plant Society of New Mexico**

The purpose of the Native Plant Society of New Mexico (NPSNM) is to “educate New Mexicans on native plant identification, ecology, and uses; encourage preservation of natural habitats; support botanical research; and promote use of native plants for conservation of water, land, and wildlife.” As the foremost organization in the state dedicated to the study and conservation of native plants, NPSNM is in a unique position to perceive changes to our flora, and to advise agencies on land management policies that will affect plant habitat. The membership of NPSNM is comprised of prominent field botanists as well as excellent amateur botanists. These individuals are motivated by a passion for hiking New Mexico’s stunning public lands, observing, cataloging, and sometimes collecting, with permits, our unique flora.

### **II. Issue**

The native flora on New Mexico’s public lands is under assault by the negative impacts of off-road vehicles (ORVs). As the use of these vehicles expands, and as ORVs encroach upon previously pristine and remote areas, the members of the Native Plant Society of New Mexico are becoming increasingly alarmed by the destruction of soils, vegetation, and plant and animal habitats.

### **III. History and Background**

In a February 2004 speech, then-Forest Service Chief Dale Bosworth stated,

“The biggest threats today are fire and fuels, invasive species, loss of open space, and unmanaged recreation. A good example [of unmanaged recreation] is off-road

vehicles, such as all-terrain vehicles. In the United States, the number of off-road vehicle users has just exploded. Ninety-nine percent of the users are responsible. But with all those millions of users, even the one percent who are the problem can have enormous impacts. Each year, the national forests get hundreds of miles of unauthorized roads and trails created by repeated cross-country travel. We're seeing more erosion, water degradation, and habitat destruction. We're seeing more conflicts between users. We have got to improve our management so we get responsible recreational use based on sound outdoor ethics" (Bosworth, 2004).

Reaching further back in time to the 1972 Nixon administration, Executive Order 11644 was created to

"establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and minimize conflicts among the various uses of those lands" (Federal Register, 1972).

In 1977, President Jimmy Carter signed Executive Order 11989, which amended Section 2 of Executive Order 11644, and added Section 9, to increase the protection given to the land by requiring agencies to identify and close areas that show evidence of damage due to off-road vehicle use (Federal Register, 1977).

Seven years after the first Executive Order, David Sheridan reported that "the Executive Orders 11644 and 11989 have been poorly implemented by the major land management agencies; hence ORV environmental damage and impairment of other recreationists' enjoyment of the resources are still out of control" (Sheridan, 1979).

In the 1970s, the decade of the Executive Orders cited above, it was estimated that ORV users in the US numbered 5 million. In 2004, that number had increased to about 51 million, a ten-fold increase (Cordell et al., 2005).

Notwithstanding the huge growth of ORVs, these motorized users of public lands still remain in the minority. According to a report called “National Forest Visitor Use Monitoring Program National Project Results, January 2000 through September 2003,” the percentage of surveyed people listing their main activity as quiet uses (backpacking, bicycling, cross-country skiing, developed camping, fishing, hiking/walking, horseback riding, picnicking, primitive camping, relaxing, viewing natural features, viewing wildlife, and viewing historic sites) was 62.7%. The percentage of surveyed visitors listing motorized use (driving for pleasure, off-highway vehicle use, other motorized uses, and snowmobiling) as their main activity was 10.1% (USDA Forest Service, 2003).

**Comment:** Each forest does their own NVUM. Which forest was this for? Or was this an average for all forests?

Nevertheless, this relatively small minority of public lands users has a disproportionate deleterious impact on our natural resources, such as soil, vegetation, and wildlife.

## **Impacts of Off-road Vehicles**

### **I. Miles of roads**

America’s national forests contain more than 373,000 miles of roads (Coughlan and Sowa, 1998), or more than 15 times the circumference of the Earth at the equator. In addition to this astronomical figure, it is estimated that there are another 60,000 miles of “ghost roads” (Coughlan and Sowa, 1998) – four-wheel-drive tracks, fire breaks, illegally created ORV trails, and ineffectively closed logging, ranching, and oil and gas drilling roads.

