Recent Off-Road Vehicle Scientific Research Reviews

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There are hundreds of scientific articles on the environmental and social impacts of motorized recreation. Luckily, there has been a recent effort to summarize their impacts into a number of literature reviews, annotated bibliographies, and best management practices. Here we present some of the most current summaries of the literature on off-road vehicles and as well as annotated bibliographies and best management practices (BMPs) based upon this growing literature. Also, Wildlands CPR continues to maintain and update a searchable annotated bibliographic database of over 20,000 citations documenting the physical and ecological effects of roads and off-road vehicles, and each quarter we summarize the research of one topic into "BiblioNotes." Below is a chronological listing of recent scientific reviews of the literature, summaries of each document, and links to the full document when available.

Wildlands CPR Road and ORV Searchable Database

Wildlands CPR continues to maintain and update a searchable annotated bibliographic database of over 20,000 citations documenting the physical and ecological effects of roads and off-road vehicles. In the U.S. alone, there are 6 million kilometers of public roads and over 36 million registered off-road vehicles. This database was created to help people access relevant scientific literature on erosion, fragmentation, sedimentation, pollution, effects on wildlife, aquatic and hydrologic effects, and various other up-to-date information on the impacts of roads and off-road vehicles. The database contains citations for both scientific and "grey" literature including journal articles, conference proceedings, books, lawsuits, and agency reports most with accompanying abstracts.
http://www.wildlandscpr.org/bibliographic-database-search

Wildlands CPR BiblioNotes

Bibliography Notes summarize and highlight some of the scientific literature in our 20,000 citation bibliography on the physical and ecological effects of roads and off-road vehicles. Each quarter, we have a new research review to help scientists, managers, and activists access important biological research relevant to roads and off-road vehicles.
http://www.wildlandscpr.org/biblio-notes

Published Reviews, Annotated Bibliographies, and Best Management Practices for Off-Road Vehicles

Wildlands CPR, and Wild Utah Project. 2008. Best Management Practices for Off-Road Vehicle Use on Forestlands - A Guide for Designating and Managing Off-Road Vehicle Routes on Forestlands. Edited by, T.A. Switalski and A. Jones. Published by Wildlands CPR, Missoula, MT. 50p.
http://www.wildlandscpr.org/files/ORV_BMP_2008.pdf

Abstract: Forest management applies to a diversity of human uses, including the use of motorized vehicles by the public. Best Management Practices (BMPs) provide science-based criteria and standards that land managers follow in making and implementing decisions about human uses and projects that affect our natural resources. BMPs are usually developed based on legal obligations, pragmatic experience, and institutional practices, and should be supported by the best available scientific knowledge. However, while many land management activities rely on established Best Management Practices, until now no BMPs have been developed to manage off-road vehicles (ORVs) on forestlands. These BMPs, based on the best available scientific knowledge, fill this gap of Forestland ORV management. This paper provides Best Management Practices to aid land managers in travel planning or in any decision making process related to off-road vehicle management on forested lands. They are not intended to provide guidance for desert lands, though there may be some applicability across landscapes.

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.
http://www.fort.usgs.gov/products/publications/22021/22021.pdf

Executive Summary: This report and its associated appendixes compile and synthesize the results of a comprehensive literature and Internet search conducted in May 2006. The literature search was undertaken to uncover information regarding the effects of off-highway vehicle (OHV) use on land health, or "natural resource attributes," and included databases archiving information from before OHVs came into existence to May 2006. Information pertaining to socioeconomic
implications of OHV activities is included as well. The literature and Internet searches yielded approximately 700 peer-reviewed papers, magazine articles, agency and non-governmental reports, and internet websites regarding effects of OHV use as they relate to the Bureau of Land Management's (BLM) standards of land health. Discussions regarding OHV effects are followed by brief syntheses of potential indicators of OHV effects, as well as OHV-effects mitigation, site-restoration techniques, and research needs.

Davenport, J, and TA 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.
http://www.wildlandscpr.org/files/uploads/PDFs/d_Switalski_2006_Enviro_impacts_of_transport.pdf

Introduction: Mass tourism is a modern phenomenon, stemming primarily from the introduction of personal vehicles and motorised mass transport from the late 19th Century onwards, accelerating particularly after 1945 by the development of passenger airlines. Initially, mass tourism was a short-range phenomenon largely within nation states, but is now global with tourists from developed countries visiting almost all parts of the globe.

