


DRAFT - SECOND VERSION

**TRAILS AND WILDLIFE
BIBLIOGRAPHY**

January 6, 1997 - Draft - Second Version

Provided by
Colorado State Parks - Trails Program
1313 Sherman Street, Room 618
Denver, CO 80203

W2216
Trails and Wildlife Bibliography Draft - S
W2216
4346



This draft document is provided to the Trails and Wildlife Task Force members to acquaint them with the format of the Trails and Wildlife Bibliography being produced by Colorado State Parks. Please note that the bibliography is in progress; citations are currently being gathered and indexed.

Please submit any comments, questions, or additional entries in writing to: Trails and Wildlife Bibliography Project, Colorado State Parks, 1313 Sherman Street, Room 618, Denver CO 80203. When recommending additional entries, please send copies of the articles and the title pages and publication data for the documents in which they were printed.

HOW TO USE THIS BIBLIOGRAPHY

Section 1, *Listings by Author*, contains full citations (author, title, publication data, summaries, and assigned key words), in alphabetical order by author name. Each document is assigned keywords depending on subject matter.

Section 2, *Index by Key Words*, lists the documents in order by key words. To locate documents dealing with snowmobile use, for example, see the *Snowmobile* listings in Section 2 for author, title, and publication date of all documents dealing with snowmobiles.

Introduction

This bibliography was created for the Trails and Wildlife Task Force Committee convened by Colorado State Parks in cooperation with Great Outdoors Colorado. The objective of the task force is to understand and define the issues concerning recreational trails and their impact on wildlife and the environment. ~~This knowledge will be used to create a *Trail Development Workbook* to help trail designers plan trails with the least amount of impact on the environment; and to revise the current trail grants processes.~~ This database is the result of the information-gathering phase of this project.

Unfortunately, there is very little research available specifically on recreational trails and their impacts on wildlife. Most of the research related to this topic deals with general human disturbances, and off-highway vehicles and their effects.

The majority of the articles included in this document were obtained through inter-library loan at Denver Public Library by using FIRST SEARCH and WORLDCAT databases. WORLDCAT accesses databases from institutions worldwide to determine which libraries own a certain publication. FIRST SEARCH searches through records from thousands of libraries in WORLDCAT to find a specific publication or article within a publication.

Other resources:

Rocky Mountain Research Center

USDA Forest Service
324 25th Street
Ogden, Utah 84401
801-625-5437
FAX: 801-625-5129

National Technical Information Service

5285 Port Royal Road
Springfield, VA 22161
1-800-553-NTIS
FAX: 703-321-8547
WEB: <http://www.ntis.gov>

Aldo Leopold Wilderness Research Institute

790 East Beckwith Avenue
P.O. Box 8089
Missoula, MT 59807-8089
406-542-4190

TRAILS AND WILDLIFE BIBLIOGRAPHY

Section 1: Indexed by Author

(See Section 2 for index by key words)

Provided by Colorado State Parks - Trails Program

Printed 1/6/98

Aasheim, R.

Snowmobile impacts on the natural environment.

Source: in: R.L. Andrews and P.F. Nowak, eds. Off-road Vehicle Use: A management challenge. Conf. Proc, 16-18 March 1980, Ann Arbor, Michigan **Pages:** 191-200 **Date:** 1980

Keywords

snowmobile

wildlife

Snowmobiling and its impacts on natural environments in Montana are described. Studies of impacts on deer and elk have produced conflicting results, but there is little doubt that additional stress on poor-condition animals in winter is undesirable. Animals accustomed to humans are less affected by snowmobiles than animals in more remote areas. Effects on small mammals and possible effects of packed snowmobile trails are discussed.*

Adams, Evelyn S.

Effects of lead and hydrocarbons from snowmobile exhaust on brook trout (*Salvelinus fontinalis*)

Source: Amer. Fish. Soc. Trans. (vol. 104) **Pages:** 363-373 **Date:** 1975

Results show that stamina in brook trout, as measured by the ability to swim against a current, was significantly less in trout exposed to snowmobile exhaust than in control fish.

Keywords

snowmobile

wildlife

Adams, L.W. and A.D. Geis

Effects of roads on small mammals.

Source: Journal of Applied Ecology (vol.20) **Pages:** 403-415 **Date:** 1983

The study was designed to determine the effects of roads in the diversity, spatial distribution, and density of small mammals. Small mammal community structure and density were both influenced by roads.

Keywords

wildlife

Adams, Lowell W., and Alfred D. Geis

Effects of Highways on Wildlife.

Source: Urban Wildlife Research Center: 10921 Trotting Ridge Way **Pages:** 152pp **Date:** 1980
Columbia, MD 21044

Keywords

human disturbance
wildlife

Effects of highways on the diversity and spatial distribution of wildlife were studied in the southern Piedmont of Virginia, North Carolina, and South Carolina; the Midwest Tillplain of Illinois; the valley region of Oregon between the Cascade and Coastal Ranges; and the central portion of northern California. Sample plots were distributed in relation to interstate highways and county roads and extended perpendicularly from roadside edges to 400m from each road type. Nine bird species were positively influenced and nine species were negatively influenced by one or both road types during either the breeding or winter season. No differences were detected in the distributions of the majority of bird species with respect to roads.

Small mammal community structure and abundance were influenced by roads. Grassland species generally preferred right-of-way (ROW) habitat and many less-habitat-specific species were distributed in ROW and adjacent habitat. Evidence was obtained indicating that large roads inhibited movement of 11 of the 40 small mammal species studied.

No significant difference was detected in deer distribution in relation to interstate highways, but deer use of habitat away from country roads was greater than use adjacent to that road type. Elk avoided roads. Cottontail rabbits were attracted to interstate ROWs but not to country ROWs.

Seventy-six percent of the road wildlife mortality was on interstate highways. Roads appeared to act in a density-dependent manner--species killed in greatest numbers were those attracted to roadsides (eg. meadowlark, indigo bunting, field sparrow, red-winged blackbird, deer mouse, several vole spp., and rabbits).

Adkinson, Gregory P.

Ecological Impacts of Trail Use in Three Indiana Nature preserves.

Source: Masters thesis: The School of Graduate Studies, Dept. of Life Sciences. Indiana State University Terre Haute, Indiana **Pages:** 137 **Date:** 1991

Keywords

soil/vegetation

The effects of trail use and presence were studied in Rocky Hollow-Falls Canyon, Pine Hills, and Pedestal Rock Nature preserves of Indiana. Soil compaction increased at trailside, and leaf litter cover tended to decrease. Most woody species, ferns, and delicate forbs decreased in frequency, cover, abundance, vigor, and maximum height near trails. Species with characteristics such as basal leaves, rhizomes, or small size tended to thrive under trailside conditions. Changes in leaf litter cover, and soil compaction appear to be the most important effects associated with trail presence and use. These factors determine the magnitude of trail effects. The communities that were studied respond differently to trail effects due to differences in species composition and site characteristics. The lack of significant variation among the three nature preserves in the dry-mesic upland community suggests that communities have a threshold to impacts of trail use, above which, amount of foot traffic along trails becomes negligible.

Albrecht, J. and T.B. Knopp

Off Road Vehicles - Environmental Impact - Management Response: A Bibliography

Source: Miscellaneous Publication 35 --1985 Agricultural Experiment Station, University of Minnesota. **Pages:** 50pp. **Date:** 1985

This bibliography was created to be used as a decision making tool by recreational and land-use managers. The articles are divided into 10 sections: (1) General environmental effects, (2) Effects on Vegetation, (3) Effects on Soil, (4) Effects on Wildlife, (5) Effects on other Recreationists, (6) Management--Policy, (7) Legislation--Regulation, (8) Conference--Symposia--Workshops, (9) Bibliographies, and (10) Author Index.

Keywords

OHV
management
soil/vegetation
wildlife

Albrecht, Jean

Trail Planning, Construction and Maintenance. A bibliography supplement.

Source: University of Minnesota. Miscellaneous Publication 76 -- 1972. **Pages:** 30pp. **Date:** 1992
Minnesota Agricultural Station.

The purpose of this bibliography is to bring together literature that will enable trail planners, managers, and users to benefit from what others have learned through research and experience.

Keywords

management
recreation

Albrecht, Jean

Trail Planning, Construction and Maintenance: A bibliography Supplement, 1996.

Source: College of natural Resources and Minnesota Agricultural Experiment Station. University of Minnesota St. Paul Minnesota. **Pages:** 29pp. **Date:** 1996
Staff Paper Series no. 118. Department of Forest Resources

The purpose of this bibliography is to bring together literature that will enable trail planners, managers, and users to benefit from what others have learned through research and experience.

Keywords

management
recreation

Allan, Nigel J.R.

Man, machine, and snow: A study of recreationists' landscape perceptions.

Source: Syracuse University, Dept. of Geography., Discussion Paper Series No. 2. **Pages:** 20pp. **Date:** 1975

Keywords

snowmobile
wildlife

Altmann, M.

The flight distance in free-ranging game.

Source: Journal of Wildlife Management (vol.22) **Pages:** 207-209 **Date:** 1958

Flight distance is discussed as a quantitative measure of reactivity of game animals to intruding persons. In studies of Moose and Elk in Wyoming, flight distances varied by habitat type, social grouping, and reproductive and nutritional states.

Keywords

wildlife
human disturbance

American Academy for the Advancement of Science.

ORV use

Source: Science (vol. 18(3)) **Pages:** 500-501 **Date:** 1974

Recommendations for the control of ORV use and it's impacts on the environment are given in this non-technical article. Designate a number of large, easily accessible areas for unrestricted use by off-road vehicles. 2) Designate portions of the desert as wilderness or other kinds of areas in which access is permitted to non-motorized travel only; 3) Prohibit off-road vehicular travel except to land-use permittees and lessees in the remaining desert lands; 4) Establish buffer strips approximately 1 mile wide in the open country along major highways; 5) Encourage states in which the desert lands occur to enact legislation requiring state and county units to establish land-use zones designed to control residential and industrial development; 6) Conduct research on the impact of recreational use on vegetation regrowth and succession, soil, animals, and water; and 7) initiate an educational outreach program.

Keywords

OHV
management

American Association for the Advancement of Science, Committee on Arid Lands

Off-road Vehicle Use

Source: Science (vol. 184) **Pages:** 500-501 **Date:** 1974

Impacts of off-road vehicle use including destruction of flora and fauna on arid lands in the United States are briefly reviewed. Problems in regulation and management of vehicle use are discussed and detailed recommendations are presented.*

Keywords

OHV
soil/vegetation
wildlife

American Forests

Snowmobiles and the National Parks.

Source: American Forests **Pages:** - **Date:** 1972,

Issues concerning snowmobiles and their use in national parks are discussed: (1) Snowmobile use should be limited to unplowed forest roads; (2) Harassment of wildlife by snowmobilers; (3) Damage to vegetation and wildlife; and (4) The disruption of other visitors. Recommendations for regulations are given.

Keywords

snowmobile
wildlife

Amstrup, S.C., and J. Beecham.

Activity patterns of radio-collared black bears in Colorado.

Source: Journal of Wildlife Management (vol.40) **Pages:** 340-348 **Date:** 1976

The impacts of the investigators on black bear activities appeared to be negligible. Instrumented bears often withdrew from observers, but human-induced alterations of their behavior appeared to be short-lived.*

Keywords

human disturbance
wildlife

Andersen, D.E., O.J. Rongstad, and W.R. Mytton

Home-range changes in raptors exposed to increased human activity levels in southeastern Colorado.

Source: Wildlife Society Bulletin (vol. 18) **Pages:** 134-142 **Date:** 1990

Keywords

human disturbance
wildlife

Anderson, D.W.

Dose-response relationship between human disturbance and brown pelican breeding success.

Source: Wildlife Society Bulletin (vol.16) **Pages:** 339-345 **Date:** 1988

The brown pelican nesting colony at Isla Coronado Norte was monitored from 1969 to 1987. Most of the activity on the island is related to a fishing camp. There was essentially only one type of human disturbance, humans walking along trails to visit cache sites at various locations. The disturbances were only related to trails, and occurred once every 1-2 weeks throughout the nesting season each year.

Keywords

wildlife
recreation
human disturbance

Anderson found that the colony has been disturbed to such an extent that nesting success has been reduced and nesting populations on that island are threatened. Nest abandonments increased with nearness to human activity, and human disturbance versus nesting success followed a typical dose-response pattern. Pelicans were affected at distances less than about 600m, illustrating the sensitivity of brown pelicans to human disturbance.

Atkinson-Wiles, G.

Wildfowl and Recreation: A balance of requirements.

Source: Br. Water Supply (vol. 11) **Pages:** 5-15 **Date:** 1969

Reservoirs in Great Britain have helped compensate for the loss of waterfowl habitat through draining and development, but growing recreational needs are upsetting this balance. Some recreational activities cause less disturbance than others; these activities must be weighed against waterfowl conservation needs and compromise use plans developed on a large scale.*

Keywords

wildlife
recreation

August, P.V., J. W. Clarke, M.H. McGaugh, and R.L. Packard

Demographic patterns of small mammals: A possible use in impact assessment.

Source: in: H.H. Genoways and R.J. Baker eds. Biological investigations in the Guadalupe Mtns NP, Texas. Symposium Proc., 4-5 April 1975, Lubbock, Texas. U.S. Natl. Park Serv. Proc. Trans. Ser.4 **Pages:** 333-340 **Date:** 1979

Keywords

human disturbance
wildlife

Demographic patterns of small mammals can be useful in determining the effects of human use upon a given area. Comparisons of populations before and after periods of human use reveal changes associated with the use which may serve as a measurement of disturbance. Preliminary results of pre-use studies in a National Park in Texas and applications to the measurement of human disturbance are discussed.*

Aune, K.E.

Impacts of winter recreationist on wildlife in a portion of Yellowstone National Park, Wyoming.

Source: M.S. Thesis. Montana State University, Bozeman. **Pages:** 111pp. **Date:** 1981

General responses of wildlife to winter recreationists in Yellowstone National Park were attention or alarm, flight, and rarely aggression. Responses varied with the species involved, nature of the disturbance, and time of season. Winter recreation activity was not a major factor influencing wildlife distributions, movements, or population sizes, although minor displacement of wildlife from areas adjacent to trails was observed. Management recommendations are presented.*

Keywords

snowmobile
human disturbance
management
recreation

Baldwin, M.F.

The off-road vehicle and environmental quality 2nd ed.

Source: The Conservation Foundation, Wash. D.C. **Pages:** 61 **Date:** 1973

This report updates an earlier edition describing the social and environmental effects of off-road vehicles, particularly snowmobiles. A section on fish and wildlife effects reviews literature describing harassment of wildlife, and legal responses to adverse impacts of off-road vehicles on wildlife. Policies for control of environmental impacts are presented.*

Keywords

OHV
snowmobile
wildlife

Baldwin, M.F.

The snowmobile and environmental quality.

Source: Living Wilderness (vol. 32 (104)) **Pages:** 14-17 **Date:** 1968

The environmental effects of snowmobile use is examined. Snowmobiles produce noise, fumes, and impacts on fish, wildlife, and trails. The harassment of wildlife by snowmobile users is also discussed. Some policy recommendations are made.

Keywords

snowmobile
soil/vegetation
wildlife

Baldwin, M.F. and D.H. Stoddard

ORV's and Wildlife: A scientific survey.

Source: ORV Monitor **Pages:** 7-8 **Date:** 1974

Keywords

OHV
wildlife

Baldwin, M.F., and D.H. Stoddard, Jr.

The off-road vehicle and environmental quality.

Source: Second edition- The Conservation Foundation, Washington D.C. **Pages:** 61pp. **Date:** 1973

This report updates an earlier edition describing the social and environmental effects of off-road vehicles, particularly snowmobiles. A section on fish and wildlife effects reviews literature describing harassment of wildlife, legal responses to adverse impacts of off-road vehicles on wildlife. Policies for control of environmental impacts are suggested.*

Keywords

snowmobile
wildlife
management
recreation
human disturbance

Bansner, U.

Mountain goat-human interactions in the Sperry-Gunsight Pass area, Glacier National Park.

Source: Unpublished report University of Montana, Missoula **Pages:** 46pp **Date:** 1976

Mountain goat-human interactions in Glacier national Park were characterized as goat approaches to people and human approaches to goats. Attractants causing goats to approach people wer identified, and overt aggressive behavior of goats toward humans noted in less than 5% of goat approaches. Goats generally approach people remaining quiet, but are frightened by sudden movements of appearances of people. Management recommendations are presented*

Keywords

human disturbance
management
wildlife

Bart, J.

Impact of human visitations on avian nesting success.

Source: Living Bird (vol. 16) **Pages:** 186-192 **Date:** 1977

Analysis of data collected for the North American Nest Record Card Program, Cornell University Laboratory of Ornithology, revealed influences of human visitation on nest mortality rates of five species of birds. The data indicate a need to prevent predators from following human trails to bird nests.*

Keywords

human disturbance
recreation
wildlife

Bayfield, N.G.

Some effects of walking and skiing on vegetation at Cairngorm.

Source: Journal of Applied Ecology (vol.7) **Pages:** 469-485 **Date:** 1971

Keywords

hike
soil/vegetation
recreation

Bayfield, N.G.

Penetration of the Cairngorms Mountains, Scotland, by vehicle tracks and footpaths: Impacts and recovery

Source: In: R.C. Lucas (compiler), Proceedings of the National Wilderness **Pages:** 121-128 **Date:** 1985

Research Conference: Current Research. USDA Forest Service, Intermountain Research Station, General Technical Report INT-212, Ogden, Utah

Case study of impacts of vehicle tracks and footpaths near the Cairn Gorm ski area.

Keywords

hike
human disturbance

Bear, G.D., and G.W. Jones.

History and distribution of bighorn sheep in Colorado.

Source: Colorado Division of Wildlife, Denver **Pages:** 232pp **Date:** 1973

Available information on the history, distribution, population trends, and ecological factors for bighorn sheep herds in Colorado are summarized. human influences are discussed for each of the herds; while few quantitative data are available, observations suggest that in many cases activities such as camping, hiking, and driving off-road vehicles influence sheep distributions and activities.*

Keywords

OHV
human disturbance
hike
recreation
wildlife

Behrend, D.F., and R.A. Lubeck

Flight behavior of white-tailed deer in two Adirondack forests.

Source: Journal of Wildlife Management (vol. 32) **Pages:** 615-618 **Date:** 1968

Flight behavior in two populations of white-tailed deer was studied in New York. Observations along forest roads and around a lakeshore suggested that deer may be more sensitive to approach by vehicle than by canoe.*

Keywords

soil/vegetation
snowmobile

Belanger, L., and Bedard J.

Responses of staging greater snow geese to human disturbance.

Source: Journal of Wildlife Management (vol. 53(3)) **Pages:** 713-719 **Date:** 1989

We studied the effects of human disturbance on staging in greater snow geese during the spring and fall in the Montmagny bird sanctuary, Quebec, 1985-1987. We recorded 652 disturbances (any event causing all or a part of a goose flock to take flight) in 471 hours of observation. Rate of disturbance was higher in fall than in spring. The entire flock was disturbed in 20% of all cases. Mean time in flight was 56 and 76 seconds in fall and spring, respectively. Transport-related activities particularly low-flying aircraft, caused > 45% of all disturbances in spring and fall. In 40% of all cases geese stopped their feeding following a disturbance. Mean time to resume feeding was then 726 seconds in fall compared to 122 seconds in spring. The level of disturbance that prevailed on a given day in fall influenced goose use of the sanctuary on the following day. When disturbance exceeded 2.0/hour, it produced a 50% drop in the mean number of geese present in the sanctuary the next day. Low-level aircraft flights over goose sanctuaries should be strictly regulated.

Keywords

human disturbance
wildlife

Belanger, L., and J. Bedard

Energetic cost of man-induced disturbance to staging snow geese.

Source: Journal of Wildlife Management (vol. 54(1)) **Pages:** 36-41 **Date:** 1990

The energetic cost of man-induced disturbance to fall-staging greater snow geese was estimated in Quebec. Two responses of birds to disturbance were considered (1) birds fly away but promptly resume feeding following a disturbance (Response A) and (2) birds interrupt feeding altogether (Response B). Daylight foraging time decreased by 4 to 51% depending on disturbance levels. Average rate of disturbance in Response A resulted in 5.3% increase in hourly energy expenditure (HEE), combined with a 1.6% reduction of hourly metabolizable energy intake (HMEI). In Response B, HEE increased by 3.4%; HMEI decreased by 209 to 19.4%. Increased in night feeding could compensate for energy losses caused solely by disturbance flights (Response A), but a 32% increase in nighttime feeding was required to restore energy losses incurred in Response B. No increased in daily feeding rate was observed between days with different disturbance levels. We conclude that man-induced disturbance can have significant energetic consequences for fall-staging greater snow geese.

Keywords

human disturbance
wildlife

Bell, J.N.

Wild animals are wild.

Source: National Wildlife (vol. 1(5)) **Pages:** 34-36 **Date:** 1963

Problems of human-wildlife interactions in National parks are described in this popular article. Park visitors unaware of the potential hazards of confrontations with wildlife sometimes create dangerous situations by inappropriate behavior. Park visitors are entitled to wildlife viewing experiences, but must be educated about wildlife behavior and maintain respect for wild animals.*

Keywords

wildlife
human disturbance

Benninger-Traux, M., J.L. Vankat and R.L. Schaefer

Trail corridors as habitat and conduits for movement of plant species in Rocky Mountain National Park, Colorado, USA

Source: Landscape Ecology 6(4):269-278 **Pages:** 269-278 **Date:** 1992

Ground-layer vegetation was sampled along selected trail corridors to determine whether corridors provide habitat for certain species and act as conduits for species movement. Patterns of plant species composition were analyzed in relation to distance from trail edge, level of trail use, and distance from trailheads, junctions, and campgrounds. Species composition was significantly affected by distance from trail edge and level of trail use, as species were favored or inhibited by the corridor, depending upon their growth habits. Species composition was also affected by distance from trailheads. These findings, along with the presence of exotic species, indicate that trail corridors in Rocky Mountain National Park function as habitat and conduits for movement of plant species.

Keywords

soil/vegetation
recreation

Berry, K.H.

The effects of four-wheel vehicles on biological resources.

Source: in: R.N.L. Andrews and P.F. Nowak, eds. Off-road vehicle use: A **Pages:** 231-233 **Date:** 1980
mgt. challenge. Conf. Proc., U.S.D.A., Office of Environmental
Qlty., Wash. D.C.

Effects of four-wheel vehicles used off roads are summarized. Impacts on wildlife habitat through effects on soil and vegetation are discussed and management problems related to biological resource degradation by off-road vehicles are discussed. Unpublished data from recent Bureau of Land Management studies of impacts on specific species are presented.*

Keywords

OHV
recreation

Berry, Kristin H.

A review of the effects of off-road vehicles on birds and other vertebrates.