Off-road vehicle drivers continually use this huge network of roads, and still they are unsatisfied with their recreational experience. According to Chris Kassar of the Center for Biological Diversity and Jason Kiely of Wildlands CPR, who conducted a review of three surveys, many ORV users like to challenge their machines by driving off-road. The following are excerpts from their review:

Colorado Coalition for Responsible OHV Riding, 2001 – as many as two-thirds of adult users go off the trail occasionally, even though they know it’s not “correct” off-road vehicle behavior.

Utah Division of Parks & Recreation, 2000 – 49 to 50 percent of dirt bikers and ATV riders prefer to ride “off established trails” or did so on their last outing.

Montana State Fish, Wildlife & Parks, 2006 – 23 percent always or sometimes ride cross-country even though off-route riding is against the rules. Over 58% have traveled off of legal routes to retrieve downed game (Wildlands CPR, 2007).

## **II. Soils**

Healthy, intact soil is the foundation of a functioning ecosystem. Although it appears obvious that soil is necessary for the establishment and retention of vegetation, this fact bears repeating.

Off-road vehicles cause damage to soils in several ways. They compact the soil as they pass over the ground. Soil compaction decreases the interstitial spaces between soil particles, making the soil less permeable to precipitation, thus drying out the soil, and making it more difficult for seedlings to develop.

Decreased soil infiltration is a major cause of erosion and runoff, as well as reduced nutrient cycling, and deleterious changes to the hydrological regime (Eckert et al., 1979; Adams et al., 1982). Soil erosion creates gullies, arroyos and channels where they previously did not exist (Wilshire et al., 1978). These gullies lower the local water table, thus drying out the surface soils.

Increases in erosion caused by off-road vehicles can have severe impacts on sediment production. One study found that 72,000 tons of sediment were produced after only one winter season of concentrated ORV use in Hungry Valley, California (Griggs and Walsh, 1981). Excess sediment, as it washes into streams and rivers, fills the interstitial spaces between rocks. These areas represent important microhabitat for many fish, amphibians, and macroinvertebrates; loss of this habitat causes reverberations all the way up the food chain.

### **III. Biological Soil Crusts**

In addition to the soil surface, which even casual observers can discern, arid New Mexico is home to important communities of cyanobacteria, mosses and lichens. Cyanobacteria constitute the major component of biological soil crusts (also known as cryptobiotic, cryptogamic, or microbiotic crusts), which are commonly found in arid and semiarid environments. Biological soil crusts cover soil spaces not occupied by green plants, and may comprise over 70% of the living ground cover. They are key in reducing erosion, absorbing and retaining precipitation, and increasing soil fertility.

Most living crust biomass grows in the top 3 mm of soil, so even small impacts can have dire consequences. Cryptobiotic crusts are easily destroyed by vehicle tires, and are also killed if they are buried by disturbed sediment (USGS 2001).

### **IV. Vegetation**

ORVs have obvious direct impacts on vegetation, as they crush plants and seedlings, and strip foliage and branches from trees and shrubs. Less obvious, and more devastating, are the indirect consequences of off-road vehicles on New Mexico's public lands.

In arid environments, vegetation is often more susceptible to damage at ground level, where ORVs pass, because desert plants grow slowly and many have shallow root systems. Destruction of vegetation in arid ecosystems can lead to desertification, defined as "the gradual reduction in the productivity of land because of excessive human use" (Kockelman, 1983).

However, all ecosystems are vulnerable to damage by off-road vehicles. "No type of land in the United States can withstand sustained ORV use without some damage" (Sheridan, 1979). In the Soils section, above, we have already seen how ORVs cause soil compaction, erosion, and gully formation, which negatively impact native vegetation.

ORVs also loosen soil, and create rows of sediment adjacent to their trails (Eckhert et al., 1979). These soil deposits are redistributed by wind and water, and can bury surrounding vegetation, thus destroying it (Belnap and Gillette, 1997).

In addition to impacts on individual plants, ORV usage lowers plant species diversity (Bury and Luckenbach, 1983). In a study conducted on the Algodones dunes, Luckenbach and Bury (1983) report that compared to plots with ORV use, the control plots (no ORV use) had 2.4 times the number of plant species, 10 times the density, 9.4 times the cover, and 40 times the volume of shrubs. Plots that sustained heavy ORV use had little to no vegetation, suggesting that the severity of damage to vegetation is directly correlated with the intensity of ORV use (Bury, 1980; Luckenbach and Bury, 1983).