The greatest ecological threats that mass tourism poses undoubtedly lie in the infrastructure and transport arrangements required to support it, particularly in situations where numbers of tourists are subject to little control. Physical development of resorts, consumption of fuel by buildings, aircraft, trains, buses, taxis and cars, overuse of water resources, pollution by vehicle emissions, sewage and litter all contribute to substantial, often irreversible environmental degradation, as well as to dramatic social consequences. The first part of the chapter focuses on the transport-related aspects of these large-scale problems.

The second part of the chapter is aimed at assessing the ecological impact of individual leisure transport. This has developed from a simple matter of walking or horse riding that sufficed for centuries, through bicycle touring and leisure boating that burgeoned at the end of the 19th Century, to the use of high-powered four-wheel drives, snowmobiles and jet skis by 21st Century leisure consumers.

Kassar, C. 2005. Motorized recreation at a crossroads: lessons from the past converge with management practices of the future – off road vehicle use on public lands. Published by Friends of the Inyo, Bishop, CA. 66p.
http://www.endangeredearth.org/orv/orvreportsmall.pdf

Introduction: …There are a multitude of scientific studies that provide sufficient evidence and support for carefully controlled and managed motorized recreation on public lands. In this unique2 report we will delve into these studies to illustrate the demonstrated, detrimental and interconnected effects of off-road vehicles on wildlife, habitat, vegetation, soil, air, water and other users. Although this report is organized to analyze off-road effects on individual ecosystem components (i.e., soil, vegetation, wildlife), these systems are inextricably linked, thus there is a significant amount of overlap in any complete discussion of the environmental impacts of ORVs. We will argue that these repercussions can be prevented or at least minimized within an efficient management system. Lastly, this report will beg the question: Why, despite over 35 years of research and reports of the negative direct and indirect consequences of off road vehicle use, does motorized recreation remain largely unmanaged?

Ministry of Water, Land and Air Protection and Grasslands Conservation Council (MWLAP and GCC). 2004. Best Management Practices for Recreational Activities on Grasslands in the Thompson and Okanagan Basins. Ministry of Water, Land and Air Protection, Victoria, B.C.
http://www.env.gov.bc.ca/wld/documents/bmp/grasslands_th_ok_bmp.pdf

The guidelines provided in this document - called "Best Management Practices" or BMPs – identify ways in which recreationists can help sustain healthy grasslands while continuing to enjoy their outdoor activities. The intent of the BMPs is to provide a set of stewardship guidelines in the form of recommended actions – the do's and don'ts of recreation – to achieve conservation and stewardship of B.C.'s Thompson and Okanagan basin grasslands.

The purpose of the BMP document is to provide stewardship guidelines for motorized and non-motorized commercial recreational activities on grasslands in B.C.'s Thompson-Okanagan basins so that damage to sensitive grassland habitats and the species that inhabit them is minimized or prevented. While the focus of the BMPs is on commercial recreation, they are applicable to all individual recreationists.

Gaines, W.L., P.H. 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. 79p.
http://www.fs.fed.us/pnw/pubs/gtr586.pdf

Summary: We conducted a literature review to document the effects of linear recreation routes on focal wildlife species. We identified a variety of interactions between focal species and roads, motorized trails, and nonmotorized trails. We used the available science to develop simple geographic information system-based models to evaluate the cumulative effects of recreational routes on habitats for focal wildlife species for a portion of the Okanogan and Wenatchee National Forests in the state of Washington. This process yielded a basis for the consistent evaluation of the cumulative effects of roads and recreation trails on wildlife habitats, and identified information gaps for future research and monitoring. We suggest that managers use an adaptive management approach to address wildlife and recreation interactions because of the complexity and uncertainty of these issues.