Source: Proc. Management of Western Forests and Grasslands for Nongame **Pages:** 451-467 **Date:** 1980
Birds. USDA Forest Service
General Technical Report INT-86.

A review of the literature on the effects of off-road vehicles on birds revealed that ORV use has significant negative impacts and can reduce numbers, diversity, and biomass of vertebrates. The degree of impact depends upon amount and intensity of ORV use, habitat type, and sensitivity of the species. The literature on effects of ORVs on soils and vegetation--major wildlife habitat components--and on related topics such as erodibility of soils, rates of erosion, and revegetation, is much more extensive. Information from such studies infer the kinds of impacts that can occur to birds and other vertebrates.

Keywords

soil/vegetation
human disturbance

Berwick, S.H.

Observations on the decline of the Rock Creek, Montana, population of bighorn sheep.

Source: M.S. Thesis. University of Montana, Missoula. **Pages:** 245pp. **Date:** 1968

Among factors that may be responsible for an observed decline in a Montana bighorn sheep population are human disturbance and harassment of sheep. Snowmobile use of an important segment of sheep winter range is increasing. It is suggested that harrasment may be debilitating to winter-stressed animals*

Keywords

soil/vegetation
recreation
snowmobile

Bird, D.M.

Birds of Prey: A plea for ethics.

Source: Ont. Nat. (vol. 17(5)) **Pages:** 16-23 **Date:** 1978

Problems facing birds of prey are described in this nontechnical article. Effects of man on raptors are discussed, including impacts of research, wildlife photography, and bird watching. Disturbances of birds by these activities can cause adults to abandon nests, and decrease survival of eggs and young through predation of exposure. Education of the public on the values of birds of prey is essential for their protection.

Keywords

human disturbance
recreation
wildlife

Blakesly, J.A. and K.P. Reese

Avian use of campground and non-campground sites in riparian zones.

Source: Journal of Wildlife Management. (vol. 52) **Pages:** 399-402 **Date:** 1988

Use of riparian habitat by 14 avian species during the breeding season on campground and non-campground sites were compared in northern Utah. A multivariate analysis showed that 7 avian species were closely associated with campgrounds, whereas 6 of 7 species associated with non-campgrounds were ground or shrub-nesting, or ground-foraging. These avian responses may be explained by differences in shrub and sapling density, litter depth, and the amount of dead woody vegetation occurring between the 2 habitats.

Keywords

wildlife
soil/vegetation
management
recreation

This study does not provide useful information on the presence of humans in campgrounds and their effect on avian use.

Bollinger, J.

Effect of snowmobile noise and deer and rabbits in their natural habitat.

Source: n: D.F. Holececk, ed. Proc. of the 1973 snowmobile and Off the **Pages:** 6pp **Date:** 1974

Road Vehicle Research Symposium. Michigan State U. East Lansing Dept. Park Recr. Resour. Tech Report 9.

The behavioral patterns of deer and rabbits before, during, and after extensive snowmobile activities was studied. The data gathered was used to assess the noise levels associated with various behavior patterns, and to assess the noise levels generated by different snowmobile uses on various types of terrain. Additional objectives were to determine the effects snowmobile noise and activity had on the home range of the deer and rabbits and their seasonal movements. To determine the reactions these animals had to men in the area not using snowmobiles but equipped with skis and snowshoes. To determine if there was a difference in predator behavior in areas where snowmobiles were used vs. those where no vehicles were operated. The research team was unable to detect an severe or negative animal reactions to the noise generated by the vehicles. Conclusions of the study indicates that the deer and rabbits were not forced to move out of their normal home ranges, nor did they seek shelter or remain stationary with fright while snowmobiles were being operated. The only negative effect determined was that the animals did increase their movement during extensive vehicle use periods. Researchers were unable to determine whether it was the noise , physical presence or both that caused the disturbance.

Keywords

human disturbance
snowmobile
wildlife

Bollinger, J.

Effects of Snowmobile Traffic on Non-Forest Vegetation and Grasses.

Source: n: D.F. Holecek, ed. Proc. of the 1973 snowmobile and Off the Road Vehicle Research Symposium. Michigan State U. East Lansing Dept. Park Recr. Resour. Tech Report 9. **Pages:** 82-85 **Date:** 1974

Keywords

snowmobile
soil/vegetation

The main objective of this study was to determine the effect of varying degrees of snowmobile traffic on non-forest vegetation and grasses found in open field areas and farms throughout the snowbelt states. The results revealed that where snow covered exceeded 3 inches in depth there were no detrimental effects on grass or vegetation stands, their vigor, or yield; High grade grasses recover naturally from heavy snowmobile traffic; Snow mobile traffic caused no stand reductions, but did cause a slower recovery in early spring.

Bollinger, John G. et al.

Snowmobile noise effects on wildlife: Report 1972-73.

Source: Submitted to the International Snowmobile Industry Association. **Pages:** 85pp. **Date:** 1973
University of Wisconsin Engineering Expt. Station.

Keywords

snowmobile
wildlife

Boucher, D.H., J. Aviles, and R. Chepote.

Recovery of trail side vegetation from trampling in a tropical rain forest.

Source: Environmental Management (vol.15) **Pages:** 257-262 **Date:** 1991

Three trails with varying periods of use and recovery were studied in a tropical rainforest in Costa Rica. The impact of trampling was evident in the comparisons of the trails to the forest control trail, as well as in the rapid increase in diversity and cover with distance from the trail center. The lack of differences between the trail used for 32 months and that used for 51 months, suggests that curvilinearity characterizes responses to trampling over time and space.

Keywords

soil/vegetation
recreation

Boyle, S.A., and F.B. Samson

Non-consumptive outdoor recreation: An annotated bibliography.

Source: USDI USFWS Special Scientific Report Wildlife 252. **Pages:** 117 **Date:** 1983

This bibliography reviews interactions between wildlife and humans participating in non-consumptive outdoor recreation activities. The 536 citations consist of books and articles which are primarily concerned with terrestrial vertebrates of North America. Included with each citation are an annotation summarizing relevant information and descriptors consisting of species names and subject keywords. Also provided are indexes to authors, species, key-words, and geographic regions; an annotated list of keywords; and a list of bibliographies on related topics.

Keywords

bike
hike
human disturbance
OHV
snowmobile
soil/vegetation
management
recreation
recreational pack-stock
wildlife
hike

Boyle, S.A. and F.B. Samson

Effects of non-consumptive recreation on wildlife: A review.

Source: Wildlife Society Bulletin (vol. 13 (2)) **Pages:** 110-116 **Date:** 1985

A literature review was conducted. 536 references (restricted to those concerning terrestrial vertebrates of North America) were identified concerning effects of non-consumptive recreation on wildlife.

Keywords

OHV
bike
snowmobile
hike
wildlife
soil/vegetation
management
recreation
human disturbance

Literature indicated that non-consumptive outdoor recreationists are creating increasing impacts on wildlife and wildlife habitat. Recreationists can affect wildlife through habitat alteration, disturbance, or direct mortality. Mechanized forms of recreation present the most serious potential impacts, but even the most casual intrusion by a person on foot may significantly affect vulnerable populations, and species vary in their sensitivity to disturbance.

Researchers have begun to identify some mechanisms of human-wildlife interactions. Wildlife conservationists are challenged to identify recreational impacts on wildlife, establish priorities for management, and implement schemes to conserve wildlife resources while providing for the increasing use-demands of recreationists.

Brander, R.B.

Ecological impacts of off-road recreation vehicles.

Source: in: Outdoor recreation research: applying the results. **Pages:** 29-35 **Date:** 1974

This paper focuses on the environmental impacts of snowmobiles. It is not a scientific study, instead the author infers some effects from existing literature on the structure and mechanics of snow and the significance of snow to small mammals and their predators.

Keywords

OHV
snowmobile
management
recreation

The insulation that snow provides is very important to small mammals which spend most of the winter at the ground and snow interface. Mechanical compaction reduces snow depth, increases thermal conductivity and snow densities by destroying air spaces. This can result in loss of habitat and in some cases mortality in some small mammal populations. The decrease in small populations of small mammals can in turn negatively affect their predators, and on up the food chain.

More scientific information is needed. Because snowmobiles accelerate the rate of environmental degradation compared to hikers, existing information should be used in making management decisions. One suggestion is to restrict traffic to a few trails and roads rather than allowing free access to fields, etc.

Bratton, S.P., M.G. Hickler and J.H. Graves

Trail erosion Patterns in Great Smoky Mountains National Park

Source: Environmental Management 3(5):431-445 **Pages:** 431-445 **Date:** 1979

All the maintained trails in Great Smoky Mountains National Park were surveyed for width, depth, and a variety of types of erosion. Trail erosion is related to a number of environmental variables including vegetation type, elevation, trail slope, and section of the park. Open grass balds and spruce-fir forest are the most erosion-sensitive plant communities, and the xeric oak and pine types are the least sensitive. Trails in virgin or mature forest tend to be in poorer condition than those in successional areas. The most important physical factor is the slope of the trail.

Keywords

soil/vegetation
human disturbance

A comparison of visitation patterns with trail condition indicates that redistribution of use would help to mitigate some erosion problems. Because trail condition is correlated to physical environmental factors, however, some sites will require intensive maintenance, even if visitation is low.

Brattstrom, Bayard H. and Micheal C. Bondello

Effects of off-road vehicle noise on desert vertebrates.

Source: In: Webb, R.H. and H.G. Wilshire, Environmental effects of off-road **Pages:** **Date:** 1983

This report contains experimental data from three separate laboratory studies conducted to determine the impact of ORV sounds on desert vertebrates. Three classes of terrestrial desert vertebrates; amphibians, reptiles, and mammals were investigated with respect to sound impacts. Couch's spade foot Toads, Mojave Fringe-Toed Lizards, and Desert Kangaroo Rats all suffered deleterious effects from moderate exposures to ORV sounds. These effects included both physiological and behavioral hearing loss, and misinterpretation of important environmental acoustical signals. Potential impacts of ORV sounds on the well-being of natural populations of desert vertebrates are indicated and the implications of these findings to the BLM are discussed. Recommendations which seek to reduce detrimental impacts of ORV's on habitats and wildlife of the California desert are suggested.

Keywords

OHV
wildlife

Bright, Julie A.

Hiker Impact on Herbaceous Vegetation along Trails in an Evergreen Woodland of Texas.

Source: Biological Conservation (vol. 36) **Pages:** 53-69 **Date:** 1986

Three trails in an evergreen woodland were chosen to study the effects of human trampling on non-woody vegetation, leaf litter, trail width, and herbaceous species diversity. Leaf litter significantly increased with distance from entry points and was greater in off-trail control plots than trail plots. Plant cover showed the reverse trend being greater in trail plots than controls. Leaf litter and plant cover were also significantly correlated with canopy, indicating environmental influence. However, *Carex planostachys Kunze*, the most successful plant on the trails, was equally prevalent in trail and control plots, demonstrating tolerance to both trampling and shade. Herbaceous species diversity was greater in trail plots and beginning stations than in control plots and trail end stations. Weedy annuals contributed the most to diversity in autumn whereas native perennials were most important in the spring. Trampling and trail side vegetation each influenced trail width more than slope or soil type. Trails were wide near entry points except where dense vegetation confined hikers to a narrow path. In general, the nature of trail-border vegetation was influential in controlling leaf litter, light, and hiker traffic patterns.

Keywords

soil/vegetation
hike

Brittingham, M.C., and S.A. Temple

Have cowbirds caused forest songbirds to decline?

Source: BioScience (vol.33(1)) **Pages:** 31-35 **Date:** 1983,

Brown-headed cowbird populations and their rate of brood parasitism in eastern North America have increased since 1900. Brood parasitism of forest songbirds is highest near open habitat. High brood parasitism rates within isolated fragments of forest habitats reduce reproductive success of certain forest song birds and may be responsible for their recent decline.

Keywords

wildlife

Buehler, D.A., T.J. Mersmann, J.D. Fraser, and J.K. Seegar

Effects of human activity on bald eagle distribution on the northern Chesapeake Bay.

Source: Journal of Wildlife Management (vol.55(2)) **Pages:** 282-290 **Date:** 1991

The relationship between bald eagle distribution and human activity on the northern Chesapeake Bay shoreline during 1985-89 was determined. Only 55 of 11,117 locations of radio-tagged eagles (4.9%) occurred in the developed land-cover type, although 18.2% of potential eagle habitat was developed. Eagle use of the shoreline was inversely related to building density and directly related to the development set-back distance. Few eagles used shoreline segments with boats or pedestrians nearby. Only 360 of 2,532 segments had neither human activity nor shoreline development. Eagle flush distances because of approaching boats were greater in the winter than in summer but were similar for adult and immature eagles. Of 2,472 km of shoreline on the northern Chesapeake, 894 km appears to be too developed to be suitable for eagle use, and an additional 996 km has buildings within 500 m, thereby reducing eagle use. The projected increase in developed land in Maryland and Virginia from 1978 to 2020 is likely to determine the future of the bald eagle population on the northern Chesapeake Bay.

Keywords

human disturbance

wildlife

Bury, R.B.

What we know and do not know about off-road vehicle impacts on wildlife.

Source: in: R.N.L. Andrews and P.F. Nowak eds. Off-road vehicle use: A mgt. challenge. Conf. Proc., U.S.D.A., Off. of Environmental Qlty., Wash. D.C. **Pages:** 110-112 **Date:** 1980

Research concerning off-road vehicles is reviewed to illustrate the level of impact on wildlife in different habitats and to provide guidance for more effective protection of wildlife in areas used for OHV activities. Effects on wildlife include direct mortality, damage to vegetation, disruption to soil, and noise harrassment. Research and management recommendations are suggested.

Keywords

OHV

soil/vegetation

management

wildlife

Bury, R.B., R.A. Luckenbach, and S.O. Busack.

Effects of off-road vehicles on vertebrates in the California Desert.

Source: Washington, D.C. U.S. Fish and Wildlife Service, Wildlife Research Report. (vol. 8) **Pages:** 1-23 **Date:** 1977

The purpose of this study was to examine the impact of ORV's on creosote shrub habitat and associated wildlife in the western California Desert. Comparisons at eight paired sites demonstrated that ORV-use areas have significantly fewer species of vertebrates, greatly reduced abundance of individuals, and noticeably lower reptile and small mammal biomass. Diversity, density, and biomass of reptiles and small mammals are inversely related to the level of ORV usage. The number of individuals found in heavily used and pit areas was 55% and 20%, respectively, of that present in undisturbed sites. Biomass estimates were even lower. Censuses at three localities also showed decreased diversity, density, and biomass estimates of breeding birds in ORV-used areas. Present evidence indicates that off-road vehicles have a negative impact on desert wildlife over large areas. This widespread impact must be recognized to manage and conserve resources in ORV-use areas.

Keywords

OHV
wildlife
management
recreation
human disturbance

Bury, R.L.

Research on off-road vehicles: A summary of selected reports and a comprehensive bibliography.

Source: Proceedings of the So. States Recreation Research Applications Workshop, 15-18 Sept. 1975, Asheville N.C. U.S. For. serv. Gen. Tech. Rep. SE-9. **Pages:** 234-272 **Date:** 1976

This report summarizes major published research findings concerning recreational use of off-road vehicles, including impacts on wildlife. An indexed bibliography is also included.*

Keywords

OHV
wildlife

Bury, R.L.

Off-road recreation vehicles: A research summary, 1966-1975.

Source: Texas Agric. Exp. Sta., College Sta. MP-1277. **Pages:** 84pp. **Date:** 1976.

A comprehensive review of research concerning off-road vehicles is presented. Sections cover administration and regulation, economics, safety, technology, and environmental effects including impacts on animals. An indexed bibliography includes 128 references.*

Keywords

OHV
management
wildlife

Bury, R.L.

Impacts of snowmobiles on wildlife.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol. 43) **Pages:** 149-156 **Date:** 1978

The major effects of snowmobiles on wildlife appear to be in changes of the animals daily routine, rather than direct mortality. This seems to be the case with regard to elk, rabbits, and small subnivean animals. Other animals such as deer seem to be more tolerant of snowmobiles. In general, snowmobiles created little effect on large animals, moderate effects were observed on medium-sized animals and small animals over wintering in subsnow environments were drastically effected.

Keywords

snowmobile
wildlife
management
recreation
human disturbance

Busack, S.D., and R.B. Bury

Some effects of off-road vehicles and sheep grazing on lizard populations in the Mojave Desert.

Source: Biological Conservation (vol. 6(3)) **Pages:** 179-183 **Date:** 1974

Data from this study suggest that both grazing and ORV use have a negative effect on some lizards, probably due to loss of cover, reduction in invertebrate food sources, disturbance of social structure, and casualties. Prolonged subjection of desert lands to intensive grazing and vehicular damage may lead to long-term damage to wildlife communities.

Keywords

OHV
wildlife
soil/vegetation
recreation

Byrne, Sheila

The Effect of Off Road Vehicle Use in the Mojave Desert on Small Mammal Populations.

Source: Preliminary Studies on the Effects of Off-Road Vehicles on the **Pages:** 58-73 **Date:** 1973

Northwestern Mojave Desert: A collection of Papers. Ed. Kristin H. Berry. Ridgecrest, California.

To determine the effect of ORV use in the Mojave desert on populations of small mammals the density and diversity of the populations on several sites with varying degrees of damage were estimated by live trapping. It was found that density and diversity were significantly lower in disturbed areas and that heteromyid rodents disappeared from these areas. Although deer mice (*Peromyscus maniculatus*) survived in disturbed areas, there was some indication that populations were not as viable.

Keywords

hike
human disturbance

Carter, A.R.

Relative impact of off-road bicycle and hiker traffic on soils: an experimental study.

Source: University of Boulder, Colorado. Research paper. **Pages:** 116pp. **Date:** 1994

Keywords

bike
hike
soil/vegetation

Carter, L.J.

Off-road vehicles: A Compromise plan for the California desert.

Source: Science (vol. 183) **Pages:** 396-398 **Date:** 1974

Off-road vehicle activities in the California desert are described, and potential and actual impacts on wildlife and other resources discussed. Management alternatives are considered in relation to minimizing impacts in desert resources.*

Keywords

OHV
management
wildlife

Cassirer, E.F., D.J. Freddy, and E.D. Ables

Elk responses to disturbance by cross country skiers in Yellowstone National Park.

Source: Wildlife Society Bulletin (vol. 20) **Pages:** 375-381 **Date:** 1992

Radio marked elk were intentionally disturbed by groups of people walking or skiing directly into their location. Disturbance resulted in displacement of elk and increased energy expenditure.

Upon disturbance, distances moved were 1,675 m, and were related to distance to topographic barriers. The elk seemed to use ridges as primary cover and stands of trees secondarily, after they had gone over a ridge. Elk in this study had a low tolerance for disturbance by people on foot or skis. Disturbance caused temporary displacement of the elk. Elk generally returned after people left the area, however, it is believed that this tendency may decline with repeated disturbances. The energy expended moving away from skiers represented approximately 5.5% of an estimated average daily expenditure of 6,035 kcal. for elk in winter and is more than the normal estimated daily energy expenditure for movement.

Researchers believe that restricting cross-country skiers to locations >650m from elk wintering areas would probably minimize displacement of most nonhabituated elk. Skiers would likely have to remain at distances of >1,700m to completely avoid disturbing elk.

The amount of winter range used by skiers and the number of days involved seemed to have more of an effect on elk than skier numbers. Therefore, when skier activity is located on elk wintering range it was recommended that concentrating use in sites with abundant topographic relief, and providing security areas in drainages adjacent to those where skiing occurs might minimize the added energy costs and displacement of elk.

Chapman, Diane

Impact of Alpine Ski Trail Corridors on a Beech-Maple Forest Community, Mon-Ste-Marie, Quebec: Spatial Variation of Edge Effects.

Source: Masters Thesis: University of Ottawa, Canada **Pages:** - **Date:** 1988

The impact effects of alpine ski trail corridors on the adjacent beech-maple forest community at Monte-Ste-Marie, Quebec, fourteen years after trail clearance were investigated. Specific objectives were to measure the spatial variation of structural and species compositional changes to the adjacent vegetation, and to consider implications of impact effects on future forest development. Findings indicate an overall impact distance of 10-15 meters; increases in species diversity in the ground, shrub, and lowest tree layers; community retrogression characterized by changes in species composition; a reduction in the average size of the dominant specie as a result of increases in density and cover in the ground, shrub, and lowest tree layers; the development of two distinct buffer zones as a consequence of these increases in density and cover; increases in the variability of density, cover, and species richness in the ground, shrub, and lowest tree layers; and structural adaptation in all layers.

Keywords

wildlife
management
recreation
human disturbance

Keywords

soil/vegetation

Chavez, Deborah J.

Mountain Biking: Issues and Actions for USDA Forest Service Managers.

Source: USDA Forest Service Research paper PSW-RP-226. Pacific **Pages:** p.6 **Date:** 1996
Southwest Research Station.

Forest Managers were asked if they had seen any evidence of resource damage from mountain bike use. Fifty-eight percent of the forests reported seeing evidence of resource damage from mountain bike use. Only 2 percent reported that they could not tell whether resource degradation was attributable to hikers, horses, livestock, motorcycles, all-terrain vehicles, 4 Wheel drive vehicles, or mountain bike use. The most common types of resource degradation included trail impacts, soil impacts, and water related impacts.

Keywords

bike
management

Chester, J.M.

Human-wildlife interactions in the Gallatin Range, Yellowstone National Park.

Source: M.S. Thesis. Montana State University, Bozeman. **Pages:** 114pp. **Date:** 1976

The relationships between the intensity and kinds of human use and the distribution, movements, and behavior of seven species of wildlife in the backcountry areas of the Gallatin Range in Yellowstone National Park were investigated in 1973 and 1974.

Except for minor shifts in elk distribution around campsites, variation in the intensity of human use did not appear to be responsible for shifts in wildlife distribution.

Wildlife encounters most commonly occurred at distances between 100 and 300 feet. Encounter distances were shortest for mule deer and moose and greatest for bears. Except for deer and coyotes, which were usually alert or running, all species were most commonly feeding when first observed. In response to knowledge of human presence, the moose was most likely to stand its ground, while bears were the least likely. Wildlife belligerency toward humans was rare. When it did occur, bear and moose were usually involved. Groups of four or more persons experienced lower observation frequencies than smaller groups. Parties of two or less were most likely to encounter grizzly bears. The use of noise did not appear to affect the frequency of wildlife observations or encounters.

Keywords

hike
human disturbance
wildlife

Chilman, K.C., J.J. Vogel, and J.L. Conley

Turkey Bay: Off-Road Vehicle Area at land Between the Lakes. Monitoring Use and Impacts Since 1973.

Source: Motorcycle Industry Council; Land Between the Lakes Association; **Pages:** 36 **Date:** 1991
Land Between the Lakes, Tennessee Valley Authority; Dept. of Forestry, Southern Illinois University.