The timing of plant damage can also compound the devastation. During the spring growth season, grasses and forbs are somewhat resilient, and may recover from ORV damage. As the season progresses, however, plants become more dry and brittle, and therefore susceptible to ORV impacts (Payne et al., 1983). In New Mexico, where summers are hot and often dry, plants damaged by ORVs during this season are unlikely to reestablish. Summer is often the time of peak ORV activity, which compounds the destruction (Rowlands, 1983). In the arid Southwest, recovery of fragile lands can take years or decades, if it happens at all.

Intensive ORV use isn't a prerequisite for environmental damage. Even one pass of an ORV can disturb the soil and usher in the establishment of weedy, invasive plant species (Bury, 1980). Many invasive plant species, whether native or introduced, thrive in disturbed soils. Minor changes in soil moisture and composition can alter plant species communities and tip the balance in favor of invasive species. Changes in plant communities, in turn, negatively affect the wildlife that depend on the native flora for survival (Bury and Luckenbach, 1983).

Roads and trails serve as conduits for non-native plant species. For example, the seeds of one highly invasive plant, Spotted Knapweed (*Centaurea maculosa*), have been shown to

hitchhike by the thousands on the undercarriages of ORVs, for distances up to 10 miles (Lacey et al., 1997). Once exotic species become established in a new locale, it is nearly impossible to keep ORVs from distributing these weed seeds in other disturbed areas. An estimated 330,000 acres across the US are converted annually from natural habitat to monocultures of invasive weeds (Belnap, 1998).

In New Mexico, millions of dollars are spent annually on the control of non-native, invasive plant species, mainly salt cedar (*Tamarix* sp.) along the Rio Grande and Pecos Rivers. If ORVs continue to proliferate, and to encroach into previously pristine areas, we can expect that more taxpayer funds will be need to be spent on eradication of invasive species.

The following table, adapted from a survey by Dr. George W. Cox (2001), depicts the occurrence of alien (also called non-native, exotic, or introduced) plant species in New Mexico, from 1915 to 2000.

<b>Alien Plant Species in New Mexico</b>			
<b>Year</b>	<b>1915</b>	<b>1980</b>	<b>2000</b>
<b>Number</b>	136	255	390

The number of alien plant species (390) in 2000 represents 11% of the total number of plant species found in the state. From 1980 to 2000, the number of non-native plant species increased by 53%. Although no studies exist on this topic, we could expect that some of this increase can be attributed to the proliferation of ORVs.

Sadly, we can also anticipate that some of our rare, threatened and endangered species, such as Solomon's Seal (*Polygonatum biflorum*), Goodding's Onion (*Allium gooddingii*), Yellow Ladies-Slipper (*Cypripedium parviflorum*), and many others, will be extirpated in our state. Similarly, New Mexico endemics, e.g., Holy Ghost Ipomopsis (*Ipomopsis sancti-spiritus*), Mogollon Deathcamas (*Zigadenus mogollonensis*), and New Mexico Figwort (*Scrophularia macrantha*), which occur only in a few isolated populations, may

slip into extinction, crushed beneath the tires of off-road vehicles and their oblivious drivers.

There is evidence that roadless areas are crucial to the conservation of native plant communities. A study conducted by Gelbard and Harrison (2003) found that the effect of distance from roads, linked with soil type, has a significant impact on the success of native plants. Michael Soule, regarded by many ecologists as the “father of conservation biology,” states that “roadless habitats act as refuges for native plant diversity” (Soule and Terborgh, 1999). We can anticipate that, as ORVs encroach into roadless areas, both Wilderness Areas and Inventoried Roadless Areas, these native plant refuges will be severely compromised.

## **V. Wildlife**

Numerous studies have investigated the effects of roads and off-road vehicles on wildlife. The inclusion of these references is beyond the scope of this paper prepared by the Native Plant Society of New Mexico.

In brief, there are direct consequences of ORVs on wildlife, such as roadkills. Less obvious, and more detrimental, are the impacts that cannot be observed as easily. These impacts include habitat fragmentation (discussed in the following paragraph), restriction of wildlife movements and gene flow, and increased human access to remote areas (Lovich and Bainbridge, 1999).