Stokowski, P.A. and C.B. LaPointe. 2000. Environmental and social effects of ATVs and ORVs: an annotated bibliography and research assessment. School of Natural Resources, University of Vermont. 31p.
http://atfiles.org/files/pdf/ohvbibliogVT00.pdf

Summary: This report provides an annotated bibliography of published research related to the environmental and social effects of ATVs on public and private lands. Citations were gathered in a comprehensive literature review of published research reports and peer-reviewed scholarly writing, and from a review of internet sources. Key findings from the research are synthesized

and evaluated, and suggestions for future research are provided. A wide variety of environmental and social impacts are documented in the research literature, including those related to soil erosion and trail degradation; vegetation; water and air quality; noise; wildlife and fish; and social conflicts among different types of recreation user groups.

Joslin, G. and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A review for Montana. Committee of Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society. 307p.
http://joomla.wildlife.org/Montana/index.

This project includes four elements:

1. A partially annotated bibliography relevant to effects of recreation on wildlife and wildlife habitats.
2. Species-group chapters and appendices that outline factors that should be considered in planning and managing recreation including, wherever possible, the status of existing knowledge of potential effects of recreation on wildlife. Species chapters address the following 6 species groups: amphibians and reptiles, birds, small mammals, semi-aquatic mammals, ungulates, and carnivores. The report also includes a chapter on vegetation soils, and water as well as a chapter on potential effects of companion dogs.
3. Proposed guidelines, supported by published literature, and committee recommendations are designed to guide the planning and management of recreation and recreational developments with consideration for wildlife values. Guidelines are summarized at the broad, general level in the project overview. Guidelines and/or recommendations specific to species groups are included in most species chapters.
4. A brochure for distribution to the general public that provides the Internet address of the Montana Chapter, TWS bibliography and report and summarizes recommended guidelines at a broad level.

Wildlands CPR, The Wilderness Society, et al. 1999. Petition to enhance and expand regulations governing the administration of recreational off-road vehicle use on National Forests. Published by Wildlands CPR, Missoula, MT 188p.
http://www.wildlandscpr.org/files/uploads/PDFs/Final_ORV_Petition_revised.pdf

Introduction: …While ORVs exert a significant impact on the environment, they are particularly devastating to soil, the thin layer of disintegrated rock and organic matter to which all life is connected. According to the U.S. Geological Survey, based on an 18-month study of ORV impacts to more than 500 soils from more than 200 sites in various climatic zones, virtually all soil types examined are vulnerable to ORV damage. Soils are among the natural resources most severely impacted by ORV use. On steep slopes, for instance, ORVs cause severe destabilization and erosion. Many soils are susceptible to compaction and rutting. Eroded soil entering streams and rivers can dramatically reduce the quality of native fish habitat. Impacts to soil quality and quantity then produce impacts to vegetation, wildlife, and entire ecosystems.

Vegetation, too, suffers from ORV use. ORVs crush, trample, bruise, shred, tear, and otherwise destroy trees, shrubs, and other plant life. In other cases, the impacts are more subtle but not less insidious or significant. By disturbing the soil, ORVs make it easy for exotic plants, such as knapweed, to become established. ORVs suppress existing native vegetation, making it easier for the exotic invaders to out compete the native plants, and they carry the foreign seeds to the very places where they most readily establish a foothold.

Wildlife and wildlife habitat are jeopardized by ORV activity as a result of habitat alteration, disturbance, or direct mortality. ORVs sometimes strike animals, intentionally or unintentionally, causing their death. The use of ORVs can severely disturb and harass wildlife, most significantly in the winter, when wildlife are already severely stressed by weather conditions and the lack of food. ORV routes often fragment and degrade wildlife habitat as well. The noise of ORVs can directly impede the ability of wildlife to find prey, avoid predators, and successfully reproduce. ORV noise can also dangerously disorient wildlife.

ORVs, especially those powered by two-stroke engines are highly polluting. The carbon monoxide, polycyclic aromatic hydrocarbons, MTBE, particulate matter, and other pollutants emitted by ORVs can have devastating effects on the quality of the air, soil, snow, and water, and on human health.

Finally, ORVs also cause adverse impacts on the recreational experiences of every other user of the National Forest System. There are safety concerns regarding ORV use, as well as conflicts with other forest users seeking a non-motorized experience. ORV conflicts with hunters, hikers, and other non-motorized recreationists are well documented. It is important to recognize that many of the environmental impacts of ORVs are synergistic, combining to produce impacts that are vastly greater than the sum of their parts.