This report describes how the ORV area and monitoring systems have evolved during 17 years. The measurements in 1973-77, and 1989-90 are documented. Changes in area conditions have been less drastic than many people had envisioned. Satisfaction with area conditions and management is high. Advantages and costs of recreation monitoring are discussed.

Keywords

soil/vegetation
human disturbance

**City of Pheonix. Parks, Recreation, and Library Department
Camelback Mountain Cholla Trailhead Trail Use Impact Analysis.**

Source: Prepared for: Cholla Trail Ad Hoc Committee. **Pages:** 7pp **Date:** 1995

This is a subjective evaluation based on the review of historic and current aerial photographs and existing knowledge of the area. The consultants looked at the impact of the trails condition and use on adjacent vegetations density and diversity. No perceptible change in vegetation density outside of the trail corridors was found. In areas where the trail corridors were obvious, social trails have decreased and vegetation has reclaimed old trails. In areas where the trail is less obvious, social trails have increased along with erosion and vegetation decline within the trail corridor. Overall the drainage areas appear to remain in natural in their natural structure. Some encroachment of exotics, and trail widening was identified.

Keywords

hike
soil/vegetation
recreation
wildlife

With proper trail construction, regular maintenance, and management control of the day use, staff are confident that the summit trails can handle the existing and reasonable growth in the volume of foot traffic with out degradation of the mountain's existing natural resources.

Cole, D.N.

Vegetational changes associated with recreational use and fire suppression in the Eagle Cap Wilderness, Oregon: Some Management Implications.

Source: Biological Conservation (vol.20) **Pages:** 247-270 **Date:** 1981

This paper provides an overview of human impacts on wilderness vegetation resulting from the construction and use of trails and campsites, grazing by pack stock, and fire suppression. This summary will focus mainly on the effects of trails and campsites.

Keywords

bike
soil/vegetation
management
human disturbance
recreation

Trail construction and use affects vegetation in four major ways: (1) improved access increases trampling and grazing of the vegetation; (2) increased trampling and grazing alters soil conditions; (3) site manipulation associated with trail construction removes vegetation and changes microclimatic and soil conditions; and (4) new vectors of plant dispersal are introduced, causing an increase in exotic species along the trail.

Researchers found that recreational use causes immediate loss of cover and dramatic shifts in vegetational composition in localized areas. It also causes irreversible damages such as soil erosion, which is accelerated by the increased soil compaction and decreased vegetative cover of trampled sites. Cover losses and changes in the vegetation composition resulting from recreational use are more pronounced on campsites than along trails or in heavily grazed meadows. Campsites also suffer from the effects of campfires, the depletion of wood supplies, the destruction to standing trees, and the compacted soil leading to soil erosion. Campsite recovery is extremely slow. In contrast, abandoned trails and meadows which are no longer grazed recover more rapidly.

Cole, D.N.

Recreational trampling effects on six habitat types in western Montana.

Source: Research paper INT-350. Ogden, UT: U.S. Dept. Ag., Forest Services, Intermountain Research Station. **Pages:** **Date:** 1985

This study examined the response of six vegetation types in western Montana to experimental trampling. The types selected were representative of those most frequently used recreationally in the neighboring Bob Marshall Wilderness.

Keywords

hike
soil/vegetation
management
recreation
human disturbance

All of the forested habitat types showed a curvilinear relationship between amount of trampling and loss of vegetation cover, loss of plant species, and soil compaction. The effect of any incremental increase in the amount of trampling decreases as trampling intensity increases. This indicates that trampling damage will generally be minimized when concentrated in space rather than dispersed over large areas.

In contrast to vegetation loss and soil compaction, trampling intensities had to be very high before much bare mineral soil was exposed. If the use is heavy enough to kill most vegetation, the use should be directed to sites with thick organic horizons.

Managers of wildernesses and recreation areas with similar vegetation can utilize these data to estimate the effects of various use levels. The resistance of the major plant species is also assessed. This information can be used to evaluate the relative durability of alternate recreation sites.

Cole, D.N.

Trampling effects on mountain vegetation in Washington, Colorado, New Hampshire, and North Carolina.

Source: Research Paper. INT-464. Ogden, UT: U.S.D.A., Forest Service, Intermountain Research Station. **Pages:** 37pp. **Date:** 1993a.

This study examined the response of vegetation to experimental trampling that simulated the effects of hiking. A total of 16 different vegetation types were studied in mountainous regions of Washington, Colorado, New Hampshire, and North Carolina. Changes in vegetation, cover, vegetation height, species richness, and species composition were evaluated.

Keywords

hike
soil/vegetation
management
recreation
human disturbance

Cole, D.N.

Changes on Trails in the Selway-Bitterroot Wilderness, Montana.

Source: U.S. Forest Service, Research Paper INT-450 **Pages:** 5pp. **Date:** 1991

“Three trails on the Selway-Bitterroot Wilderness were monitored over an 11 year period. Although individual trail segments changed over this period, there was no net erosion from these trail systems.”

Keywords

hike
soil/vegetation
human disturbance

Cole, D.N.

Minimizing conflict between recreation and nature conservation.

Source: in: D.S. Smith and P.C. Hellmund eds. Ecology of Greenways. **Pages:** 105-122 **Date:** 1993.
Univ. Minn. Press. St. Paul, MN. USA.

Various ways of reducing the conflict between recreation and nature are explored beginning with an overview of the impacts of recreation on natural environments, and the factors that influence the severity of these impacts. These factors suggest a number of alternative design and management strategies have been adapted to a specific situation. Trampling by humans causes most of the impact that recreation has on soils and vegetation. Recreation affects animals in four ways, habitat modification, harvest, pollution, and direct disturbance. The amount of impact is a function of both use and environmental characteristics, and the design of the site and the intensity of management. Practical guidelines for design and management of greenways are proposed.

Keywords

human disturbance
management
soil/vegetation
recreation
wildlife

Cole, D.N.

The wilderness threats matrix: A framework for assessing impacts.

Source: U.S. Dept. of Agriculture, Forest Service Intermountain Research **Pages:** 1-14 **Date:** 1994
Station, Ogden, Utah. Research Paper INT-475

This report proposes a comprehensive framework for assessing threats to wilderness. The most significant threats to wilderness are recreational use and its management, livestock grazing and management, mining, fire, introduction of exotic species, pollution, and practices on adjacent lands. The threats matrix can help planners and managers describe current management situations, develop assumptions about the future, and assess impacts of alternative management actions.

Keywords

soil/vegetation
management
recreation
wildlife

Cole, D.N.

Backcountry Impact Management: Lessons From Research

Source: Trends: (vol.31(3)) **Pages:** 10-14 **Date:** 1994

This article explores conclusions drawn from research regarding the impacts of recreation on the environment, and what those conclusions imply about the appropriateness of various potential management strategies. Based on this research, the management strategies with the most promise include, (1) controlling type of use, (2) encouraging low impact behaviors, (3) avoiding use during seasons when soil and vegetation are particularly vulnerable to disturbance, (4) encouraging use of durable sites, (5) confining use in popular places, and (6) perhaps, dispersing use widely in lightly used places.

Keywords

soil/vegetation
recreation

Cole, D.N.

Resource Impacts Caused by Recreation.

Source: Presidents Commission on Americans Outdoors. **Pages:** 1-11 **Date:** —

This literature review outlines the important issues and problems regarding recreational impacts on the environment and summarizes the major findings from existing studies. Knowledge gaps are presented. Of the four resources impacted by recreation, vegetation and soil have been studied much more frequently than wildlife, water, or air.

Keywords

soil/vegetation
recreation
wildlife

Cole, D.N., and N.G. Bayfield

Recreational trampling of vegetation: standard experimental procedures.

Source: Biological Conservation (vol. 63) **Pages:** 209-215 **Date:** 1991

Cole and Bayfield present a standard protocol for controlled trampling experiments. The procedure provides information on both damage to vegetation in response to short duration trampling and subsequent recovery over a one-year period. Changes in vegetation cover, vegetation height, bare ground cover, and the cover of individual species can be assessed. It is designed to be efficient both in area and time requirements. It can be applied in a wide variety of vegetation types.

Keywords
soil/vegetation
recreation
management

Cole, D.N., and R.L. Knight

Impacts of recreation on biodiversity in wilderness.

Source: in: Proceedings of a symposium on wilderness areas: Their impact. **Pages:** 33-40 **Date:** 1990
Utah State University, Logan

This article discusses seven recreational impacts on biodiversity in wilderness areas. These include: 1) construction of trails, 2) trampling of vegetation and soils on trails and campsites, 3) collection and burning of wood in campfires, 4) water pollution associated with camping activities, 5) harassment of animals, 6) hunting, fishing, and associated management programs, and 7) grazing by recreational pack stock. In this summary I will focus mainly on the impact of trails and trail related activities.

Keywords
hike
human disturbance
soil/vegetation
management
wildlife

Trail construction can alter the local microclimate and topography dramatically. Moisture conditions are changed, where drainage systems are interrupted and by the removal of trees and brush. This also increases direct precipitation and light intensities and decreases evapotranspiration rates.

Trails may also impact species composition and interactions by creating edge. This may cause an increase of edge-species. Edge-species may result in the decline of habitat-interior species through predation, competition, or parasitism. Trails also result in the trampling of vegetation. The result is loss of vegetation, change in understory species composition, and the compaction of mineral soils. Most of this impact is localized, being confined to the immediate vicinity of trails. The use of trails often results in the unintentional harassment of animals causing displacement of the animal or habituation to humans.

Grazing by recreational pack stock can reduce vegetative cover and change species composition.

Cole, D.N., and R.L. Knight

Wildlife preservation and recreational use: conflicting goal of wildlife management.

Source: Transactions of North American Wildlife and Natural Resources Conference (vol. 56) **Pages:** 233-237 **Date:** 1991

The need for more research on recreational impacts on wildlife is addressed: In order to more effectively minimize conflict between recreation use and wildlife preservation goals, we need to: 1) understand the responses of wildlife to recreational activities; 2) understand the factors that influence the nature and magnitude of impacts; 3) improve research methods; and 4) develop and implement new management strategies.

Keywords
management
human disturbance
recreation
wildlife

Cole, D.N., and S.J. Trull

Quantifying vegetational Response to Recreational Disturbance in the Northern Cascades, Washington.

Source: Northwest Science (Vol.66(4)) **Pages:** 229-236 **Date:** 1992

Vegetational response to various levels of controlled recreational trampling is described and the variation in response between vegetational types and species is explored. Four vegetation types were trampled at intensities that ranged from 25 to 700 times. Responses shortly after trampling and after one year of recovery were documented. Vegetational response varied significantly both with trampling intensity and between vegetation types. A sedge meadow dominated by black alpine sedge was about 25 times more resistant to trampling damage than a subalpine for meadow, in which *Sitka valerian* was the most abundant species. Recovery during the year that followed trampling was greatest in the forb meadow; it was lowest in the two vegetation types dominated by woody species - heather and boxwood. The resistance and resilience of individual species was also assessed. Species resistance appears to be determined by the location and toughness of perennating tissues and by the growth rate of regenerating tissues. These results have immediate application to recreation managers and also increase our basic understanding of disturbance ecology.

Keywords

soil/vegetation
management

Cole, D.N., M.E. Petersen, and R.C. Lucas

Managing wilderness recreation use: common problems and potential solutions.

Source: U.S. Dept. of Ag., Forest Service Intermountain Research Station, **Pages:** 60pp **Date:** 1987
Ogden, Utah. Gen. Tech. Report INT-230.

This report summarizes information on alternative management tactics available for dealing with common wilderness recreation problems. Section one describes eight strategies for attacking problems: reduce use of the entire wilderness, reduce use of problem areas, modify the location of use within problem areas, modify the timing of use, modify type of use and visitor behavior, modify visitor expectations, increase the resistance of the resource, and maintain or rehabilitate the resource.

Keywords

soil/vegetation
management
recreation
wildlife

Section two describes the nature of general problems resulting from recreational use of wilderness. In order of frequency, the most common problems are trail deterioration, campsite deterioration, litter, crowding, packstock impact, human waste disposal, impacts on wildlife, user conflicts, and water pollution. For each of these problems, strategies and tactics to alleviate the problems are listed.

Coleman, Rosalind

Footpath erosion in the English Lake District

Source: Applied Geography 1:121-131 **Pages:** 121-131 **Date:** 1981

Footpath erosion is a matter of concern in the English Lake District, where recreational pressure on the fells is increasing. Erosion may be expected to result from the interaction of recreational geomorphological and climatic forces with the inherent resistance of vegetation and soil conditions. A broad-scale survey of 485 sites on 25 paths in the Lake District demonstrated the importance of specific variables for footpath erosion. Erosion (measured as path width, extent of bare ground or maximum depth) is found to increase with the square root of the slope angle and the square of the recreation pressure. These two variables also interact with each other, while other factors, such as vegetation type, soil type and topographic position, also influence rate of erosion. A threshold slope angle of 15-17 degrees seems to separate actively eroding from stable slopes.

Keywords

soil/vegetation

Cooke, A.S.

Observations on how close certain passerine species will tolerate an approaching human in rural and suburban areas.

Source: Biological Conservation (vol.18) **Pages:** 85-88 **Date:** 1980

Information was obtained on how close passerines tolerate an approaching human before flying away. Species tended to be significantly more approachable in suburban areas than in rural areas. There was also a significant association between degree of tolerance and size. Smaller birds allowed a closer approach than larger species.

Keywords

human disturbance
wildlife

Corbet, P.S.

Snowmobiles: For pleasure, profit, and pollution.

Source: Ont. nat. (vol.8(2)) **Pages:** 10-12 **Date:** 1970

Impacts of snowmobiles on urban and rural environment, including effects on wildlife, are discussed in this nontechnical article. Snowmobiles compact snow, changing the physical and thermal properties and this potentially affecting animals that live beneath the snow in winter. Deliberate harassment of wildlife by snowmobilers is uncommon but may be significant. Effective legislation and enforcement are needed to control the impacts of snowmobiles on the environment.*

Keywords

snowmobile
wildlife

Cotrell, Chuck

Roads and Habitat Fragmentation

Source: The Road-RIPorter Jan/Feb 1997 **Pages:** 12-13 **Date:** 1997

Habitat fragmentation not only results in decreased habitat area and increased patchiness of the habitat, but also causes microclimatic changes along the patch perimeter that alters the vegetation structure of remnant forest. Reported depths of climatic and vegetational change in ecosystems of the eastern United States (40-60m) correspond to areas of observed behavioral modification in various vertebrate species (50m).

Keywords

OHV
soil/vegetation
management
recreation
wildlife
human disturbance

The study in Medicine Bow-Routt National Forest demonstrates the pervasive influence roads can have at landscape level. Other issues regarding roads include poaching, soil erosion, noxious weeds, and pollutions.

Cowan, I.M.

Management implications of behavior in the large herbivorous mammals.

Source: in: V. Geist and F. Walther, eds. The behavior of ungulates and its relation to management. Vol. 2. IUCN Publ. New Ser. 24, Morges, Switzerland.

Several topics concerning ungulate behavior and management are reviewed, including behavioral constraints on nonconsumptive use. Protection of breeding grounds, reducing disturbance to newborn young, and minimizing harassment from tourists and vehicles are suggested.*

Keywords

human disturbance
snowmobile
wildlife

Dale, D., and T. Weaver

Trampling effects on vegetation of the trail corridors of north Rocky Mountain Forests.

Source: Journal of Applied Ecology (vol.11) **Pages:** 767-772 **Date:** 1974

Trail studies made in forests of central Montana and adjacent Wyoming show that (1) trail widths increase slowly with increasing traffic, (2) trails used by horses are deeper but not wider than those used by hikers alone, (3) a relatively narrow (1-2m) band of vegetation at the trail side is affected, and (4) some plants disappear at trail sides, some are largely unaffected, and others invade those sites.

Keywords

soil/vegetation
wildlife

Davidson E., and M. Fox

Effects of off-road motorcycle activity on Mojave Desert vegetation and soil.

Source: Madrano (vol.22) **Pages:** 381-390 **Date:** 1974

Studied the effects of off-road motorcycle activity on vegetation and soil in the Mojave Desert. In this article, motorcycle disturbance is interpreted as the effects of both motorcycle racing trails and pit areas, where off-road vehicles park during the races. Data show an overall trend toward fewer plants and less cover per individual shrub in the disturbed areas than in the undisturbed areas. The most common herbaceous species on the study sites is an introduced species. The density of this species is higher in the disturbed areas than in the undisturbed area.

Keywords

OHV
soil/vegetation
human disturbance
recreation

OHV use resulted in the compaction of soil on the study plots. This causes an increase in run-off and a decrease in the amount of water being filtered into the soil and available for plant growth.

Deforge, J.R.

Stress: Is it limiting bighorn?

Source: Trans. Desert Bighorn Council (20) **Pages:** 30-31 **Date:** 1976

The bighorn sheep is an ice-age mammal that has become highly specialized, evolving essentially outside the influence of man. Today, however, human encroachment on sheep habitats and disturbance of populations result in stress on bighorns, forcing them to adapt socially. Stress, frequently human-induced, appears to be a major limiting factor in the bighorns struggle for survival.*

Keywords

human disturbance
wildlife
recreation

Deforge, J.R.

Man's invasion into bighorn habitat.

Source: Trans. Desert Bighorn Council (16) **Pages:** 112-115 **Date:** 1972

From observations of bighorn populations in California, the author suggests that off-road vehicle use and other human disturbances caused a reduction in the number of bighorn sheep using the area.*

Keywords

OHV
human disturbance
wildlife

**Dept. of Interior Bureau of Land Management, Glenwood Springs
Castle Peak Travel Management Plan and Environmental Assessment.**

Source: Dept. of Interior Bureau of Land Management, Glenwood Springs **Pages:** 7pp. **Date:** 1997
EA. No. CO-078-07-49

The BLM prepared this document to make revisions to the Castle Peak area's current transportation system, in response to increased recreational demands and visitor use conflicts related to the travel area. The objective is to protect land and resource values, while continuing to provide a variety of motorized and non-motorized recreational opportunities.

Keywords

OHV
bike
hike
management
recreation
wildlife

Des Granges, J.L. and A. Reed.

Disturbance and control of selected colonies of double-crested cormorants in Quebec.

Source: Colonial Waterbirds (vol.4) **Pages:** 12-19 **Date:** 1981

Double-crested cormorants nesting in mixed colonies with gulls in the St. Lawrence estuary were subjected to various disturbances. Visits to colonies by investigators resulted in significant losses of eggs and young to gull predation. Nests near the colony peripheries and those containing no hatched young suffered the greatest losses.*

Keywords

human disturbance
wildlife

Doan, K.H.

Effects of snowmobiles on fish and wildlife resources.

Source: Conv. Int. Assoc. Game Fish Conserv. Comm. (vol. 60) **Pages:** 97-103 **Date:** 1970

Increases in demand for snowmobiles and potential impacts on fish and wildlife resources are reviewed. Impacts of snowmobiles are listed as benefits and liabilities; other sections discuss registration, regulation, and education of snowmobile users.*

Keywords

snowmobile
wildlife

Doherty, James E.

Shame on the Snow.

Source: National Wildlife (vol.12(2)) **Pages:** 28-29 **Date:** 1974

This non-technical article addresses concerns about the impacts of snowmobiles on the environment, especially wildlife such as: (1) intensive use of the most popular snowmobile trails, (2) increasing encroachment into more remote areas, (3) the harassment of wildlife by snowmobilers, and (4) The presence of snowmobiles in critical wintering areas for wildlife.

Keywords

snowmobile
wildlife

Dorrance, M.J. and P.J. Savage

Effects of snowmobiles on white-tailed deer.

Source: Journal of Wildlife Management (vol.39 (3)). **Pages:** 563-569 **Date:** 1975

The effects of snowmobiles on white tailed deer were studied at St. Croix State Park and Mille Lacs Wildlife Management Area in Minnesota during 1973 and 1974.

Researchers found that home range size, movements, and distance from radio-collared deer to the nearest trail increased with snowmobile activity at Mille Lacs, but remained unchanged at St. Croix. Number of deer along a 10-km trail decreased as snowmobile traffic increased at St. Croix. Light snowmobile traffic caused the displacement of deer from areas immediately adjacent to trails at St. Croix. Deer returned to areas along trails within hours after snowmobiles ceased at St. Croix. Deer responded to very low intensities of intrusion by man and vehicles.

Keywords

snowmobile
human disturbance
recreation
wildlife

Douglas, C.L.

Coordination of bighorn research and management in Joshua Tree National Monument.

Source: Transactions of the North American Wild Sheep Conference (2) **Pages:** 1-15 **Date:** 1976

In Joshua Tree National Monument, California, decreases in annual precipitation over the last 20 years have caused a large decline in available water resources for bighorn sheep. Human presence worsens the problem when campers and hikers keep sheep away from waterholes and cause general harassment. Management actions to improve conditions for bighorn sheep are discussed.*

Keywords

hike
human disturbance
wildlife

Doyle, P.

Progress made by the snowmobile industry since 1971 in areas of environmental concern.

Source: in: D.F. Holecek, ed. Proc. of the 1973 snowmobile and Off the Road Vehicle Research Symposium. Michigan State U. East Lansing Dept. Park Recr. Resour. Tech Report 9.

Results of two industry-funded studies are reported in support of claims that snowmobiles produce negligible impacts on the environment. One project in Wisconsin determined that telemetered deer and rabbits increased movements during snowmobile activity periods, but did not change home range size; another study found minimal impacts of snowmobile use on forest vegetation.*

Keywords

snowmobile
wildlife

Dunaway, D.J.

Human disturbance as a limiting factor of Sierra Nevada Bighorn Sheep.

Source: in: transactions of the first North American wild sheep conference, April 14-15, 1971, Fort Collins, CO. Colorado Dept of Fishery and Wild. Biology

Disturbance caused by human recreation is suggested as a factor limiting populations of bighorn sheep in California. Three populations that have declined were in areas of increased recreational use; two other stable populations have suffered less disturbance by recreationists.*

Keywords

human disturbance
recreation
wildlife

Dunaway, D.J.

Status of bighorn sheep populations and habitat studies on the Inyo National Forest.

Source: Transactions of the Desert Bighorn Council (14) **Pages:** 127-146 **Date:** 1970

Included in this report of ecological studies of bighorn sheep in California are observations concerning possible impacts of recreation activities on sheep.

Recreational use in sheep habitats has coincided with sheep population declines in some cases.*

Keywords

human disturbance
wildlife

Dunaway, D.J.

Bighorn sheep management on the Inyo National Forest, a new approach.

Source: Transactions of the Desert Bighorn Council (15) **Pages:** 18-23 **Date:** 1971

A major factor in the decline of bighorn sheep populations in California appears to be excessive human use of sheep ranges. A zoological areas is proposed to include two large bighorn sheep ranges; management objectives are to protect and maintain habitat and limit use.*

Keywords

human disturbance
wildlife
hike
recreation

Eckstein, R.G. and O.J. Rongstad.