Habitat fragmentation occurs when habitat loss or human-constructed barriers divide an area of relatively contiguous habitat into smaller, discontinuous parcels. This fragmentation can alter wildlife behavior. According to ecologists L. Harris and G. Silva-Lopez, “Roads are perhaps North America’s number one fragmenting force” (Harris, L. and G. Silva-Lopez, 1992). Dozens of studies document that many species avoid roads and trails, which act as *de facto* boundaries. As ORV users create more and denser road networks, many species of wildlife will be negatively impacted.

## **VI. User Conflicts and Noise**

As ORVs intrude ever deeper into remote areas, conflicts with quiet users – horseback riders, bicyclists, hikers, backpackers, hunters, anglers, botanists – are inevitable. Numerous accidents have already occurred with equestrians whose horses were frightened by the noise of ORVs.

The scientific literature contains studies of how noise affects many species of animals, including *Homo sapiens*. Loud noise, even that which falls within established health guidelines, can cause hearing loss. But beyond that, loud noise can also trigger negative emotions, from tension to violence (Louderback, 2003). Physical effects of loud noises include heart disease, high blood pressure, ulcers, and, of course, hearing loss (Environmental Protection Agency, Office of Noise Abatement Control, 1978).

Normal conversation ranges from 60 to 65 decibels. Many sources state that if you have to raise your voice to be heard a meter away, your hearing may be at risk. Off-road vehicles, even at a distance of 50 meters, require that you raise your voice to be heard. In California, often the leader in public health and environmental issues, industry standards permit ORV noise levels up to 96 decibels (Josephson, 2007).

The Noise Pollution Clearinghouse asserts that “Some individuals and businesses feel that they have a right or the freedom to use a common resource in any way they see fit... Perhaps they do not realize what most of us learned on the school yard years ago: ‘that my right to swing my fist ends at your nose.’ Or, perhaps they do not recognize the soundness of our parallel claim ‘that my right to create noise ends at your ear.’ In any case, these people are acting as bullies, claiming rights and freedoms that are not theirs while degrading resources that are ours” (Noise Pollution Clearinghouse, 2008).

Americans retreat to our public lands to escape from societal sounds and stresses. Loud noise, such as that emanating from ORVs, when experienced in areas that were previously peaceful refuges, is an especially egregious assault to the senses.

### **Travel Management Plan summary**

In late 2005, the Forest Service released Travel Management regulations intended to protect against the damages inflicted on national forest lands by motor vehicles traveling cross-country (off-road). The regulations require limiting motor vehicles to designated roads, trails and areas.

The general criteria to be used in making decisions about individual ORV routes include “consider[ing] the effects” on: natural and cultural resources, public safety, recreational opportunities, access needs, conflicts among uses,” and others.

When deciding whether to include a route in the official recreational road system, these specific criteria are to be used: designations must have the “objective of minimizing: damage to soil, watershed, vegetation, and other forest resources; harassment of wildlife and significant disruption of wildlife habitats; incompatibility of motor vehicle use with existing conditions in populated areas,” and more (Federal Register, 2005).

All national forests and grasslands, nationwide, have been tasked with the development of a Motor Vehicle Use Map, which will designate which routes are open to off-road vehicle use. When this map is released, with a target date of 2009, all cross-country travel will be prohibited, with the possible exception of discrete areas set aside for off-road recreation. Roads will be closed to motor vehicle travel unless posted open, and the Motor Vehicle Use Map will be the enforcement tool.

### **Recommendations**

The Native Plant Society of New Mexico makes the following recommendations, in an effort to preserve the beauty of our native flora.

**1. Riparian areas:** Riparian areas occupy less than 2% of the landscape of the Southwest, but their ecological importance is much greater than their physical footprint. Many species of wildlife depend on riparian habitats for water, food, and cover. Many ORV trails travel the length of perennial and intermittent streams, or cross them several

times. Even mainstem rivers, such as the Gila and the San Francisco, are often used as ORV trails. It is unacceptable that land managers allow New Mexico's most productive areas to be destroyed by frivolous recreational pursuits. All roads that travel through riparian areas should be closed or rerouted.