Effects of snowmobiles on the movements of white-tailed deer in Northern Wisconsin.

Source: Proceedings of the Midwest Fish and Wildlife Conference (vol. 35) **Pages:** 35-39 **Date:** 1973

Studies in northern Wisconsin evaluated the effects of snowmobile use on white-tailed deer in wintering yards. Movements and activities of telemetered deer were compared between a yard receiving snowmobile use and one with no use. Some deer showed avoidance of snowmobile trails while machines were present, but no significant changes in home range size or daily movement patterns were observed.*

Keywords

snowmobile
wildlife

Eckstein, R.G., T.F. Obrien, O.J. Rongstad, and J.G. Bollinger.

Snowmobile effects on movements of white-tailed deer : a case-study.

Source: Environmental Conservation (vol.6) **Pages:** 45-51 **Date:** 1979

The effects of snowmobile traffic on the winter home-ranges, movements, and activity patterns, of White-tailed Deer were studied during two winters in northern Wisconsin. There were no significant differences in home-range size and habitat use of the Deer in areas with and without snowmobiling. However, snowmobiling caused some deer to leave the immediate vicinity of the snowmobile trail.

Keywords

snowmobile
management
wildlife

Daily activity patterns of Deer were little affected by snowmobiles except in one period when deer were more active at times when snowmobiles were absent. Darkness reduced the reaction of the Deer to a disturbance. Deer appeared to react more to a person walking than a person on a snowmobile. It is recommended that snowmobile trails are routed away from deer wintering areas.

Anderson, J.H.

Status of the Peregrine Falcon in the Rocky Mountains in 1973.

Source: Auk (vol 91) **Pages:** 727-736 **Date:** 1974

Factors responsible for an apparent decline in the numbers of peregrine falcons in the central Rocky Mountains is discussed. Pesticides appear to be the major factor; human disturbance such as rock climbing, picnicking, and highways may be important locally but are widespread enough to explain the general decline.

Keywords

human disturbance
recreation
wildlife

Engel, J.M., F.R. Courtsal, R.L. Martin, J.R. Messerli, T. H. Hooper, R.E. Mumford, and L.E.

Recovery Plan for the Indiana Bat

Source: U.S. Fish and Wildlife Service, Washington D.C. **Pages:** 34pp **Date:** 1975

Data concerning the biology, ecology, and status of the endangered Indiana bat, and management plans to accomplish the recovery of the species, are outlined. Human disturbances to vulnerable winter populations are considered the major cause of population decline. Vandalism and inadvertent disturbance by spelunkers and biologists have been responsible for measurable declines in several instances.

Keywords

human disturbance
wildlife

England, Kristie

Ideas on off-highway vehicle management.

Source: Professional development for outdoor recreation management **Pages:** 1-24 **Date:** 1993
program, Clemson University

The lack of management of OHVs in the Ozark-St. Francis National Forest has caused a significant amount of resource damage, mainly to vegetation. An OHV management direction that has been written for the Ozark-St. Francis National Forest, but has not been implemented. This paper documents some actions that have been taken on the forest in implementing the management direction. It also discusses ideas from other research that can be used to manage OHV's and suggests a plan of action for implementation.

Keywords

human disturbance
soil/vegetation
management
recreation

Erwin, R.M.

Breeding habitat use by colonially nesting waterbirds in two mid-Atlantic U.S. regions under different regimes of human disturbances.

Source: Biological Conservation (vol 18) **Pages:** 39-51 **Date:** 1980

Nesting habitat selection by four species of seabirds was compared between New Jersey and Virginia. Low seabird use of barrier islands along the more disturbed New Jersey coast suggests that human disturbance causes seabirds to nest in less preferred habitats. Effects of the habitat shift on seabirds is discussed.*

Keywords

human disturbance
wildlife

Evans, R.D., and C.W. Wolfe, JR.

Effects of nest searching on fates of pheasant nests.

Source: Journal of Wildlife Management (vol.31) **Pages:** 754-759 **Date:** 1967

Data from 1,276 pheasant nests were analyzed to determine the effects of nest searching on nest fate. Nests where a visit resulted in the hen flushing had the highest abandonment rate, and nests where a hen was present during the visit but did not flush had the highest percentage of success. However, active nest visits compared to nests terminated before the visit suggested that nest visitation had a negligible effect on nest fate.

Keywords

human disturbance
wildlife

Ferguson, M.A.D., and R. Langvatn

Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta.

Source: Canadian Field Naturalist (vol. 96) **Pages:** 69-78 **Date:** 1985

Effects of cross-country skiing on distribution of Moose and Elk during winter were studied on Elk Island National Park, Alberta. Aerial observations, and track and pellet-group counts provided indices to distribution that could be related to trail location and/or use. Cross-country skiing influenced the general over winter distribution of Moose but not of Elk. Both species, however, tended to move away from areas near heavily-used trails during the ski season (January-March). Day to day movements away from trails occurred after the onset of skiing, but such displacement did not increase with the passage of additional skiers.

Keywords

human disturbance
recreation
wildlife

Ferris, R.M. and M.J. Kutilek

Responses of black-tailed deer to off-highway vehicles in Hollister Hills State Vehicular Recreation Area Hollister, CA.

Source: Department of Biological Sciences, San Jose State University. **Pages:** 42pp. **Date:** 1989

The responses of black-tailed deer were studied at Hollister Hills State Vehicular Recreation Area in Hollister, CA. Researchers captured 14 female deer and equipped them with radio-collars. Movements, habitat use, and activity levels were recorded for one year and compared with OHV levels. Home range sizes for deer living within the riding area were similar to those of previously studied deer populations living in similar habitats but were not exposed to OHV use. No significant correlation was found between OHV activity levels and deer activity levels. Deer generally avoided OHV riding areas during peak use but returned to their established home ranges after traffic levels subsided. Studies have shown that animals reacted minimally to disturbances on established trails and roads but there were increased responses to disturbances where none had occurred before.

Keywords

OHV
recreation
wildlife

Researchers found that home-ranges of deer at Hollister Hills were centered around water and food supplies. It is recommended that future trails are developed away from major drainages and other preferred habitat types. An effort should also be made to educate trail users and encourage them to ride only on established trails.

Fetterolf, P.M.

Reproductive success of minimally disturbed ring-billed gulls

Source: Colonial Waterbirds (vol4:68) **Pages:** Abstract Only **Date:** 1981

Reproductive success of ring-billed gulls was monitored during three breeding seasons. Investigator disturbance during incubation ranged from one 15-minute visit in 1980 to nest checks every second day in 1977 to 1978. Minimally disturbed reproductive success was at least 60% higher than the average from previous studies when disturbance was more severe.

Keywords

human disturbance
wildlife

Fish, E.B., G.L. Borthers and R.B. Lewis

Erosional impacts of trails in Guadalupe Mountains National Park, Texas

Source: Landscape Planning, 8: 387-398 **Pages:** 387-398 **Date:** 1981

Twenty-six erosion transects were established on a variety of surface situations to include major trails and roads, small trails and non-trail controls. Transects were remeasured at intervals of 4, 5, 8 and 17 months. Results indicate that active soil movement is occurring throughout Gaudalupe Mountains National Park.

Approximately 85% of the points measured showed evidence of change, either by erosion or deposition. Major trails and roads indicate a greater degree of instability based on cross-sectional area changes. A greater percentage of the cross-sectional area change is attributable to deposition in the major trail or road and small trail categories when compared to the control transect category. These results may indicate that the trail sites are serving as deposition zones as a result of their impedance of normal drainage routes.

Keywords

soil/vegetation

Foin, T.C., E.O. Garton, C.W. Bowen, J.M. Everingham, R.O. Schultz, and B. Holton, Jr.

Quantitative studies of visitor impacts on environments of Yosemite National Park, California, and their impacts for management policy.

Source: Journal of Environmental management (vol.5) **Pages:** 1-22 **Date:** 1977

In a review of recent studies of visitor use impacts in Yosemite National Park, difficulties of generating useful general theories concerning environmental impacts of recreation are discussed. The dual mission of national parks is described and related to research activities. Recommendations are made to strengthen research in the parks through the establishment of dependable funding channels and the clear delineation of research objectives.*

Keywords

management
recreation

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler

Responses of mule deer to disturbance by persons afoot and in snowmobiles.

Source: Wildlife Society Bulletin (vol.14) **Pages:** 63-68 **Date:** 1986

Controlled disturbance of mule deer occurred from mid-January until early March in 1979-1980 within a 3-km² portion of the Junction Butte State Wildlife Area in north-central Colorado.

The study found that mule deer were disturbed more by persons on foot than by snowmobiles. Responses by deer to persons were longer in duration, involved more frequent running, and were greater in energy expenditure. Intensity of responses by deer was dependent upon distance between animals and disturbances. Minimizing all responses by deer would require persons afoot and snowmobiles to remain >334m and >470m from deer.

Keywords

hike
snowmobile
human disturbance
management
recreation
wildlife

French, J.M.

Distribution, abundance, and breeding status of ospreys in northwestern California.

Source: M.S. Thesis. Humboldt State University Arcata, CA **Pages:** 58pp **Date:** 1972

Factors influencing breeding success, abundance, and distribution of ospreys were studied in northwestern California. Logging, vehicular traffic, shooting, and recreational activity were considered potentially disturbing to nesting ospreys. There was no indication that recreation activities, including sightseeing, camping, and swimming were detrimental to breeding success of ospreys.

Keywords

human disturbance
wildlife

Fyfe, R.

The peregrine falcon in northern Canada.

Source: IN: J.J. Hickey, ed. Peregrine falcon populations: Their biology and decline. University of Wisconsin Press, Madison. **Pages:** 101-114 **Date:** 1969

Recent evidence suggests that the peregrine remains a common breeding bird in northern Canada, although a local decline in one area was attributed to human disturbance. Human interference with peregrines near northern settlements is a possible decimating factor.

Keywords

human disturbance
wildlife

Garber, D.P.

Osprey nesting ecology in Lassen and Plumas Counties, California.

Source: M.S. Thesis. Humboldt State University, Arcata, CA. **Pages:** 59pp. **Date:** 1972

Nesting efforts of ospreys were studied in northeastern California. Major cases of nesting were high winds and eggshell breakage, but human disturbance was responsible for 33% of observed egg losses. In one case campers caused adult ospreys to abandon a nest with eggs. During fledgling counts young ospreys sometimes flew from nests, apparently for the first time. Such early flights may increase the incidence of injury and predation of fledglings.

Keywords

human disturbance
wildlife

Garland, G.G.

Techniques for assessing erosion risk from mountain footpaths.

Source: Environmental Management (vol. 14(6)) **Pages:** 793-798 **Date:**

The objective of this research was to develop a technique for assessing the risk of erosion from footpaths before they are constructed, to be used as tool for selecting the most viable, cost-efficient routes. The technique was tested on a path in the Drakensberg Mountains in South Africa.

Keywords

soil/vegetation
recreation

Garton, E.O., C. W. Bowen, and T.C. Foin

The impact of visitors on small mammal communities of Yosemite National Park.

Source: IN: T.C. Foin Jr., ed. Visitor impacts on National Parks: The Yosemite ecological impact study. University California, Davis Inst. Ecol. Publ.10. **Pages:** 44-50 **Date:** 1977

Visitor use of meadow and forest sites in Yosemite National Park was related to the distribution and abundance of small mammals. Deer mouse populations apparently increase in response to human use of forested areas, while montane vole populations showed no relationship to human use except for gross habitat alterations such as meadow draining. Data for other small mammals were insufficient to determine relationships with human use.

Keywords

human disturbance
wildlife

Gates, J.E.

A functional approach to estimating habitat edge width for forest birds.

Source: The American Midland Naturalist (vol.105) **Pages:** 189-192 **Date:** 1981

Two functional approaches toward estimating habitat edge width are proposed. These methods rely upon the dispersion of nests of bird species associated with edge habitat. Field data collected in central Michigan are used to compare and contrast the two methods with habitat edge width determined structurally. The results provide an ecologically more meaningful estimate of edge width. Particular applications are discussed.

Keywords

management
wildlife

Gavrin, V.F.

Effect of anxiety factor on game fowl population productivity.

Source: In: I. Kjerner and P. Bjurholm, eds. Proc., XIth International Congress of Game Biologists, 3-7 Sept. 1973, Stockholm, Sweden. Nat'l Swedish Environmental Protection Board, Stockholm.

Pages: 401-403 **Date:** 1974

Keywords

human disturbance
wildlife

Effects of stress on waterfowl and grouse was studied in the USSR. Recreational activities in bird habitats disturb daily activity pattern and alter the behavior of birds. Disturbance causes additional predation pressures and losses of young to starvation; disrupted timing of breeding lowers female fertility and increases the number of inferior birds in the population.

Geist, V.

Is big game harassment harmful?

Source: Oilweek (vol.22(17)) **Pages:** 12-13 **Date:** 1971

harassment of North American big game is considered in terms of animal energy budgets and physical damage. Energy "costs" of harassment are calculated as energy expended above and beyond normal daily expenditures. Chronic harassment may result in reduced reproductive rates and increased mortality.*

Keywords

human disturbance
wildlife

Geist, V., R.E. Stemp, and R.H. Johnson

Heart-rate telemetry of bighorn sheep as a means to investigate disturbances.

Source: In: The Ecological Impact of Outdoor Recreation on Mountain Areas in Europe and North America, eds. N.G. Bayfield and G.C. Barrow. Recreational Ecology Research Group Report No. 9. Wye, College, England:

Pages: **Date:** 1985

Keywords

human disturbance
wildlife

Gillett, W. H., J.L. Hayward, Jr., and J.F. Stout.

Effects of human activity on egg and chick mortality in a glaucous-winged gull colony.

Source: Condor (vol. 77) **Pages:** 492-495 **Date:** 1975

During studies of glaucous-winged gulls on Colville Island, Washington, the investigators' presence increased chick mortality in areas where they worked, but had no effect on egg mortality. The increase in chick losses resulted largely from chicks moving into adjacent territories and being attacked by neighboring adults when investigators entered the chicks' home territory.*

Keywords

human disturbance
wildlife

Gochfeld, M.

Terns in Traffic.

Source: Natural History (vol. 87(6)) **Pages:** 54-61 **Date:** 1978

Effects of various human disturbances on nesting common terns in New York are described. Tern populations on Long Island have been stable, but increasing recreational disturbances may soon cause declines. Terns in disrupted habitats are sometimes forced to nest in marginal habitats where tern productivity is lower.*

Keywords

human disturbance
wildlife

Graham, H.

The Impact of Modern Man.

Source: IN: G, Monson and L. Sumner, eds. The desert bighorn: It's life **Pages:** 288-309 **Date:** 1980
history, ecology and management. University of Arizona Press,
Tucson.

The history of man's relationship with bighorn sheep and current impacts of man on sheep are reviewed. Effects of hiking, horseback riding, motor vehicles, motorboats, ski lifts and tramways, aircraft noised, and dogs are discussed. Human-caused habitat alterations are related to tolerance of sheep to intrusions.

Keywords
human disturbance
recreation
wildlife

Gray, J.R.

Kinds and costs of recreational pollution in the Sandia Mountains.

Source: New Mexico State University Las Cruces, Agric. Edxp. St **Pages:** 57pp. **Date:** 1977

Environmental costs of recreation in the Sandia Mountains, New Mexico, were quantified by surveying recreationists, identifying associated pollutants and environmental impacts, and calculating costs of their control. Wildlife harassment, primarily by hikers, was among impacts that tended to restrict activities most in a cost analysis model. Nature study and hunter groups were determined as having the highest costs per hour.

Keywords
human disturbance
hike
recreation
wildlife

Grier, J.W.

Bald eagle behavior and productivity responses to climbing to nests.

Source: Journal of Wildlife Management (vol. 33) **Pages:** 961-966 **Date:** 1969

Data are presented concerning behavior and productivity of bald eagles in response to climbing to nests in Ontario. No evidence was found of changes in bald eagle productivity resulting from single climbs to nests when young were from 2 to 11 weeks old.

Keywords
recreation
wildlife

Griffith, R.E.

Environmental quality impact.

Source: IN: Proceedings of the International Snowmobile Conference, 20-21 **Pages:** 5-8 **Date:** 1969
May 1969, Albany, N.Y. U.S. Bureau of Outdoor Recreation, Ann
Arbor Mich. and Philadelphia, PA., and New York State
Conservation Commission, Albany.

A report of the committee on environmental quality is presented, including consideration of snowmobile effects on wildlife and wildlife habitat. A deficiency in snowmobile recreation planning has been a lack of concern for environmental impact, including harassment of wildlife and intrusion into big game winter ranges. The author recommends the protection of critical wildlife habitat and the establishment of laws regarding harassment of wildlife.

Keywords
snowmobile
wildlife

Griscom, B.

Wildlife Protected Along Many Rail-Trails.

Source: Trailblazer. Pages: 5-6 Date: 1994

Research relating to ecology and conservation ecology shows that greenways with native vegetation can benefit species both within the trail corridor and in the larger open spaces connected by the trail. In the short term, linear parks such as rail-trails allow mammals to travel from one isolated habitat patch to another in search of food. In the long term, such corridors may help th natural migration of plants and animals.

Keywords

wildlife
recreation

Grubb, T.G., and R.M. King

Assessing human disturbance of breeding bald eagles with classification tree models.

Source: Journal of Wildlife Management (vol. 55(3)) Pages: 500-511 Date: 1991

Researchers recorded 4,188 events of human activity and associated bald eagle response in the vicinity of 13 central Arizona nest sites during 1983-1985. A hierarchical classification of 9 dependent and 3 independent parameters was developed to quantify pedestrian, aquatic, vehicle, noise (gunshot/ sonic boom), and aircraft disturbance groups. Type and frequency of response varied inversely with the distance from an eagle to the disturbance. Bald eagles were more often flushed from perches than nests and were most easily disturbed when foraging. Pedestrian was the most disturbing human activity, whereas aircraft was the least. researchers developed classification tree (CART) models for pooled and group disturbances to evaluate response severity and to formulate disturbance-specific management criteria. Response frequencies and critical distances for pooled disturbance were 64% at < 215 m, 45% between 216 and 583 m, an 24% at >583 m. Frequencies, distances, and the influence of secondary characteristics varied among disturbance groups. The CART models ranked distance to disturbance as the most important classifier of eagle response, followed in decreasing order of discriminatory value by duration of disturbance, visibility, number of units per event, position relative to affected eagle, and sound. The procedure offers improved specificity in human disturbance assessment.

Keywords

human disturbance
wildlife

Grubb, T.G., W.W. Bowerman, J.P. Giesy, and G.A. Dawson

Responses of breeding bald eagles, *Haliaeetus leucocephalis*, to Human activities in North central Michigan.

Source: Canadian Field Naturalist (vol.106) Pages: 443-453 Date: 1992

To characterize disturbance and analyze eagle response, we recorded 714 events of potentially disturbing human activity near six pairs of Bald Eagles breeding in north central Michigan in 1990. Vehicles and pedestrians elicited the highest response frequencies, but aircraft and aquatic activities were the most common. Magnitude of response was inversely proportional to median distance-to-disturbance. Seventy-five percent of all alert and flight responses occurred when activity was within 500m and 200m, respectively. Adults responded more frequently than nestlings, and at greater distances to disturbance when perched away from nests. May was the peak month for human activity, most of which occurred on weekends and after noon. Classification tree models are used to assess disturbance-specific response frequencies and to formulate management considerations.

Keywords

human disturbance
wildlife

Gutzwiller, K.J.

Assessing recreational impacts on wildlife: the value and design of experiments.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol.56) **Pages:** 248-255 **Date:** 1991

Keywords

This paper emphasizes the practical and scientific value of field experiments in recreational impact assessment, and offers advice about how such experiments should be designed to maximize their interpretability.

Gutzwiller, K.J.

Serial management experiments: an adaptive approach to reduce recreational impacts on wildlife.

Source: Transactions of the North American Wildlife and Natural Resources Conference (vol.58) **Pages:** 528-536 **Date:** 1993

Keywords

Serial experimentation is an adaptive approach in which the results from each new experiment are used to update existing knowledge and refine current management plans. This paper presents ways to use serial experimentation to reduce recreational impacts on wildlife. It offers advice about how to design initial and follow-up management experiments, provides examples of how such experiments might be implemented, and identifies major knowledge gaps about the effects of recreationists on wildlife.

management
recreation
wildlife

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson.

Effects of human intrusion on song occurrence and singing consistency in sub-alpine birds.

Source: Auk (vol.111) **Pages:** 28-37 **Date:** 1994

Keywords

In 1989, 1990, and 1991, experiments were conducted on 30 circular 1.0-ha. sites to assess whether human intrusions during a 10-week period influenced the occurrence and consistency of primary song in breeding subalpine birds. Using only those weekly censuses during which a species was present at a site, we computed song occurrence as the percentage of censuses during which a species sang, and we calculated singing consistency as the maximum number of consecutive censuses during which a species sang. An intrusion bout involved one person who walked through a site for 1 or 2 hours. We used a priori contrasts, involving habitat covariates when appropriate, to assess differences in song occurrence and singing consistency between control and intruded sites and between sites at which the inner 25% of the site was disturbed (S25) and those at which 100% of the site was disturbed (S100). Singing by a number of species did not appear to be influenced by intrusion. For several species, however, song occurrence and singing consistency were higher on control sites than on intruded sites, indicating intrusion reduced singing activity. Song occurrence was higher on S100 relative to S25 sites as well. This latter pattern may have emerged because all of the individuals using the S100 sites were able to observe us during repeated intrusions and discern that we were not predators, whereas most of the individuals using the S25 sites may have reduced their singing to avoid detection by us. Because song is essential in territory defense, mate acquisition and in other reproductive activities, levels of intrusion that alter normal singing behavior have the potential to lower reproductive fitness of males that are sensitive to this form of disturbance.

human disturbance
wildlife

Haefeli, Patricia

The Crystal River Valley Bicycle Trail Study

Source: Pitkin County, CO, Pitkin County Open Space and Trails **Pages:** 60 pp. + 41 pp. **Date:** 2/16/9

The Crystal River Valley lies in the West central part of Colorado.

Bicycle study focusing on the impacts of proposed bicycle trail improvements as well as user preferences.

Keywords

bike
management

Hall, C.N. and F.R. Kuss

Vegetation alteration along trails in Shenandoah National Park, Virginia

Source: Biological Conservation 48:211-227 **Pages:** 221-227 **Date:** 1989

Most studies in the USA of vegetation alteration and human impact along trails have been located in large western wilderness areas. The objective of this study was to determine vegetation changes occurring along trails in an eastern ecosystem supporting second-growth deciduous forest. The location of this study was Shenandoah National Park in Virginia, which has a long history of trail use by humans. Located in different sections of the park, ten trails were chosen as study areas. In each, transects were established to measure ground flora in trialside, transition, and undisturbed areas perpendicular to the trail. Field data were collected on frequency, life-form, and percent cover for ground flora of 25cm or less in height. Cover and species diversity increased toward the trail in eight out of ten cases. Competition for light and resistance to trampling were thought to influence the occurrence of plants along the transect. Plants found along the trail border were represented by low growth-forms, early blooming, orgraminoid characteristics, and hemicryptophyte, therophyte, or chamaephyte life-forms. Plants found in the undisturbed zone were represented by scattered cover and frequency, woody growth forms or delicate herbacious forms, and phanerophyte or geophyte life-forms.

Keywords

soil/vegetation
human disturbance

Hamilton, K.S., S.A. Holl and C.L. Douglas

An evaluation of the effects of recreational activity on Bighorn sheep in the San Gabriel Mountains, CA.

Source: Desert Bighorn Council Transactions, 26th annual mtg. **Pages:** 50-55 **Date:** 1982

The effects of human disturbance on bighorn sheep was studied in the San Gabriel Mountains, California. The hypothesis that bighorn were abandoning habitat receiving high levels of human use were tested.

Keywords

human disturbance
wildlife

Bighorn using the Narrows Mineral lick in South Fork Lytle Creek were not displaced by the presence of people in the canyon. The greatest proportion of sheep use of the lick and people use of the canyon occurred during midday hours. There was no correlation between numbers of people using the canyon and numbers of bighorn using the lick. Frequency of people traveling near the lick was important since sheep did not avoid the lick; they used it only when no humans were in the immediate vicinity.

The presence of large numbers of hikers on Devil's backbone trail, located in sheep summer range did not cause sheep to abandon adjacent habitat. There was no significant difference in sheep distribution between the Devil's Backbone trail (heavy recreational use) and the Cucamonga Peak trail (light recreational use).

Hammerstrom, F., D.D. Berger, and F.N. Hamerstrom, Jr.

The effects of mammals on prairie chickens on booming grounds.

Source: Journal of Wildlife Management (vol. 29) **Pages:** 536-542 **Date:** 1965

Studies in Wisconsin examined reactions of greater prairie chickens on booming grounds to mammalian predators and humans. Prairie chickens were disturbed most by people, including farmers, fishermen, and bird watchers. Persons on foot walking towards or near the booming ground appeared to cause birds to flush from a greater distance than from any other mammal. Birds were disturbed more by dogs and livestock than by native foxes and deer.

Keywords

recreation
wildlife

Hammit, W.E., and D.N. Cole

Wildland Recreation: Ecology and Management

Source: John Wiley and Sons, Inc. New York **Pages:** 341pp. **Date:** 1987

The topic of wildland recreation is covered in three main sections. The first describes impacts associated with recreation use, what these impacts are, and how important they are. The second part addresses factors that determine the amount and type of recreational impact. This provides an understanding of why certain places are more heavily damaged than others and suggests techniques that might be used to minimize or mitigate impacts. The third part discusses the management techniques available for dealing with impact problems. It gives you valuable information and examples to meet management objectives in wildland areas.

Keywords

management
recreation

Hammond, M.C., and W.R. Forward

Experiments on causes of duck nest predation.

Source: Journal of Wildlife Management (vol. 20) **Pages:** 243-247 **Date:** 1956

Sources of bias in duck nesting studies are examined, including the possibility of increased nest predation due to human disturbance.

Keywords

human disturbance
wildlife

Harrison, R.T., W.J. Makel, and B.B. LaMoure

Sound Levels of Five Motorcycles Traveling Over Forest Trails: Rock Creek ORV Area.

Source: USDA Forest Service Technology and Development Program. **Pages:** 7pp. **Date:** 1993
2300-Recreation. 9323 1802--SDTDC.

The noise of motorcycles is hypothesized to have potential impact in two areas; one, impact on wildlife; second, impact on other Forest users and adjacent landowners. This report presents a brief study carried out by the Technology and Development Center in the Rock Creek area. It presents recommendations for mitigation of any noise effects from motorcycles, and for further studies. Researchers concluded that distances of 400 ft. or greater, motorcycles which meet the State of California and USDA Forest Service 101 dBA limit will not cause sounds loud enough to impact the hearing of people or animals; and that no direct physiological effect upon animals in the area could be expected from the sound of motorcycles.

Keywords

soil/vegetation
human disturbance

Heinzman, G.

The American Bald Eagle: Despite protection, this wary bird cannot coexist with man.

Source: Natural History (vol. 70 (6)) **Pages:** 18-21 **Date:** 1961

The author summarizes recent research findings and observations of bald eagles in Florida. Studies of nest sites revealed a circle around nests with a radius of 150 to 300 yards within which human presence caused eagles to flee. Reasons for eagle population declines in Florida are cited.

Keywords

human disturbance
wildlife

Henson, P. and T.A. Grant

The effects of human disturbance on trumpeter swan breeding behavior.

Source: Wildlife Society Bulletin (vol. 19) **Pages:** 248-257 **Date:** 1991

Researchers studied the response of breeding trumpeter swans to human disturbance occurring along Copper River Highway, near Cordova, Alaska. Except for incidental disturbances caused by researchers, disturbances were normally occurring and were not experimentally applied or controlled. Swans were most sensitive to the noise and visible presence of stopped vehicles, pedestrians, and researchers. These disturbances led to frequent recesses by incubating females, to uncharacteristic brood movements, and to significant behavior changes. Undisturbed swans always covered eggs with nesting material before they left, whereas disturbed swans did not. Females took longer recesses when disturbed and spent less time feeding and preening. These recesses may lead to an increase in egg and hatchling mortality and additional stress on the female.

Keywords

human disturbance
wildlife

Hickman, S.

Evidence of edge species attraction to nature trails within deciduous forest.

Source: Natural Areas Journal (vol.10) **Pages:** 3-5 **Date:** 1990

Repulsion from or attraction to nature trails by forest-breeding birds was determined by comparing the average distance of individual species' territories from control (imaginary) vs. test (actual) nature trails. Several edge bird species known to cause a decrease in the reproductive success of forest-interior birds were attracted to trails. This constitutes evidence that the reproductive success of forest interior species may be indirectly decreased by nature trails.

Keywords

recreation
wildlife

Hicks, L.L. and J.M. Elder

Human disturbance of Sierra Nevada bighorn sheep.

Source: Journal of Wildlife Management (vol.43) **Pages:** 909-915 **Date:** 1979

California bighorn sheep and recreationists were studied in the Sierra Nevada Mountains of California from May through August of 1976. Direct observation of sheep and people, pellet transects, and hiker interviews were used to assess overlap in areas of use and nature of interactions. Distance, juxtaposition, age and sex composition, and herd size are important factors in reactions of bighorns to humans.

Keywords

hike
human disturbance
management
recreation

Humans and bighorns in the Mt. Baxter summer range usually are separated spatially. Interactions have been minimized by preference of people to camp near water and trails. Observations at Mt. Baxter indicated that the herd of bighorn sheep is not declining due to recreational use of the area. Recruitment rates and lamb survival are high, and few cases of diseased or infirm animals were noted. Other studies, show that intense recreational activity reduced desert bighorn occupancy of an area in the San Gabriel Mountains of southern California. Therefore regulations should continue to limit use of the study area by humans.

Holmes, T.L., R.L. Knight, L. Stegall, and G.R. Craig

Responses of wintering grassland raptors to human disturbance.

Source: Wildlife Society Bulletin (vol.14) **Pages:** 63-68 **Date:** 1993

Keywords

human disturbance
wildlife

Holroyd, J.C.

Observations of Rocky Mountain Goats on Mount Wardle, Kootenaly National Park, British Columbia.

Source: Canadian Field Naturalist (vol, 81) **Pages:** 1-22 **Date:** 1967

Behavior of mountain goats in British Columbia is described, including reactions to man. Goat responses to human presence varied according ro season, herd size, and other circumstances. Goats were rarely aggressive toward the author, although two incidents are described in which a goat appeared to threaten him.

Keywords

human disturbance
wildlife

Hoover, B.

Off-road vehicle problems on federal lands.

Source: Proceedings of Annual Meeting-Association of Midwest Fish **Pages:** 37-49 **Date:** 1973
Wildlife Committee. (vol 40)

Problems associated with the recreational use of off-road vehicles are discussed. Damage to natural resources includes habitat destruction and direct impacts on wildlife. Instnces of inadvertant and deliberate harassment of game animals are provided. Regulatory legislation and management procedures are discussed in detail.

Keywords

OHV
wildlife

Horejsi, B.

Some thoughts and observations on harassment and bighorn sheep.

Source: IN: Proceedings of the Biennial Symposium of the Northern Wild **Pages:** 149-155 **Date:** 1976
Sheep Council, 10-12 February 1976, Jackson, Wyoming.

Harassment and its possible effects on bighorn sheep are discussed. Active harassment results in visible responses by sheep, while passive harassment produces no visible response but may have psychological and physiological effects on sheep. Harassment has significant impacts on individuals and populations, leading to a variety of conditions which reduce fitness. Minimizing harassment of sheep should be given top priority among management objectives.

Keywords

human disturbance
wildlife

Huff, D.E., and P.J. Savage.

A correlation of deer movements with snowmobile activity in Minnesota during winter.

Source: Proceedings of the Midwest Fish and Wildlife Conference. (vol. **Pages:** 42-49 **Date:** 1972
34)

Studies of telemetered white-tailed deer in Minnesota compared deer activities between areas of high and no snowmobile use. The size of deer home ranges was much reduced at the high use area, and snowmobile use appeared to force deer into less preferred habitats where nighttime radiant heat loss was greater.*

Keywords

snowmobile
wildlife

Huff, Dan E. et al.

Wildlife-snowmobile interaction project; preliminary report covering period November 1971-April 1972.

Source: University of Minnesota and Minnesota Dept. of Natural Resources **Pages:** 34pp. **Date:** 1972
Cooperating.

There is a strong relationship between numbers of tracks and specific cover types during the winter at Sherburne National Wildlife Refuge; in the most heavily used cover type, oak woods, significantly fewer tracks crossed the snowmobile trail than the snowshoe rail. Major cover types should be considered before constructing snowmobile trails in areas established for wildlife.

Keywords

snowmobile
wildlife

Hunt, G.L. Jr.

Influence of food distribution and human disturbance on the reproductive success of herring gulls.

Source: Ecology (vol.53) **Pages:** 1050-1061 **Date:** 1972

A three year study of Herring Gull reproductive success on four islands in Maine indicated that production of young was controlled by different factors operating on the eggs and chicks. Hatching success was inversely related to the disturbance of colonies by picnickers, which apparently caused the adults to leave their eggs exposed to solar radiation to addle the eggs. The survival of chicks was lower on islands distant from sources of edible refuse than on islands close to sources of waste, regardless of visits by picnickers. The nutrition and growth rates of chicks on inner and outer islands were similar. The attendance of parents on the territories was found to be less on an outer island than on an inner island. It was concluded that differences in parental behavior associated with greater foraging effort were responsible for a higher loss of chicks to predation on the outer islands.

Keywords

human disturbance
wildlife

Ikeda, H. and K. Okutomi.

Effects of human trampling on multispecies competition on early-phase development of a tread community.

Source: Ecological Resource (vol.5) **Pages:** 41-54 **Date:** 1990

The results of this study suggest that (1) the pioneer species interfere with the establishment of tread community species under lower trampling intensity, (2) heavier trampling reduces the competitive ability of pioneer species, while it favors the establishment of tread community species, (3) there are competitive interactions among the tread community species under higher trampling intensity, and (4) the species more susceptible to multispecies competition and tolerant to trampling are established in more heavily trampled habitats.

Keywords

soil/vegetation
recreation
human disturbance

Ittner, R., D.R. Potter, J.K. Agee, and S. Anschell, eds.

Recreational Impacts on Wildlands

Source: Conference Proceedings Seattle, WA. U.S. Forest Service, U.S. National Park Service, R-6-001-1979. **Pages:** 341pp. **Date:** Oct.

Keywords

recreation

Jacoby, Jill

Mountain Bikes: A new dilemma for wildland recreation managers

Source: Western Wildlands 16(1):25-28 **Pages:** 25-28 **Date:** 1990

This article looks at some of the management issues raised by mountain bike use, examines some current problem-solving approaches and concludes with recommendations for resource managers.

Keywords

bike

Jarvinean, J.A. and W.D. Schmid.

Snowmobile use and winter mortality of small mammals.

Source: in: M. Chubb, ed. Proceedings of the 1971 Snowmobile and Off the Road Vehicle Research Symposium, 14-15 June 1971, East Lansing, Mich. Michigan State U., East Lansing, Dept. Park Recr Resour tech report 8. **Pages:** 131-141 **Date:** 1971

Keywords

snowmobile
wildlife

Trapping results in Minnesota showed increased winter mortality of small mammals beneath snow-mobile compacted snowfields. It is suggested that compaction inhibits mammal movements beneath snow and subjects subnivean organisms to greater temperature stress. More information is necessary.

Jenni, D.A.

A study of the ecology of four species of herons during the breeding season at Lake Alice, Alachua County, Florida.

Source: Ecological Monograph (vol. 39) **Pages:** 245-270 **Date:** 1969

Keywords

human disturbance
wildlife

The effects of the investigator on herons were evaluated during studies of heron ecology in Florida. Some losses occurred from flushing adults from nests with subsequent loss of young, but indirect effects may have been more important. Nestlings often regurgitated when disturbed, and the youngest nestlings frequently died of starvation. However, production data and other observations suggest that the impact of the investigator on heron survival was not great.

Johnson, R.F., Jr., and N.F. Sloan

The effects of human disturbance on the white pelican colony at Chase Lake National Wildlife Refuge, North Dakota.

Source: Intl. Bird-Banding News (vol.48) **Pages:** 163-170 **Date:** 1976

Mortality factors responsible for low fledging rates of white pelicans in North Dakota were studied. Nest abandonment related to water conditions and sibling rivalry were major causes of poor reproduction. Predation, accidents, and physical stress do not cause significant mortality in an undisturbed situation, but may become significant with extensive and repeated human disturbance.*

Keywords

human disturbance
wildlife

Johnson, T.H.

Responses of breeding peregrine falcons to human stimuli.

Source: In: Proceedings of the Southwest Raptor Management Symposium **Pages:** 301-305 **Date:** 1990 and Workshop, eds., Glinski et al. National Wildlife Federation, D.C.

For each observation of stimulus and response, the nature, size or loudness, and the horizontal and vertical position and direction of motion of each stimulus with respect to the falcon were recorded. stimuli were grouped into three categories, aircraft, machinery, and people. Peregrine falcon behavioral responses to human stimuli were classed into four levels. A function based on the distance and intensity of the stimulus is proposed to quantify the stimulus intensity. These were used to examine 135 observed peregrine responses to various human stimuli. Stimulus values for each level or response have a range of 39-47db, reflecting the wide variability of peregrine responses to given stimuli. However, stimulus values within the four classes of response have similar distributions and are consistently higher with response level. Lowest stimulus values were used to calculate the largest response distances to a standard stimulus. These distances define two management zones, within 900m and 3400m of suitable nest sites.

Keywords

human disturbance
wildlife

Jones and Stokes Assoc., Inc.

Rock Creek off-road vehicle/deer study.

Source: Prepared for CA. Department of Fish and Game; CA. Dept. of Parks and Recreation and Eldorado National Forest, Sacramento, CA. **Pages:** **Date:** Sept. (JSA 89-201)

The response of six to eight radio-collared deer to four levels of ORV use was determined by evaluating changes in the size of 2-day activity centers and foraging behavior. During low levels of use approximately 13 riders per day were in the study area; approximately 28 riders per day were present during moderate levels; and 47 riders per day were present during high levels of ORV use. No ORV use was used as a control.

Keywords

OHV
hike
management
recreation
wildlife

No statistically significant differences were detected in the size of 2-day activity centers or the amount of feeding time along the different levels of ORV use.

This study concluded that the deer at Rock Creek were not affected by the ORV's because no trends in the data existed to suggest otherwise. The total amount of time that deer foraged and the daily cycle of feeding periods were similar to populations of deer that had not been disturbed by ORV's. There was a low probability of an ORV encountering a deer because of the low population densities and large home ranges in the study area. Hikers had a minimum amount of disturbance on deer mostly related to harassment by dogs. This was decreased with education of visitors.

Further impacts can be reduced by moving ORV use out of deer critical habitat.

Jorgensen, P.

Vehicle use at a desert bighorn watering area.

Source: Transactions of Desert Bighorn Council (vol. 18) **Pages:** 18-24 **Date:** 1974

Desert bighorn and human activity were observed at a watering area in California, where an unpaved road crossed a creek used as a water source by bighorn. Bighorn activity at the site decreased about 50% on days when vehicle traffic was present; vehicles and bighorn tended to utilize the area at about the same time of day. The evidence suggests that sheep are forced to use less preferred bedding sites as a result of human disturbance.

Keywords

human disturbance
wildlife

Josselyn, M., M. Martindale, and J. Duffield

Public Access and Wetlands: Impacts of Recreational Use.

Source: Tech. Report #9 Romberg Tiburon Centers, Center for Environmental Studies, San Francisco State University, Tiburon CA.

Pages: 56pp. Date: 1989

Keywords

recreation
wildlife

Literature reviewed demonstrates that wetland plants and animals are vulnerable to the effects of human recreational activities. The most dramatic effects reported for wildlife are those that occur at breeding sites, but the long-term effects of disturbances during non-breeding portion of the life cycle have not yet been studied, nor have the effects of human recreational activities on many individual species. Very few before and after studies have been done at public use sites, therefore, many studies involve species that are already acclimated to human activities and the change in wildlife use as a result of public access use is not known. Many available studies are concerned with vegetation, fewer with breeding birds, and fewer still with non-breeding birds, other vertebrates, and invertebrates. No studies were found on the effectiveness of various barriers or buffers in reducing the impacts of human recreational activities.

Kellert, S.R. and J.K. Berry

A bibliography of human-animal relations.

Source: University Press of America, Lanham, MD. Pages: Date: 1985

This bibliography contains 3861 citations. Citations are organized by key word. Included in this bibliography are articles involving recreation, OHV's, and human disturbance in general.

Keywords

OHV
human disturbance
recreation
management
wildlife

Kesteloot, E.

Perturbations causes par la presence humaine. (Disturbance due to the presence of humans.)

Source: IN: Towards a new relationship of man and nature in temperate lands. Part 1: Ecological impact of recreation and tourism upon temperate environments. IUCN Tenth Technical Meeting, 26-30 June 1966, Lucerne, Switzerland. IUCN Publ. New Ser. 7, Morges, Switzerland.

Pages: 237-243 Date: 1967

Keywords

human disturbance
wildlife

Causes and mechanisms of human disturbance of wild animals are discussed. The disturbing presence of humans is through sight, sound, and scent; reactions of animals to these stimuli vary. The effects on animals of the growing number of people interested in stalking,, observing, photographing, or feeding wildlife are discussed.

King, M.M. and G.M. Workman

Response of desert bighorn sheep to human harassment: management implications.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol.51) **Pages:** 74-85 **Date:** 1986

Behavioral response of desert bighorn sheep to human disturbance was evaluated in southeastern Utah from 1981 to 1983. Bighorn response was compared between two areas with contrasting disturbance histories. Red Canyon bighorn have been exposed to greater levels of hunting pressure and vehicular traffic than have White Canyon bighorn. To determine if differences in behavioral response to human disturbance existed between Red Canyon and White Canyon bighorn groups of bighorn were deliberately harassed by hikers and vehicles.

Keywords

hike
human disturbance
recreation
wildlife

Results of this study indicated that desert bighorn historically exposed to higher levels of human disturbance are more sensitive to human encounters than are bighorn in relatively undisturbed areas. Eighty three percent of harassment trials elicited flight responses from Red Canyon bighorn compared to 46 percent for White Canyon bighorn. Average distance fled as a result of harassment was approximately 2.75 times greater for Red Canyon bighorn than White Canyon bighorn. Group wariness was exhibited at more intense levels by Red Canyon bighorn than White Canyon when they remained in the presence of harassing stimuli. Activity budgets of harassed animals differed significantly between areas particularly with respect to feeding behaviors. Under harassed conditions, Red Canyon bighorn were at attention longer and fed less than White Canyon bighorn.

Kirby, R.E.

The impact of human activity upon wildlife and wildlife habitat. Statement of work.

Source: Official information transfer, Research and Development, U.S. Fish and Wildlife Service. **Pages:** 3pp. **Date:** 1985

Keywords

human disturbance
soil/vegetation
wildlife

Klein, D.R.

Reaction of reindeer to obstructions and disturbance.

Source: Science (vol.173) **Pages:** 393-398 **Date:** 1971

Reactions of reindeer to snowmobiles in Scandinavia are discussed in this description of human impacts on reindeer. It is suggested that observations of Scandinavian reindeer may aid in managing impacts of industrialization on Caribou in North America.*

Keywords

snowmobile
wildlife

Klein, M.L.

Waterbird behavioral responses to human disturbances.

Source: Wildlife society Bulletin (vol.21) **Pages:** 31-39 **Date:** 1993

Waterbirds were subjected to experimental disturbance at Ding-Darling National Wildlife Refuge in Florida to investigate the effects of human disturbance on waterbird behavior. Refuge visitors were observed and their behaviors were categorized to assess their potential for disturbing wildlife.

Keywords

hike
wildlife
human disturbance
management
recreation

Approaching birds on foot was the most disruptive of the usual activities of refuge visitors. Visitors that spoke to refuge staff were less likely to disturb wildlife. This shows the importance of education in decreasing human-wildlife interactions.

Klinghammer, E.

Man and Animals: Towards a sympatric relationship with wild animals.

Source: IN: C.M. Kirkpatrick, ed Wildlife and People. Proceedings of the **Pages:** 180-187 **Date:** 1978
1978 John S. Wright Forestry Conference, 23-24 February 1978,
Purdue University, West Lafayette, Ind.

Keywords

human disturbance
wildlife

Problems of human-wildlife interactions are discussed in relation to behavior of wildlife and humans. Human attitudes toward animals, responses of animals to humans, and special relationships between humans and animals are discussed. Various options for the management of wildlife in relation to human interests are evaluated.

Knight, R.L.

Responses of Nesting Ravens to People in Areas of Different Human Densities.

Source: Condor (vol.86) **Pages:** 345-346 **Date:** 1984

Knight measured the responses of ravens to investigators in a moderately populated agricultural area and a sparsely populated agricultural area, to determine whether different responses were related to human density and accompanying persecution. The level of human densities, and the frequency and nature of human activities in the nesting area, affect responses of ravens toward human intruders. Ravens nesting in an area of moderate human density and high persecution were more timid and showed stronger avoidance behavior and lower nest defense than ravens in an area of low human density and low persecution.

Keywords

human disturbance
wildlife

Knight, R.L.

Outdoor Recreation: The Highest And Best Use Of Our Public Lands?

Source: Dept. of Fishery and Wildlife Biology Colorado State University **Pages:** 23pp. **Date:** —
Fort Collins, CO 80523

This essay discusses the economic and environmental effects of a growing interest in recreation on public lands. It explores the controversy regarding whether or not recreation is benign, and discusses the responsibilities of managers and recreationists in conserving public parks.