**2. Threatened and endangered species:** New Mexico's threatened and endangered plant and animal species deserve protection from off-road vehicles. Land managers are legally and morally bound to safeguard these species from ORVs and other threats. Routes in vulnerable habitats should be closed or rerouted. Land management agencies should strengthen their monitoring programs, so they can determine whether populations of threatened and endangered species are increasing or declining.

**3. Route densities:** The Travel Management Rule's elimination of cross-country travel is a welcome change from the status quo. However, the intent behind eliminating cross-country travel could easily be compromised if the Forest Service designates high-density road networks. The Native Plant Society of New Mexico recommends that the Forest Service broaden the reach of its existing road density standards to ensure that all motorized routes – whether classified as a “road” or “trail,” and whether “authorized” or “unauthorized” – are factored into route density calculations. Agencies' route designations are unimportant; a route's on-the-ground impact is the only criterion that needs to be considered for ecological health.

Route densities should be designated using clearly defined, science-based standards. The general effects of roads on wildlife have been discussed in the Wildlife section, above. Territory sizes are fairly well established for many species of wildlife, and studies have shown that road densities alter animal behavior and breeding. These factors need to be considered when making decisions on road densities.

Finally, road densities need to be calculated without averaging in Wilderness Areas and other similar roadless designations.

**4. Inventoried Roadless Areas:** Roadless areas serve as refuges for flora and fauna, help preserve water quality, and present quiet recreational opportunities not found near roads. We recommend that these roadless (or nearly roadless) areas retain their primitive nature. No new roads should be permitted, and existing roads should be carefully analyzed to determine whether they can be closed.

**5. Dispersed Camping:** Individual national forests have been given latitude in how they handle the issue of camping outside of developed campgrounds. The Travel Management regulations allow for “designating fixed distances from open routes allowing cross-country travel for the specific purpose of dispersed camping.” The Forest Service lacks the resources to enforce and maintain its current road system. If users are allowed to travel off roads to find camping spots, this will increase user-created routes, and it will be difficult to keep people within the designated fixed distance. Creating open areas or issuing permits for cross-country travel for the purposes of dispersed camping is not consistent with the intent of the Travel Management Rule.

The Native Plant Society of New Mexico recommends the designation of terminal routes or spurs that provide access to dispersed camping opportunities. Also, camping should be allowed adjacent to designated routes, with campers parking just off the road, and walking to their camping destination.

**6. Motorized Big Game Retrieval:** Motorized big game retrieval is another potential exception – provided for by the Travel Management guidelines – to the cross-country travel ban. As with dispersed camping, this exception has the potential to be an enforcement nightmare for the Forest Service. The reality of granting exceptions for big game retrieval will inevitably involve the creation of more trails that will continue to be used by others. This scenario is inconsistent with the spirit of the Travel Management Rule.

NPSNM recommends that hunters continue to pack out their downed animals, just as they have done since time immemorial. The New Mexico Department of Game and Fish recommends this policy, with exceptions for disabled hunters, and we concur.

**7. Road System Budget Constraints:** National forests currently have a backlog of roads suffering from deferred maintenance problems. The budget for road maintenance is woefully inadequate, and still in decline. For example, in a Roads Analysis Report for the Gila National Forest, the annual maintenance costs for level 3-5 roads (i.e., all roads with the exception of closed and high clearance vehicle routes) is listed as \$4,508,135. The report states that “road operation and maintenance funding on the Gila National Forest ranges from approximately \$1.6 - \$1.8 million per year and is expected to stay in that range in the foreseeable future” (Gila National Forest, 2003).

The Native Plant Society of New Mexico is concerned that drainage and erosion problems on unmaintained roads will only worsen, and will exacerbate watershed quality issues. It is our position that national forests should be required to designate a recreational road network that is within their budgetary constraints.

### **Summary**

The Native Plant Society of New Mexico is very concerned about the impacts of off-road vehicles on our native flora, and about the spread of invasive plant species. We have the expertise to advise land managers about the changing status of our native flora, and are willing to work with the Forest Service, Bureau of Land Management, and other land management agencies to reach the above-stated objectives.

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