Keywords

human disturbance
wildlife
recreation

Knight, R.L., and D.N. Cole

Effects of recreational activity on wildlife in wildlands.

Source: Transactions of the 56th North American Wildlife and Natural Resources Conference. **Pages:** 238-247 **Date:** 1991

There are four ways in which recreational activities can impact wildlife-harvesting, habitat modification, pollution and disturbance. Immediate responses to recreational disturbance are death and changes in behavior such as abandonment of a preferred site, changes in foraging patterns and food habits, altered nesting behavior, and elevated heart rates. Very little is known about how non-consumptive recreation affects population characteristics. Managers should attempt to keep wildlife impacts to acceptable levels by modifying the factors that influence the nature, frequency and magnitude of responses such as: the type of activity, timing, location, frequency, predictability, and the characteristics of the wildlife being disturbed. This means either controlling recreational disturbance or influencing characteristics of the animals that will increase their tolerance to disturbance.

Keywords

wildlife
recreation
human disturbance

Knight, R.L., and J.Y. Kawashima

Responses of Raven and Red-Tailed Hawk Populations to Linear Right of Ways.

Source: Journal of Wildlife Management **Pages:** 266-271 **Date:** 1993

This study examined the relationship between linear right-of-ways and common raven and red-tailed hawk populations in the Mojave Desert of California by flying helicopter transects along paved highways, transmission powerlines, and control areas. Ravens were equally common along highway and power line transects, but were more abundant along these transects than along controls. Raven nests were more abundant along powerlines than along either highways or controls. Red-tailed hawks and their nests were more abundant along powerlines than along either highway or control transects. Neither species used potential nest or perch sites in proportion to their availability. The data suggests that ravens are more abundant along highways because of automobile generated carrion, whereas both ravens and red-tailed hawks are more common along powerlines because of the presence of superior perch and nest sites. It is recommended that land managers evaluate possible changes in vertebrate populations and community-level interactions when assessing the effects of future linear right-of-way projects.

Keywords

management
wildlife

Knight, R.L., and K.J. Gutzwiller, eds. 1995.

Wildlife and Recreationists: Coexistence Through Management and Research.

Source: Island Press Covelo, CA **Pages:** 348pp. **Date:** 1995

Wildlife recreationists defines and clarifies the issues surrounding the conflict of outdoor recreationists and wildlife. It is a synthesis of what is known concerning wildlife and recreation and addresses both research needs and management options to minimize conflicts.

Keywords

OHV
bike
snowmobile
wildlife
hike
management
recreation

Knight, R.L., and S.K. Skagen

Effects of recreational disturbance on birds of prey: A review.

Source: in: Glinski et al., Eds. Proceedings of S.W. Raptor Management Symposium and Workshop. National Wildlife Federation., Washington, D.C. **Pages:** 355-359 **Date:** 1988

Existing studies were reviewed on the effects of recreational activities on birds of prey. Recreational disturbance was found to alter normal raptor activity patterns by 1)altering the distribution of raptors, 2)causing birds to flush from nests, which can lead to an increase in nest predation, 3)causing abandonment of breeding territories, 4)reducing productivity and 5)affecting foraging behavior.

Keywords

human disturbance
recreation
wildlife

Recreational disturbance of raptors can be mitigated by either completely denying human access to important raptor habitat or by placing spatial or temporal restrictions on recreational disturbances. More studies are needed to make wise management decisions.

Koford, C. B.

The California condor.

Source: National Audobon Society Research Report 4. **Pages:** 154pp. **Date:** 1953

Reactions of nesting adult condors to human disturbance are among behavioral aspects of the California Condor described. Reactions to disturbance vary depending on stage of incubation, time since nesting began, previous disturbance, and other factors. Nesting adults are aware of humans in sight within 500 yards of the nest, and behavior is altered under such conditions. It is impossible to photograph nesting condors without disturbing them.

Keywords

human disturbance
wildlife

Kopischke, Earl D.

Effects of snowmobile activity on the distribution of white-tailed deer in south-central Minnesota, 1971-1972.

Source: Minnesota Game Research Quarterly Progress Reports (32(2)) **Pages:** 139-146 **Date:** 1972

Keywords

snowmobile
wildlife

Kristi Withrow

Tales of Trails

Source: Peak and Prairie. Rocky Mountain Chapter of the Sierra Club **Pages:** 5 **Date:** 1997
Vol. XXII. No. 5. Oct/Nov 1997.

This article discusses some of the impacts of trails on the environment. Trails introduce habitat fragmentation and the edge effect. Trails also aid in the introduction of exotic plant and animal species, as well as the increase in pollution by OHV's. This impact can be reduced by developing trails along established corridors of roads and existing trails and by avoiding sensitive areas.

Keywords

soil/vegetation
wildlife
recreation

Kuss, F. R.

The Effect of Two Hiking Intensities on Wildland Trail Wear

Source: in: Proceedings - National Wilderness Research Conference: **Pages:** 158-165 **Date:** 1986
Current Research U.S. Forest Service, General Technical Report
INT-212:158-165

Keywords

hike
human disturbance

This paper summarizes five years of study designed to quantify the effects of hiking on wildland trails and describes the physical effects of two hiking intensities on experimental trails located in New Hampshire and Virginia.

The effects of hiking experimental trails composed of fine sandy loam soils at two intensity levels equal to 600 and 2400 passes delivered over a six week period were compared in 1978, 1979, 1980 and 1982. Results of six separate experiments indicated erosion of low-intensity hiked plots showed a curvilinear relationship to impacts in the early stages of these experiments. The degree of change in penetration resistance was found to be use-level independent with greatest change occurring under low use. Extent of trail wear as evidenced by the total amount of material eroded from the trails was clearly a function of the total number of impacts. However, this distinction was not expressed until after 800 to 1200 hiking passes had been imposed on fine sandy loam soils. These results were attributed to an initial stabilization of the treadways by the combined effects of compaction and the incorporation of more surface organic matter into these surfaces as a result of the high level of use.

Kuss, F.R.

Hiking boot impacts on woodland trails

Source: Journal of Soil and Water Conservation 38(2):119-121 **Pages:** 119-121 **Date:** 1983

The effects of two types of hiking boots on erosion of woodland trails was compared. Hikers wore conventional lug-soled boots or boots with a corrugated rubber compound sole.

Keywords

hike
soil/vegetation
human disturbance

Kuss, F.R. and C.N. Hall

Ground Flora Trampling Studies: Five Years After Closure

Source: Environmental Management 15(5):715-727 **Pages:** 715-727 **Date:** 1991

Trampling as an ecological factor is a major concern of the management of park, forest, nature preserves, and wilderness areas as recreational resources. Of particular importance to the management concept of carrying capacity is the relative resistance of native plant communities to trampling and the resilience or the capacity of impacted communities to recover. This information can be used by management to establish seasonal use limits to prevent irreversible degradation of these resources. The purpose of this study was to follow the recolonization of experimental trail surfaces barren of vegetative cover and hiked at three levels of use intensity. Results of this study indicate that soil compaction as measured by soil penetration resistance increased progressively with use level while the total number of species, species diversity, and dominant index scores declined. A major finding was that the greatest degree of change occurred at the first level of hiking, indicating that major floristic measures were most affected by the least amount of hiking. Recolonization of impacted areas that received 100 trampling passes as measured by plant cover, dominant indices, floristic dissimilarity, and species diversity was similar to areas receiving four and eight times more trampling, despite major differences in soil penetration resistance. These data suggest limited use delivered at one time can be as damaging as increasing levels of use delivered over time.

Keywords

soil/vegetation

human disturbance

Kuss, F.R. and Jenkins, W.A.

Effects of Footgear Design on Trail Wear: A Summary of Five Years of Research

Source: In: Proceedings: Southeastern Recreation Research Conference - **Pages:** 39-49 **Date:** 1985
1984 Presented Paper Session. University of Georgia, Institute for Behavioral Research

Results of this study indicate that soil consistency is a major determinant influencing trail wear caused by different boot types. Trail wear was assessed in terms of erosion and run-off volume. On trail surfaces where smeary or greasy conditions predominated, greater wear was caused by the Silvato mini-check soled boot. Under conditions where the soil was friable and moist, greater damage to trail surfaces was caused by the conventional lug-soled boot. Incidence of slippage on slippery surfaces was five times greater with the mini-check tread than with the lug-soled boot.

Keywords

soil/vegetation

Leinenger, W.C., G.F. Payne

The effects of off-road vehicle travel on rangeland in Southeast Montana.

Source: Montana Agricultural Experiment Station. Montana State **Pages:** **Date:** 1979
University, Bozeman MT, Research Report 153.

This study looked at the number of impacts as well as the timing of impacts seasonally. In general there is a higher compaction rate on wet soil. A threshold level was observed in the impact range from 8 to 32 passes. Grasses and forbes showed a low agreement with seasonal variation in impact, while shrubs and soil compaction rates showed a high agreement with early seasonal impacts having a greater effect.

Keywords

OHV

soil/vegetation

Lenington, S.

Predators and Blackbirds: The "uncertainty principle" in field biology.

Source: Auk: (vol. 96) **Pages:** 190-192 **Date:** 1979

From field studies in new jersey and a review of literature, the author concludes that human activities, paticularly research activities, significantly increase predation on red-winged blackbird nests. Predators may follow human scents to nests, or repeated flushing of adults may attract predators to nest locations.

Keywords

human disturbance
wildlife

Levenson, H. and J.R. Koplin

Effects of human activity on productivity of nesting ospreys.

Source: Journal of Wildlife Management (vol.48) **Pages:** 1374-1377 **Date:** 1984

Osprey nests were located and checked from the ground in April 1974. A nest was classified as occupied if a pair of ospreys was present and exhibited normal reproductive behavior such as courtship, feeding, and nest building. Human activity within 0.5km of an occupied nest was qualitatively assessed and assigned to one of three categories: 1) no disturbance or minimal disturbance; 2)relatively constant disturbance, present before nesting commenced; 3)no activity observed during the initial check in late April when most ospreys on occupied nests were incubating eggs, but constant and intense activity present from mid-May until the end of the nesting season.

Keywords

human disturbance
management
recreation
wildlife

Researchers found that the average percent of occupied nests producing fledglings and the average number of young fledged per occupied nest declined with increasing recreational activity levels. 73% of occupied nests in category one were successful, but only 27% in category three were successful. At extremely high levels of activity begun after incubation started, most pairs of ospreys were unsuccessful, greatly reducing total productivity.

Liddle, M.J.

Recreation ecology: Effects of trampling on plants and corals. Trends in ecology and evolution.

Source: Ecology and Evolution (vol.6) **Pages:** 13-17 **Date:** 1991

The effects of walking (trampling) on plants and corals are reviewed. Liddle discusses how a plants size, morphology, and anatomy and survival strategies affect its resistance to trampling. Further research needs are suggested. This study is intended to be used by recreation mangers in determining which areas are more sensitive to human disturbance and trampling.

Keywords

soil/vegetation
management
recreation

Light, J.T. Jr.

An ecological view of bighorn habitat on My. San Antonio.

Source: Transactions of the North American Wild Sheep Conference. (vol. **Pages:** 150-157 **Date:** 1971

1)

Ecological analysis of a California bighorn sheep range revealed relationships between bighorn habitat use and human disturbance associated with a ski resort and a summer cabin. It was found that bighorn use did not occur where human use was heavy and sheep were forced into less satisfactory habitats.

Keywords

human disturbance
wildlife

Light, J.T., Jr.

Analysis of bighorn habitat in the San Gabriel Mountains.

Source: Transactions of the Desert Bighorn Council (vol. 17) **Pages:** 53-58 **Date:** 1973

Information is presented on bighorn habitat use and effects of man on bighorn sheep in the San Gabriel Mountains, California. Projected recreation use levels in summer are expected to surpass what bighorns will tolerate, displacing sheep from preferred habitats. Management guidelines proposed for the area include limitations on number of recreationists and the location of travel routes to minimize human-bighorn encounters.

Keywords

human disturbance
wildlife

Light, J.T., Jr.

A progress report on bighorn habitat management in the San Bernadino National Forest.

Source: A progress report on bighorn habitat management in the San Bernadino National Forest. Trans. Desert Bighorn Council (vol. 14) **Pages:** 9-13 **Date:** 1970

Bighorn sheep range in the San Bernadino National Forest, California, is being managed to perpetuate sheep habitat and forest environments along with providing for public recreational opportunities. Proposed expansion of an existing ski area may adversely affect sheep habitat and cause disturbance to the sheep population: impact studies recently initiated will determine impacts and provide measures to protect bighorn habitat and forest quality.

Keywords

recreation
wildlife

Lime, D.W., and G.H. Stankey

Carrying Capacity: Maintaining outdoor recreation quality.

Source: IN: Recreation symposium proceedings, 12-14 October 1971, Syracuse, N.Y. U.S. Forest Service, Northeastern Forest Experiment Station, Upper Darby, Pa. **Pages:** 174-184 **Date:** 1971

Impacts on physical resources are a factor in determining recreational carrying capacity. The abundance, behavior, and survival of wildlife is often influenced by recreational activity.

Keywords

recreation
wildlife

Lodico, N.J.

Environmental effects of off-road vehicles.

Source: Bibliography series No. 29, U.S. Department of the Interior office of library services, Wash. D.C., 20240 **Pages:** 109pp. **Date:** 1973

Technical articles, conferences and symposia, and popular articles concerning environmental effects of off-road vehicle use are reviewed. Effects on animals of snowmobiles, motorcycles, all-terrain vehicles, and four-wheeled vehicles are discussed. A bibliography of 103 citations is included.

Keywords

OHV
snowmobile
wildlife

Losos, E., J. Hayes, A. Phillips, C. Alkire, and D. Wilcove

Taxpayers Double Burden: Federal Resource Subsidies and Endangered Species.

Source: The Wilderness Society's Bolle Center for Ecosystem Management. **Pages:** 95pp. **Date:** 1993

This book outlines the results of a one year study conducted by the Wilderness Society that examined the degree to which resource extraction contributes to the endangerment of plant and animal species and the costs to taxpayers of that damage. The study found that recreational activities, damage 23 to 26 percent of federally listed species. The most destructive types of recreational activity were ORV use and general recreation. Hiking followed next, while boating, swimming, and skiing were infrequently mentioned as causes of endangerment. Section 3 includes a case study on Recreation in Clear Creek Management Area which outlines species endangerment caused by ORV use.

Keywords

hike
OHV
recreation
wildlife

Lucas, R.C.

Impact of human pressure on parks, wilderness, and other recreation lands.

Source: in: K.A. Hammond, G. Macinko, and W.B. Fairchild, eds. **Pages:** 221-239 **Date:** 1978

Sourcebook on the environment: A guide to the literature.
University of Chicago Press, Chicago, Ill. and London, England.

Several selected types of recreational impacts on wildlands and parks are reviewed, including physical and biological changes associated with recreational activities. Most literature reviewed is concerned with impacts on landscapes, vegetation, and soils, but effects of recreation on wildlife are also mentioned.

Keywords

recreation
wildlife

Luckenbach, R.A.

An analysis of off-road vehicle use on desert avifaunas.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol. 43) **Pages:** 157-162 **Date:** 1978

ORV's can directly affect desert birds by nest destruction, crushing of individuals, harassment and noise production which could interfere with territorial establishment and maintenance. Subsequent habitat alteration decreases the overall amount and quality of shelter, foraging areas, perches, nesting sites and materials. Harassment and noise may force a parent to leave an active nest for long periods exposing the young to thermal and water stress. The loss of large tracts of creosote and other habitats along migration routes may interfere with future migration patterns and adversely affect the summer visitant breeding avifauna of the entire Pacific Coast.

Keywords

human disturbance
OHV
wildlife

Concentrating ORV activities in limited areas that have already received impact is viewed as the best alternative for short-term management programs. In addition, seasonal or statutory closures of areas critical to game, raptors, endangered, and nesting-restricted species during breeding and fledging or during peak concentrations would reduce conflict with sensitive species.

Lyons, J.R.

Non-consumptive wildlife associated recreation in the U.S.: Identifying the other constituency.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol. 47) **Pages:** 677-685 **Date:** 1982

Keywords

recreation

MacArthur, R.A., V. Geist, and R.H. Johnston

Cardiac and behavioral responses of mountain sheep to human disturbance.

Source: Journal of Wildlife Management (vol. 46) **Pages:** 351-358 **Date:** 1982

Telemetered heart rates and behavioral responses of mountain sheep were recorded in response to human disturbance in the Sheep River Wildlife Sanctuary in S.W. Alberta. Cardiac and behavioral responses of sheep to an approaching human were greatest when the person was accompanied by a dog or approached sheep from over a ridge. Because the road is the focal point of human activity in the sanctuary, few responses were observed in reaction to traffic or approach by humans walking directly from a parked vehicle. Similarly, there were no responses to helicopters or fixed winged aircraft at distances >400m from the sheep. This shows that wildlife respond to the predictability of humans.

Keywords

hike
human disturbance
management
recreation
wildlife

Makel, W.J.

All-terrain vehicles and trail bikes in the forest: A management approach.

Source: USDA Forest Service Rocky Mountain Forest and Range **Pages:** **Date:** 1988
Experimental Station Library.

This project develops a philosophy for managing trailbikes and ATVs. This philosophy is based upon caring for our natural resources while providing recreational opportunities for ATV and trailbike users. It also makes recommendations for managing this use on the San Bernadino National Forest and offers suggestions on implementing the new policies. It suggests modifications of other resource activities to make them more compatible with ATV and trailbike use and to minimize conflicts.

Keywords

bike
human disturbance
OHV
management
recreation
wildlife

Most of the research conducted on OHV conflicts with wildlife have been concentrated in desert areas rather than forested lands. Research in the California desert indicates that OHV activity affects wildlife by:

1. Direct damage to soil and vegetation--food and cover.
2. Noise harassment of animals--territoriality, courtship, breeding
3. Direct mortality

Birds are apparently one of the most sensitive of the vertebrates to OHV influence. More information is needed on the subject.

Manini, B.P. Neuhaus, and P. Ingold

Behavior of Marmots under the influence of different hiking activities.

Source: Biological Conservation (vol.64) **Pages:** 161-164 **Date:** 1993

The aim of this study was to analyze the response of marmots to the following five types of hiking activities common in alpine regions: trail hiking, cross-country hiking, hiking over areas with burrows, trail hiking with led dogs, hiking with a free-running dog (on a leash).

Keywords

hike
management
recreation
wildlife
human disturbance

Marmots seemed least frightened by the trail hikers. Possibly because behavior of trail hikers is somewhat predictable. In this case, marmots rarely ever took refuge in burrows. This happened more often when the hikers had a led dog or were cross-country hikers. Even more marmots took refuge in their burrows with burrow-hikers or those with free running dogs. After retreating to a burrow because of a cross-country hiker, all marmots had returned within 10 minutes. It took much longer for the animals to reappear after a trail hiker with a dog. The longest intervals were measured after hikers with a free-running dog had passed through the territory.

A comparison of 10 experimental groups shows that whenever a trail hiker, trail hiker with dog, or cross-country hiker passed through their territory, at least one animal resumed foraging within 30 minutes. This happened in only half of the experiments when a hiker with a free running dog was involved.

Warning whistles were almost only emitted in encounters with hikers with dogs. It happened more often in the case of hikers with a free running dog.

March, D., and C. Adams

A front range concept: The need for the Noddles-Rampart-South Platte recreation Area.

Source: Wildlife-2000, Aurora CO. **Pages:** 112pp. **Date:** 1973

Results of a comprehensive study of wildlife, motorized recreation vehicles, and forest management in central Colorado are reported. Impacts of off-road vehicles on wildlife are severe, especially when engine noise is loud. Human recreational activities have accelerated habitat changes which threaten vital watersheds and the wildlife which inhabit them.

Keywords

human disturbance
recreation
wildlife

Mathisen, J.E.

Effects of human disturbance on the nesting of bald eagles.

Source: Journal of Wildlife Management (vol.32) **Pages:** 1-6 **Date:** 1968

Known nests of bald eagles on the Chippewa National Forest were observed to determine nest occupation and nesting success. The nests were divided into three groups reflecting degrees of isolation. Results indicated that human activity at levels existing on the Chippewa is not an important source of disturbance and has no measurable effect on nesting effect or nest occupancy. Most human activity around nest sites in this region occurred during the latter part of the nesting cycle when family ties were strongest. Habitat modified by timber management in the immediate vicinity of nest sites did not appear to affect nesting activity. Failure of eagles to produce young on the Chippewa must be related to some factor other than human disturbance.

Keywords

human disturbance
management
wildlife

Matlack, G.R.

Solid logical edge effects: Spatial distribution of human impacts in suburban forest fragments.

Source: Environmental Management (vol. 17) **Pages:** 829-835 **Date:** 1993

Distributions of human impact were described in 40 fragmentary stands in northern New Castle County, Delaware. The distribution of human impact showed a significant bias to the forest edge, with 95% of the localized damage occurring in the first 82 meters. Edge distances of campsites, vandalized trees, and firewood gathering were negatively correlated with distance to the nearest graded road, indicating the importance of road access. Several forms of impact were also clustered near footpaths, although distance to paths was independent of edge distance in all cases. These findings suggest that damage may be minimized by limiting road access and avoiding the creation of small forest fragments.

Keywords

human disturbance
recreation

McCool, S.F.

Snowmobiles, animals, and man: Interactions and management issues.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol. 43) **Pages:** 140-148 **Date:** 1978

Decisions regarding the opening, closing, or restricting of lands to snowmobile and other off-road vehicle use appears to be more a function of intuitive managerial expertise and judgment and political pressure than a direct result of systematic problem-driven research. Existing research on snowmobile-wildlife impacts has been unable to produce a consensus on the impacts of the activity on a wildlife population. The snowmobile problem results from human behavior and the way humans use snowmobiles. Understanding why humans use snowmobiles, perhaps even to the point of finding effective and acceptable recreational experiences.

Keywords

human disturbance
management
snowmobile
recreation
wildlife

McEwen, Douglas N.

Turkey Bay Off-Road Vehicle Area at Land Between the Lakes: An example of New Opportunities for Managers and Riders.

Source: South Illinois University at Carbondale Dept. of Recreation, **Pages:** 28pp **Date:** 1978
Research Report No. 1.

The Turkey Bay OHV area has developed a plan to monitor the impact of off-road vehicles on wildlife, soil and vegetation. The plan was conducted over a five year period. No significant impact was found. More changes occurred in this particular forest as a result of mowing and logging activities. No definite conclusions can be made on the impact of OHV use on wildlife productivity, more data is needed. However, researchers can conclude that there have been no large migrations from the area, and that there is still a great variety of animals that inhabit Turkey Bay.

Keywords

wildlife
OHV
soil/vegetation
management
human disturbance
recreation

McLellan, B.N. and D.M. Shackleton

Immediate reactions of grizzly bears to human activities.

Source: Wildlife Society Bulletin (vol.17) **Pages:** 269-274 **Date:** 1989

Reactions of grizzly bears to human activities were studied between 1979 and 1986 in the North Fork of the Flathead River Drainage of southeastern British Columbia and Northern Montana. Bears responded more strongly to ground-based human activities, such as people on foot or moving vehicles, when in the open than when in cover. Cover had less effect on their response to fixed-wing aircraft. Bears generally displayed stronger reactions to human activities, other than to people on foot, that occurred <76 meters than farther away. The strongest response of bears to people was on foot, and these actions were most extreme in areas of low human use.

Keywords

human disturbance
wildlife

McQuaid-Cook, J.

Effects of Hikers and Horses on Mountain Trails

Source: Journal of Environmental Management, 6:209-212 **Pages:** 209-212 **Date:** 1977

Intensive recreational use of an area by hikers or horses will cause considerable damage to the soil, vegetation and aesthetic qualities. Trampling by hikers causes extreme soil compaction on level sites and initiates accelerated gully erosion on slopes. Horses tend to loosen and move soil causing deep gullies on slopes; but, damage by horses on level sites is considerably less than caused by hikers.

Keywords

management
recreation

McReynolds, H.E. and R.E. Radtke

The impact of the motorized human on the wildlife of forested lands.

Source: IN: C.M. Kirkpatrick, ed. Proceedings Wildlife and People. Purdue Research Foundation, West Lafayette, IN. **Pages:** 102-117 **Date:** 1978

Effects of off-road vehicles on wildlife of forested lands are reviewed. Cases for and against the use of snowmobiles, motorcycles, and four-wheel drive vehicles in forests are presented. Few reliable data on off-road vehicle impacts on wildlife are available, but it is probable that indirect effects and unintentional harassment of wildlife have produced the greatest damage.*

Keywords

OHV
wildlife

Michael, Edwin D.

Effects of Highways on Wildlife.

Source: Division of Forestry. West Virginia University Morgantown, West Virginia 25305 **Pages:** 89 **Date:** 1976

Field studies were conducted in Coopers Rock State Forest, north West Virginia, to measure the impact of Appalachian Highway 48 on wildlife populations. Field data were collected from 1971 to 1975. Changes in population densities were monitored by recording direct sightings of the highway resulted in the creation of two new habitats which were not previously present: The right-of-way vegetation and ecotone. Responses of small mammals and song birds to these new habitats are discussed. Populations of some animals increase following highway construction while others decrease. Responses of major game animals are discussed. No game animal seemed to exhibit a change in distribution as a result of the highway being constructed. Also, no change in population density could be attributed to the presence of the highway. Recommendations are given regarding future research on the topic.

Keywords

human disturbance
wildlife

Miller, Clint K.

Environmental Impacts of passive recreational trails in riparian areas.

Source: Sixth Annual Colorado Riparian Association Conference, Alamosa, **Pages:** 1-7 **Date:** 1994
CA.

This article discusses the impacts of recreational trails in riparian areas such as the edge effect, and habitat fragmentation. It also discusses trail management alternatives available to resource managers.

A table was constructed showing short term and long term impacts on vegetation and wildlife.

Keywords

bike
hike
wildlife
management
recreation
human disturbance

Miller, S.G. and R.L. Knight

Wildlife Responses to Pedestrians and Dogs.

Source: Department of Fishery and Wildlife Biology, Colorado State **Pages:** — **Date:** —
University, Fort Collins, CO 80523

(Abstract contains initial results. The results continue to be analyzed and refined prior to publication.) The responses of two grassland passerines, one forest passerine, and one large mammal exposed to recreational treatments both on and off-trail, including a pedestrian alone, a pedestrian accompanied by a dog-on-leash, and a dog alone, were measured. The responses measured included flush response, flush distance, and distance of flush. All wildlife species in the study exhibited greater responses when the treatment occurred off-trail than when on-trail. In the grasslands, the dog-alone treatment elicited the least response by vesper sparrows and western meadowlarks, whereas pedestrian-alone and pedestrian accompanied by dog-on-leash elicited greater responses. In the forest, American robins responded similarly to a pedestrian alone and a pedestrian accompanied by dog-on-leash. Mule deer exhibited the greatest response when a pedestrian was accompanied by a dog. The results have important implications for the design and implementation of management policies, such as using spatial and behavioral restrictions, to ensure the coexistence of wildlife recreationists.

Keywords

human disturbance
wildlife
hike
recreation

Miller, Scott. G., and Richard, L. Knight

Recreational Trails and Avian Communities

Source: Knight: Dept. of Fishery and Wildlife Biology Colorado State **Pages:** **Date:** —
University Fort Collins, CO 80523
Miller: Dept. of Open Space 66S. Cherryvale Road Boulder, CO
80303

The influence of trails on breeding bird communities in forest and mixed-grass prairie ecosystems in Boulder County, Colorado was investigated during 1994 and 1995. Species composition was altered due to the presence of trails in both ecosystems. Generalist species were more abundant near trails and some species were displaced away from trails. Within the grassland ecosystem, birds were less likely to nest near trails. Within both ecosystems, rate of nest predation was greater near trails. No brown-headed cowbird parasitism was found in the grassland ecosystem. In the forest ecosystem, rate of nest parasitism was not influenced by trails.

Keywords

wildlife
recreation

Moen, Aaron, N.

Effects of disturbance by snowmobiles on heart rate of captive white-tailed deer.

Source: New York Fish and Game Journal (vol.29(2)) **Pages:** 176-186 **Date:** 1982

Captive white-tailed deer exhibited increased heart rates in response to controlled tests of the effect of disturbance by snowmobiles conducted from December through March.

Keywords

snowmobile
management
human disturbance
wildlife

Initial heart rate responses to the starting of the snowmobile and responses to its moving by indicated that deer can react to stimuli without changes in their overt behavior. When the snowmobile circled the pen, the deer showed greater heart rate and behavioral responses. Other deer in the yard also showed greater fright responses when the snowmobile approached them directly than when it moved tangentially to their activity area.

Moen concluded that, the increase in heart rate and additional movements caused by encounters with snowmobiles increase rather than decrease energy expenditures by deer. Such increases have the potential to affect productivity of individuals and, ultimately, of the population. Management should take into consideration the basic biological characteristics of wildlife species. It is evident that disturbance by snowmobiles is contrary to long-term energy-conservation adaptations of white-tailed deer.

Morgantini, L.E., and R.J. Hudson

Human disturbance and habitat selection in Elk.

Source: in: M.S. Boyce and L.D. Hayden-Wing eds. North American elk: **Pages:** 132-139 **Date:** 1980
ecology, behavior and management. University of Wyoming,
Laramie.

Keywords

OHV
wildlife
human disturbance
recreation

Studies of big game habitat selection in Alberta showed that behavioral factors including human disturbance can affect habitat selection. Heavy use of marginal sectors of potentially available habitat and occasional spatial overlap with bighorn sheep appeared to be a direct result of human activity, particularly vehicular activity and hunting.*

Mortensen, C.O.

Visitor use impacts within the Knobstone Trail Corridor

Source: Journal of Soil and Water Conservation 44(2):156-159 **Pages:** 156-159 **Date:** 1989

All impacts of visitor use within the corridor of the 93-km-long (58-mile) Knobstone Hiking Trail in southern Indiana were systematically evaluated. On an areal basis, camping impacts were not extensive. When present, these impacts affected the trail environment through increased soil compaction and exposure, tree wounds, floristic dissimilarity, loss of duff, and site development. The most striking impact was pervasive dissimilarity, loss of duff, and site development. The most striking impact was pervasive damage by off-road vehicles, including tread widening, entrenchment, and soil exposure.

Keywords

soil/vegetation

Murphy, J.R.

Nest site selection by the bald eagle in Yellowstone National Park.

Source: Utah Acad. Sci. Arts Let. Proc. 42(Part 2) **Pages:** 261-264 **Date:** 1965

Along with proximity to water and food sources, human disturbance is suggested as an important factor determining bald eagle nest site selection in Yellowstone National park. Instances of apparent disruption of bald eagle nesting by human intrusions are cited.

Keywords

human disturbance
wildlife

Neil, P.H., R.W. Hoffman, and R.B. Gill

Effects of harassment on wild animals--an annotated bibliography of selected references.

Source: Colorado Division of Wildlife. Special report number 37. State **Pages:** 21pp. **Date:** 1975
publication code W-R-S-37-'75

This is a compilation of 68 annotated references dealing with some of the many forms of harassment of wild animals and birds in their natural habitats. Emphasis in this bibliography is principally on the effects of off-the-road vehicles, free-roaming pets, urbanization and other habitat alterations, and hunting.

Keywords

human disturbance
wildlife

Neumann, P.W., and H.G. Merriam

Ecological Effects of Snowmobiles

Source: Canadian Field Naturalist (vol. 86) **Pages:** 207-212 **Date:** 1972

Studies in Ontario showed that snowmobile use caused significant changes in snow structure and wildlife behavior. Snow structural changes by snowmobiles had significant effects on temperature gradients, water holding capacity and melting rate. Snowshoe hare and red fox mobility and distribution also were effected. Snowmobile damage to hardwood saplings and planted pines was significant. Browsing was unaffected except to damaged saplings.

Keywords

snowmobile
soil/vegetation
wildlife

Neumann, Peter W. and H. Gray Merriam

Ecological effects of snowmobiles.

Source: Canadian Field Naturalist (vol. 86) **Pages:** 207-212 **Date:** 1972

Keywords

snowmobile
soil/vegetation
wildlife

Noake, D.W.

Camping as a factor in the ecological impact of tourism and recreation.

Source: in: Towards a new relationship of man and nature in temperate lands. Part 1: Ecological impact of recreation and tourism upon temperate environments. Intl. Union Conserv. Nat. publ. New Ser. 7. Morges, Switzerland. **Pages:** 224-229 **Date:** 1967

Keywords

soil/vegetation
recreation
wildlife

Camping has become a major part of tourism and recreation in recent years. Many modern campers seek only inexpensive vacations or overnight accommodations, harboring little interest in nature. Terrain damage, soil and water pollution, and disruption of peripheral natural habitats are frequent results of excessive camping pressure. Wildlife can be exposed to harmful substances in trash and debris left at campsites, or suffer further harassment from campers or their pets.*

Noe, F.P., W.E. Hammitt, and R.D. Bixler

Park User Perceptions of Resource and use Impacts under Varied Situations in Three National Parks.

Source: Journal of Environmental Management (vol 49 (3)) **Pages:** 323-336 **Date:** 1995

“On-site user perceptions of resource and use impacts were investigated at three national parks in the southeastern United States. The major purpose of this research was to investigate the symbolic meaning that different groups of park visitors assign to specific impact situations, involving the perception of five categories of impacts: litter, erosion, dead trees and animals, crowding and congestion, and commercial encroachment. Respondents were asked to rate the degree of acceptance/unacceptance for the five types of impacts that exist in various settings and conditions. An on-site intercept interview and mail questionnaire resulted in 971 cases for analysis. Results indicated that park user perceptions and tolerance for impacts vary widely, and that within changing situations there are degrees of acceptability and unacceptability. Finally, there are margins of relative differences between clustered groups of respondents and how they respond to impact situations.” (Noe, Hammit, Bixler, 1995, p.323)

Keywords

soil/vegetation
recreation
wildlife

Noss, Reed

The Ecological Effects of Roads.

Source: Road-Rippers Handbook. P.O. Box 7516 Missoula, MT 59807 **Pages:** 2-12 **Date:** 1996

Ecological impacts of roads on wildlife are reviewed. There are both direct and indirect effects of roads. Direct effects include: roadkills, road aversion and other behavioral modifications, the fragmentation and isolation of populations, increased pollution, impacts in terrestrial habitats (habitat loss, spread of exotics, edge effects), and impacts on hydrology and aquatic habitats (increased erosion and sediment loads). Indirect effects include increased access by humans which often leads to the overcollecting of rare plants or wood for fires, an increase in wild fire, and development.

Keywords

OHV
human disturbance
recreation
wildlife

Olsen P. and J. Olsen

Alleviating the impact of human disturbances in the breeding peregrine falcon. II. Public and recreational lands.

Source: Corella (vol.4) **Pages:** 54-57 **Date:** 1980

The impact of ornithologists (including photographers, egg collectors, and bird watchers) on nesting peregrine falcons is discussed. Suggestions are made for minimizing bias in field studies due to disturbance and for alleviating breeding disruption. In planning parks, etc., roads and nature trails should be located in areas of least disturbance to all fauna and the public educated about the impact of disturbance and how to avoid it.

Keywords

human disturbance
wildlife

Owens, N.W.

Responses of wintering Brent Geese to human disturbance.

Source: Wildfowl (vol.28) **Pages:** 5-14 **Date:** 1977

This paper describes the effects of human disturbance on Dark-bellied Brent Geese wintering in Essex in 1973-1974 and 1974-1975 in terms of: a) the restriction of feeding area; b) the effects of feeding behavior and fighting.

Keywords

human disturbance
wildlife

Page, P.J.

Special wildlife investigations: Second progress report of the San joaquin River rookery study.

Source: California Dept. Fish Game Project 17-054-R-03/WP03/J05/SP2 **Pages:** 25pp. **Date:** 1971

(MIN 047380842]

Keywords

Human disturbance and adverse weather reduced nesting success of great blue herons on the San Joaquin Ricer in California. The presence of fishermen caused herons to abandon nests. A case of fledgling mortality due to disturbance by the investigators is recorded.

human disturbance
wildlife

Palmer, Don

Developing Mountain Bike (non-motorized) Opportunities on the Pisgah Ranger District.

Source: Clemson University. Program for Outdoor Recreation Management. **Pages:** 20pp **Date:** 1991

Prepared for: USDA-Forest Service Pisgah Ranger District, NC

Keywords

The primary objectives of this project are to: 1) establish criteria which can be used to plan and monitor the environmental, safety, and social effects of mountain bikes on previously hiker-only trails; 2) develop user-friendly questionnaires and monitoring forms that can be used by all levels of the agency; 3) implement a 5-year monitoring program (1991-1995) to verify or modify the criteria; 4) determine the type of visitors using our trails, their expectations and experience level; 5) meet the monitoring requirements established in the district recreation plan; 6) publish the final product as a "Pocket Guide for Land Managers", to be used for planning and monitoring mountain bike opportunities, primarily on previously hiker-only trails.

bike
management

Paynter, R.A., Jr.

Clutch-size and egg mortality of Kent Island eiders.

Source: Ecology (vol.32) **Pages:** 497-507 **Date:** 1951

In a study of nesting eiders on Kent Island, New Brunswick, human disturbance of eiders appeared to increase mortality of eggs. Presence of the researcher caused eiders to temporarily abandon nests, leaving eggs vulnerable to predation by gulls.

Keywords

human disturbance
wildlife

Pedersen, R.J.

Management and Impacts of Roads in Relation to elk populations.

Source: Conference Proceedings: Recreational Impact on Wildlands. Oct. **Pages:** Date: 1978
27-29, 1978 Seattle, WA.
U.S. Forest Service No. R-6-001-1979.

Keywords

human disturbance
wildlife

Wildlife managers need to understand the effects of harassment on survival, growth, behavior, and reproductive success of wild animals. Harassment may be defined as any activity which increases the physiological cost of survival or decreases reproduction.

Roads have become a subject of controversy with respect to many aspects of land management. Roads affect elk by directly removing habitat from production and indirectly producing vehicle disturbance. A single land road 6.7 m wide removes 1.1 ha per mile from elk production. A double lane road 10.36 m wide removes 1.7 ha per mile from elk production.

Elk were documented to move 250 m to 4 km from logging and road construction. Elk use out to 804.6 m declined 154 percent for main roads, 108 percent for secondary roads, and 33 percent for primitive roads. Using 250 m as the zone adjacent to roads avoided by elk, 80.6 ha of habitat is removed from elk production.

There is a need to create an awareness in relation to environmental effects and an urgent need to consider roads in terms of long range productivity.

Pelton, M.R.

Use of foot trail travelers in the Great Smoky Mountains National Park to estimate black bear (*Ursus americanus*) activity.

Source: IN: S. Herrero, ed. Bears--their biology and management. Second **Pages:** 36-42 **Date:** 1972
International Conference on bear Research and Management, 6-9
November 1970, Calgary, Alberta. IUCN Publ. New Ser. 23,
Morgs, Switzerland.

Keywords

human disturbance
wildlife

Index trails were hiked by researchers to collect data on bear activity in Great Smoky Mountains National park. Additional data were collected from bear survey forms distributed to back packers. While bear activity appeared to be independent of visitor use on a park-wide scale, local densities of bears seemed to be affected by people. Visitors and poachers are probably the greatest factors influencing bear concentrations.

Penland, S.T.

The natural history and current status of the Caspian Tern (*Hydroprogne caspia*) in Washington State.

Source: M.S. Thesis. University of Puget Sound, Tacoma, Wash. **Pages:** 101pp. **Date:** 1976

Status, distribution, and aspects of biology of the Caspian tern were studied in Washington State. Human activity, affecting terns directly and indirectly, appears to be the greatest hazard to tern survival. Nest abandonment in response to disturbance was observed; mortality of eggs and especially chicks due to human presence can seriously impair the breeding success of the colony. Management recommendations are suggested.

Keywords

human disturbance
wildlife

Penny, J.R.

Off-road vehicles on the public lands in California.

Source: IN: M. Chubb, ed. Proceedings of the 1971 Snowmobile and Off Road Vehicle Research Symposium, 14-15 June 1971, East Lansing, Mich. Michigan State University, East Lansing Dept. Park Recr. Resour. Tech Report 8.

Keywords

OHV
wildlife

Among effects of off-road vehicle use cited are impacts on desert bighorn sheep and the destruction of nests of upland game birds. Management problems and potential solutions are discussed.

Piatt, J.F., and B.D. Roberts, W.W. Lidster, J.L. Wells, and S.A. Hatch

Effects of human disturbance on breeding least and crested auklets at St. Lawrence Island, Alaska.

Source: Auk (vol. 107) **Pages:** 342-350 **Date:** 1990

Keywords

human disturbance
wildlife

Researchers measured the effect of human disturbance on auklet breeding success, and identified natural sources of egg mortality on St. Lawrence Island, Alaska in 1987. Selected Least auklet study plots were subjected to three levels of disturbance. Because fewer crested auklets were found, they were studied at only one level of disturbance. Least Auklets had higher breeding success on control plots than on disturbed plots. Crested auklets had a breeding success of 42% on disturbed plots. Predation by rodents and weather accounted for most natural chick mortality.

Pomerantz, G.A., D.J. Decker, G.R. Goff, and K.G. Purdy

Assessing impact of recreation and wildlife: a classification scheme.

Source: Wildlife Society Bulletin (vol.16) **Pages:** 58-62 **Date:** 1988

Keywords

management
wildlife
recreation

The authors developed a classification of impacts that recreational activities can have on wildlife which can be used as framework for making decisions regarding the permissibility of various recreational uses of wildlands. Negative impacts were classified into the following six categories: 1) Direct mortality, 2) Indirect mortality, 3) Lowered productivity, 4) Reduced use of refuge, 5) Reduced use of preferred habitat, 6) Aberrant behavior or stress.

Poole, A.

The effects of human disturbance on osprey reproductive success.

Source: Colonial Waterbirds (vol.4) **Pages:** 20-27 **Date:** 1981

Keywords

human disturbance
wildlife

The effects of three types of human disturbance on the reproductive success of two coastal populations of nesting Ospreys are analyzed: visits to nests by researchers, the trapping of breeding adults, and non-investigator human activity in the vicinity of nests. No correlation existed between increasing numbers of brief nest visits and reproductive success. Likewise, no significant differences were found in the number of young/active of successful nest between nests visited two or more times and those checked only from a distance by aerial survey. Limited data suggest that Osprey young are perhaps vulnerable to research disturbance during fledging and that climbing nest trees and poles in areas that harbor raccoons may increase predation. The trapping of nesting adult Ospreys, using appropriate methods and timing, did not adversely effect either their reproductive success or the growth of their young. Similarly nests exposed to fairly continuous human activity in their vicinity produced young a rates equivalent to wilderness nests.

Portnoy, J.W.

Some ecological and behavioral aspects of a nesting population of red-shouldered hawks (*Buteo lineatus lineatus*).

Source: M.S. Thesis. University of Massachusetts, Amherst. **Pages:** 61pp. **Date:** 1974

Hawks reacted to human disturbance during incubation by abandoning clutches at four nests. A hypothesis is presented linking an apparent decline of red shouldered hawks to factors including sensitivity to human disturbance during nesting.

Keywords

human disturbance
wildlife

Purdy, K.G., and W.W. Shaw

Recreational use of desert bighorn habitat in Pusch Ridge Wilderness.

Source: Trans. Desert Bighorn Council (vol.24) **Pages:** 52-56 **Date:** 1980

Preliminary results are reported of research in progress concerning recreation impacts on bighorn sheep in Arizona. The study seeks to quantify recreation use, determine interactions of recreationists and sheep, and assess impacts.

Keywords

recreation
wildlife

Quinn, N.W. and R.P.C Morgan

Simulation of soil erosion induced by human trampling

Source: Journal of Environmental Management, 10:155-165 **Pages:** 155-165 **Date:** 1979

Previous work on soil erosion induced by human trampling has concentrated on damage to vegetation cover to the virtual exclusion of studies on the mechanics of the processes involved and the measurement of soil loss and run-off. The results show that most damage to vegetation by walking arises from compaction by the heel in the early part of each step and shearing by the toe action at the end of each step. The shearing action is the most important, and , within the 5 degree to 20 degree range of slopes studied, has its greatest effect on the steeper slopes. The breakdown of the soil by trampling occurs whilst wear of vegetation is still in progress, and not, as previously thought, after the vegetation cover has disappeared. Thus, by the time there is visual evidence of declining plant cover, the critical period in which erosion is initiated is already past.

Keywords

hike
soil/vegetation
human disturbance

Ream, C.H.

Impact of backcountry recreationists on wildlife: an annotated bibliography.

Source: USDA General Technical Report INT-84 **Pages:** **Date:** 1980

This bibliography includes papers that:1) Describe the interaction or recreationists with some species of wildlife in a natural setting; or 2) Present research findings or techniques that could be used to reduce man's impact on wildlife. Recreation--skiing, backpacking, hiking, photography, and bird watching--was considered "backcountry" where it affected wildlife in natural, undeveloped areas whether they were wilderness as defined in the 1964 Wilderness Act or lightly roaded. However, the emphasis was on lands that were not heavily used by motorized vehicles.

Keywords

bike
hike
human disturbance
management
recreation
wildlife

Ream, C.H.

Human-wildlife conflicts in backcountry: Possible solutions

Source: in: Conference proceedings: Recreational impacts on wildlands. **Pages:** 153-163 **Date:** 1979
U.S. Forest Service No. R-6-001-1979.

Biological, sociological, managerial, and popular literature was reviewed to identify the extent of human impacts on wildlife in the backcountry and some possible solutions. The major impact often results from passive recreationists who unintentionally produce stressful situations for wildlife. Possible solutions include people management, wildlife management, and habitat modification.

Keywords

hike
wildlife
management
human disturbance
recreation

Reeves, R.H.

Wild turkey management in Arizona.

Source: Proc. Annu. Conf. West. Assoc. State Fish Comm. (32) **Pages:** 106-109 **Date:** 1952

In a general discussion of management and research on wild turkeys in Arizona, human disturbance of nests is listed among detrimental effects of human activities on turkey populations.

Keywords

human disturbance
wildlife

Retfalvi, L.I.

Breeding behavior and feeding habits of the bald eagle (*Haliartus leucocephalis* L.) on San Juan Island, Washington.

Source: M. For. Thesis. University of British Columbia, Vancouver. **Pages:** 180pp. **Date:** 1965

Studies of the bald eagle breeding behavior in Washington determined reasons for the general decline in eagle numbers. Eagles subjected to prolonged human presence appeared to become accustomed to humans, and were less easily frightened from nests by human presence. Disturbance by interested tourists and the author may have been responsible for some nest abandonments, but the destruction of habitat poses the greatest threat to the bald eagles.

Keywords

human disturbance
wildlife

Reynolds, H.V., III

Population studies of the golden eagle in south central Montana.

Source: M.S. Thesis University of Montana, Missoula **Pages:** 69pp. **Date:** 1969

During population studies of golden eagles in Montana, effects of human disturbance on nesting eagles were assessed. Comparisons of data from different years when intensity of human disturbance varied suggest that banding activities and repeated visits to nests did not influence eagle nest occupancy or productivity.

Keywords

human disturbance
wildlife

Richens, V.B., and R.G. Lavigne

Response of white-tailed deer to snowmobiles and snowmobile trails in Maine.

Source: Canadian Field Naturalist (vol. 92) **Pages:** 334-344 **Date:** 1978

The use of a 17km snowmobile trail system by white-tailed deer was studied during three winters (1972-1975) in Somerset County, Maine. Use was significantly correlated with deer density and with winter severity. Temperature, wind, snowfall, and deer sinking depth in snow was used as the winter-severity index. Most deer followed snowmobile trails for short distances and used them near major bedding areas. Disturbance of deer by snowmobiles did not cause them to abandon preferred bedding and feeding sites. Sinking depth of deer on snowmobile trails was significantly less than off trails. They traveled and fed along 9.1 km of snowmobile trails made in openings adjacent to existing concentration areas. white-tailed deer response to snowmobile trails varied with time of day, cover type, proximity to deer trails, snow depth, and deer sinking depth but not with temperature or group size. There is some evidence that deer habituate to judicious use of snowmobiles. Deer management could be enhanced by use of snowmobiles.

Keywords

OHV
snowmobile
wildlife
management
human disturbance
recreation

Riegelhith, R.

Grizzly bears and human visitation.

Source: M.S. Rep. Colorado State University, Fort Collins **Pages:** 80pp. **Date:** 1966

Data obtained by questionnaire responses from 16 parks and wilderness areas indicated that backcountry use by non-hunting recreationists is not an important factor in grizzly bear survival. Besides attraction to garbage dumps, respondents reported no increased grizzly use of visitor concentration areas. Unprovoked grizzly attacks on humans are always possible, though extremely rare.

Keywords

human disturbance
wildlife

Robbins, C.S.

Effects of forest fragmentation on bird populations.

Source: in: R.M. DeGraaf and K.E.Evans, eds. Management of north central and northeastern forests for non-game birds. U.S. Dept. Agric. For. Serv. Gen Tech. Rep. NC-51. **Pages:** 198-212 **Date:** 1979

Many of the insectivorous songbird species that winter in the tropics are dependent on large unbroken tracts of forest during the breeding season. These species are disappearing from localities where forests are becoming fragmented. By long-range planning, managers can prevent local extinctions of these area sensitive birds through use of such techniques as management in large units, retention of connecting corridors, and prevention of excessive isolation of forest fragments. Edge conditions can be provided, where appropriate to meet the needs of upland game species.

Keywords

management
wildlife

Robert, H.C., and C.J. Ralph

Effects of human disturbance on breeding success of gulls.

Source: Condor (vol.77) **Pages:** 495-499 **Date:** 1975

The effects of human disturbance were studied in 1968 on parts of a single colony of gull on Southeast Farallon Island, CA. Disturbances usually consisted of one person walking slowly in the study plot for about 30 minutes. This study suggests that under defined conditions, the presence of an investigator can be detrimental to breeding success. Hatching failure was found to be directly proportional to the amount of disturbance in a plot. However, mortality of young was inversely proportional to the amount of disturbance. This mortality was apparently the result of occasionally disturbed chicks reacting to the presence of the investigator by running into other territories and being attacked by adults. Young gulls that were more frequently disturbed were less frightened, and less subject to attack by adults. Overall mortality of young, comparing the completely undisturbed plot with the disturbed plot, was higher on the disturbed plot.

Keywords

management
human disturbance
wildlife

Robertson, R.J., and N.J. Flood

Effects of recreational use of shorelines on breeding bird populations.

Source: Canadian Field Naturalist (vol.94) **Pages:** 131-138 **Date:** 1980

Studies at six lakes in southern Ontario investigated effects on breeding birds of disturbance caused by recreational use of shorelines. Levels of disturbance were rated according to density of cottages, proximity of roads, and boat traffic adjacent to the shorelines. Disturbed areas had more birds but lower species diversity than more natural areas.*

Keywords

human disturbance
recreation
wildlife

Rost, G.R.

Response of deer and elk to roads.

Source: M.S. Thesis. Colorado State University, Fort Collins. **Pages:** 51pp. **Date:** 1975

Responses of deer and elk to roads on winter ranges in Colorado were studied by counting fecal pellet groups along transects perpendicular to roads. Deer and elk apparently avoided areas near roads, particularly areas within 200 meters of roads. Deer avoided even dirt roads, some of which were used only by four-wheel drive vehicles, trail bikes, and hikers.

Keywords

recreation
wildlife

Russell, D.

Occurrence and human disturbance sensitivity of wintering bald eagles on the Sauk and Suiattle Rivers, Washington.

Source: Proceedings of the Washington Bald Eagle Symposium (vol. 1). **Pages:** **Date:** 1980

Wintering bald eagles were censused on the Sauk and Suiattle rivers during the winter of 1979-80 to provide baseline data on numbers and distribution. A rubber raft mode of censusing was used on these little studied and somewhat inaccessible rivers. Concurrent with censusing, preliminary human disturbance tolerance was measured as represented by the flushing response of eagles to the census raft. Eagles utilizing river stretches with lower levels of human activity showed significantly higher sensitivity to human disturbance.

Keywords

OHV
management
wildlife

Russell, H.

The environmental consequences of the off-road vehicle: with profiles of the industry and the enthusiast.
Source: Defenders of Wildlife and Friends of the Earth, 2000 N. ST. Wash, **Pages:** 36pp. **Date:** 1974
D.C. 20336

Keywords

OHV

Sachet, G.A.

Integrated Trail Planning Guidelines for Wildlife Recreation, and fish resources on Mount Hood National Forest.

Source: Professional Development for Outdoor Recreation Management **Pages:** 56 **Date:** 1990
Program, Clemson University

The goal of this project was to fully integrate recreation, fish, and wildlife resources on the Mt. Hood National Forest into trail planning. A secondary, but less explicit goal was to demonstrate that protecting fish and wildlife, and providing recreational experiences are mutually beneficial. These goals were achieved by reviewing the current literature on fish, wildlife, and recreation interactions; Identifying key fish and wildlife species, and sensitive habitats on the Mt. Hood National Forest; Developing trail planning guidelines that address critical needs of key fish and wildlife species, sensitive habitats and trail users; Developing trail planning guidelines that emphasize trail users' needs, positive fish and wildlife interactions with trail users, and interpretive opportunities; Identifying monitoring procedures to validate assumptions concerning wildlife, fish, and recreationists needs, and test the effectiveness of trail planning guidelines.

Keywords

management
recreation
wildlife

Satchell, J.E.

The effects of recreation on the ecology of natural landscapes.

Source: European committee for the Conservation of nature and natural resources, Council of Europe, Nat. Environ. Ser. 11. **Pages:** 117 **Date:** 1976

This report reviews European literature concerning public recreational demand, the effects of recreation on natural ecosystems, and the management strategies for minimizing impacts of public pressures. Discussions include recreational impacts on wildlife of coastal, grassland, mountain, forest, and other ecosystems. The concept of carrying capacity and case studies of impact management in Europe are described.*

Keywords

soil/vegetation
recreation
wildlife

Sather, J.H.

Wildlife survey and investigations: Muskrat investigations.

Source: Neb. Game Parks, Comm. Project W-015-R-08/WP13. (MIN **Pages:** 11pp. **Date:** 1952
267480399)

During population studies of muskrats in Nebraska, behavioral responses of female muskrats were noted. Adult females that were disturbed while suckling young attempted to deposit the young on separate feeding platforms.

Keywords

human disturbance
wildlife

Schmid, W.D.

Modification of the subnivean microclimate by snowmobiles.

Source: in: A.O. Haugen, ed. Proc. of the snow and Ice in relation to Wildlife and Recreation Symposium, 11-12 Feb. 1971, Ames, Iowa. Iowa Coop. Wild. Res. Unit, Iowa State University, Ames.

Pages: 251-257pp **Date:** 1971

Keywords

snowmobile
wildlife

Compaction of snow by snowmobiles alters the mild subnivean microclimate and promotes densification of snow. The stress of winter temperatures may increase for organisms that live within or beneath compacted snowfields.

Schmid, W.D.

Snowmobile activity, subnivean microclimate and winter mortality of small animals.

Source: Bull. Ecol. Soc. Am (vol.53(2)) **Pages:** 37 **Date:** 1972

Keywords

snowmobile
wildlife

Mechanical compaction of snowfields by snowmobiles alters the mild subnivean microclimate and promotes densification of snow. The stress of winter temperatures may increase for organisms that live within or beneath these compacted snowfields and the densified snow may be a greater barrier to animal movement in the subnivean space. Experimental manipulation of a snowfield has shown that the winter mortalities of small mammals are markedly increased under snowmobile compaction. We recovered none of the twenty-one marked animals from the experimental plot, whereas eight of eighteen marked specimens were captured at least once on an adjacent control plot.

Schmidly, D.J., and R.B. Ditton

Assessing human impacts in two national park areas of western Texas.

Source: Conference Proceedings: Recreational Impact on Wildlands. Oct. 27-29, 1978 Seattle, WA. U.S. Forest Service No. R-6-001-1979. **Pages:** 139-152 **Date:** 1978

Keywords

human disturbance
soil/vegetation
wildlife

This paper presents some of the results of human impact research conducted under contract with the National Park Service in Big Bend National Park (BBNP) and Amistad Recreational Area (ARA) in 1976 and 1977, respectively. Two types of impact, livestock grazing and recreational impact resulting from human use at designated campsites and their effects upon two biotic components (terrestrial rodents and vegetation), were monitored in the riparian habitats of BBNP and ARA. Our results suggest that present levels of recreational usage in the Rio Grande River System have had little significant impact on these biological parameters in riparian habitats. Comparison of our findings with those of other workers suggests that an assessment of the cause (quantification and classification of users) as well as the effect (measurement of environmental changes) of visitor impacts is necessary to provide managers the information needed to cope with these problems. Management implications of the research are discussed.

Schnell, J.H.

Habitat management series for unique or endangered species, report no. 18: Black hawk (*Buteogallus anthracinus*).

Source: U.S. Bureau of Land Management Tech. Note 329 **Pages:** 25pp. **Date:** 1979

Information on the status, life history, and habitat of the black hawk is reviewed. Human disturbance from recreationist is not a widespread factor at present but probably will seriously affect black hawk populations in the future as recreational demand increases. Peak human use of riparian habitats often coincides with the most critical hawk nesting stages; premium nest site locations are often favored by recreationists as well. Control of human disturbance by active management is recommended.

Keywords

human disturbance
recreation
wildlife

Schoenfield, C. A., and J.C. Hendee

Wildlife management in wilderness.

Source: Wildlife Management Institute and Boxwood Press, Pacific Grove, **Pages:** 172pp. **Date:** 1978
Calif.

A section on people-wildlife conflicts describes potential impacts on wildlife from increasing recreational use of wilderness areas. Frequently used campsites may attract animals that become habitual scroungers on garbage; more subtle impacts include animals forced from home ranges and harassed by recreationists. Dangerous animals often threaten the safety of humans. Decisions concerning how to as well as whether to make wilderness safe for visitors must be faced by wilderness managers.

Keywords

human disturbance
wildlife

Schrieber, R.W.

A brown study of the brown pelican.

Source: Natural History (Vol. 91(1)) **Pages:** 38-42 **Date:** 1982

Although brown pelicans are beginning to recover from the effects of chemical contaminants in the environment, human disturbance poses a continuing threat. Human visitation to pelican colonies causes reduced productivity from behavior alterations, exposure of young and eggs, and predation by gulls and crows. More than 700 brown pelicans die each year in Florida alone by becoming entangled in fishing gear.

Keywords

human disturbance
wildlife

Schultz, R.D., and J.A. Bailey

Responses of Rocky Mountain National Park elk to human activity.

Source: Journal of Wildlife Management (vol.42) **Pages:** 91-100 **Date:** 1978

Responses of elk in Rocky Mountain National Park, Colorado, to human activities were studied in 1974-75. The elk, which experienced little or no hunting, were very visible and were disturbed little if any by normal on-road visitor activities.

Keywords

human disturbance
wildlife

Schultz, T.D., and J.A. Bailey

Responses of National Park elk to human activity

Source: Journal of Wildlife Management (vol.42) **Pages:** 91-100 **Date:** 1978

The responses of Rocky Mountain National Park elk to human activities were studied in the autumn on 1974 and winter-spring 1975. During autumn numbers of elk seen, rates of bugling, times of arrival and departure of elk to and from meadows, and harem bulls' activities were analyzed for relationships with traffic volume and tourist activities. Results suggested small effects of traffic caused elk to leave open areas. Harassing elk in 2 meadows on alternate weeks during the winter and spring did not effect their distribution or observability on winter ranges. Elk made greater use of areas near roads as the winter-spring study progressed, suggesting slight avoidance of roads when forage was more abundant earlier in winter. Wintering elk often used a residential area at night when human encounters were minimal. During winter and spring, elk were approached significantly closer during darkness with artificial lights than daylight. These elk, which experienced little or no hunting, were very visible and were disturbed little, if any, by normal on-road visitor activities.

Keywords

human disturbance
management
recreation
wildlife

Schwink, K.

Rock Creek off-road vehicle use Environmental Assessment--Eldorado National Forest.

Source: Georgetown Ranger Station 7600 Wentworth Springs Road **Pages:** 53pp. **Date:** 1986
Georgetown, CA 95634

The purpose of this assessment is to evaluate the management of off-road vehicle use in the Rock Creek area. The Environmental Assessment includes a section on wildlife in the Eldorado National Forest and the potential effects of OHV's on them.

Keywords

OHV

Scott-Williams, B.W.

Effects of visitor use on the ecosystems of Rocky Mountain National Park, Colorado, U.S.A.

Source: IN: Towards a new relationship of man and nature in temperate lands. Part 1: Ecological impact of recreation and tourism upon temperate environments. IUCN Tenth technical meeting, 26-30 June 1966, Lucerne, Switzerland. IUCN Publ. New Ser. 7, Morges, Switzerland.

Results of visitor impact studies in Rocky Mountain National Park, Colorado, are summarized. Much of the information is concerned with changes in plant communities and landforms, but observation of visitor effects on wildlife are also noted. Visitors have altered the behavior of small mammals and birds by feeding them at roadside turnouts and parking areas.

Keywords

human disturbance
wildlife

Severinghaus, C.W., and B.F. Tullar

Wintering Deer Versus Snowmobiles

Source: Conservationist (vol.29(6)) **Pages:** 31 **Date:** 1975

According to this brief essay, snowmobiles have a negative impact on wintering deer. The harassment of deer by snowmobiles results in increased energy expenditure during a time when food sources are low and energy conservation is most important for survival. It is recognized that some deer actually follow snowmobile trails. Although these trails are rarely in areas that supply an abundance a food. Snowmobile trails should not be allowed in deer wintering areas and established trails should be kept a minimum of one-half mile from these areas.

Keywords

wildlife
snowmobile

Singer, F.J.

Behavior of mountain goats, elk, and other wildlife in relation to U.S. Highway 2, Glacier National Park.

Source: West Glacier National Park, West Glacier, Montana. **Pages:** 96pp. **Date:** 1975

Behavior, habitat use, and disturbance of elk, mountain goats, and other wildlife were studied in relation to a highway in Glacier National park, Montana. Habituation to the highway made elk more vulnerable to poaching. Mountain goat-human interactions occurred frequently near a salt lick; goat reaction were avoidance of and/or flight from humans. Highway design and construction are discussed.

Keywords

human disturbance
wildlife

Skagen, S.K.

Behavioral responses of wintering bald eagles to human activity on the Skagit river, Washington.

Source: in: R.L. Knight, G.T. Allen, M.V. Stalmaster, and C.W. Servheen, **Pages:** 231-241 **Date:** 1980

eds. Proc. of the Washington bald eagle symposium. The Nat. Conserv., Seattle, Wash.

Eagles were found to be more sensitive to disturbance while feeding on gravel bars than while perching, and to approaches by humans on foot and concealed than by people in vehicles. A significant decrease in the proportion of eagles feeding was observed when human activity was present within 200m of the feeding area in the previous 30 minutes. A significant between-season variation occurred in the use of feeding areas relative to human presence, which correlated with food availability. Eagles appeared more tolerant to human activity in the season of low food availability.

Keywords

human disturbance
wildlife

Skagen, S.K., R.L. Knight, and G.H. Orians

Human disturbance in an avian scavenging guild.

Source: Applied Ecology (vol.1) **Pages:** 215-225 **Date:** 1991

Keywords

human disturbance
wildlife

Skiba, G.T.

Ecological evaluation of the Dinosaur National Monument bighorn sheep herd.

Source: M.S. Thesis. Colorado state University, Fort Collins, CO **Pages:** 107pp. **Date:** 1981

Human disturbance is one of several factors discussed relating to bighorn sheep ecology in Dinosaur National Monument, Colorado/Utah. An apparent sheep population decline has coincided with an increase in white water rafting through important sheep habitat, but observations suggest that sheep are not seriously disturbed by people on foot or in rafts. Management recommendations include considerations for location of campsites to minimize sheep disturbance.

Keywords

human disturbance
recreation
wildlife

Smith, D.L.O. and J.W. Dickson

Contributions of vehicle weight and ground pressure to soil compaction

Source: Journal of agricultural engineering research 46:13-29 **Pages:** 13-29 **Date:** 1990

The results of a series of field experiments to investigate the relative effects of vehicle weight and ground pressure on soil compaction are presented. The compaction resulting from the passage of single wheels, with various combinations of wheel load and ground pressure, tended to substantiate theoretical predictions that increases in ground pressure produce significant soil bulk density near the soil surface but have less effect at greater depth. Conversely, increases in wheel load, at a given ground pressure, produce significant increases in compaction only at greater depth. The compaction resulting from conventional vehicles, and from vehicles which were purpose-built to minimize soil compaction carrying low and high payloads, exemplifies the importance of reducing vehicle weight as a means of minimizing soil compaction.

Keywords

management
recreation

Snow, C.

Habitat management series for endangered species, report no. 6: San Joaquin kit fox *Vulpes macrotis mutica*, related subspecies and the swift fox, *Vulpes velox*.

Source: U.S. Bureau of Land Management. Tech. Note 238 **Pages:** 24pp. **Date:** 1973

Status, biology, and habitat factors are described for the San Joaquin kit fox and the swift fox. In general, loss of suitable habitat appears to be a limiting factor for the kit fox; populations in the Mojave and Colorado deserts are seriously affected by habitat disturbance caused by off-road vehicle use. Management recommendations include support of research on the effects of off-road vehicles on kit-fox habitats.

Keywords

OHV
wildlife

Sodja, R. jr.

Effects of snowmobile activity on wintering pheasants and wetland vegetation in Northern Iowa marshes.

Source: M.S. Thesis. Iowa State University, Ames IA **Pages:** 67pp. **Date:** 1978

Effects of dispersed snowmobile use on ring-necked pheasants and marsh vegetation were studied in Iowa. No effects of snowmobiling on pheasant movements or behavior were found. Observed vegetation changes did not appear to seriously alter wildlife habitat.*

Keywords

snowmobile
wildlife
soil/vegetation

Wilson, J.P., and J.P. Seney

Erosional impact of hikers, horses, motorcycles, and off-road bicycles on mountain trails in Montana.

Source: Mountain Research and Development (vol.14(1)) **Pages:** 77-88 **Date:** 1994

Results of this study provide land managers with some new data summarizing relative impacts of four different users on two existing trails in southwest Montana. In particular, the results indicate that: 1) the natural processes occurring on the two trails used for this study are complicated and difficult to decipher; 2) sediment yield is detachment-limited rather than transport-limited; 3) horses produced significant larger quantities of sediment compared to hikers, off-road bicycles, and motorcycles; and 4) the greatest sediment yields occurred on wet trails. Future research is needed to examine higher intensities of use, increased rainfall intensities, wet soil conditions, and mechanical as well as water driven erosion processes.

Keywords

bike
hike
soil/vegetation
management
recreation
recreational pack-stock

Yalden, P.E., and D.W. Walden

The influence of recreational disturbance on common sandpipers breeding by an upland reservoir in England.

Source: Biological Conservation (vol.61) **Pages:** 41-49 **Date:** 1992

Common sandpipers breeding around the Ladybower Reservoir in the Peak District National Park, England, are disturbed by anglers and other visitors, so that they take flight about 29% more than they would if undisturbed: They frequently are forced to encroach on their neighbors' territories, causing far more fighting than done by nearby riverine birds. They take flight from an approaching human at 27m, but when guarding their chicks react at 75m; anglers may stand as close as 25m apart, emphasizing the potential for disturbance. Disturbance from anglers is high at the start of the breeding season, and continues throughout, whereas casual disturbance from other visitors is very erratic. Along the north shore of the reservoir, common sandpipers avoid using the favored angling beaches, whereas on the south shore they retreat to the conifer plantations. The consequence is a reduction in the size of the breeding population, but breeding success is unaffected.

Keywords

human disturbance
recreation
wildlife

Yalden, P.E., and D.W. Walden

Recreational disturbance of breeding golden plovers.

Source: Biological Conservation (vol.15) **Pages:** 243-262 **Date:** 1990

Detailed observations were made of golden plovers being disturbed, during the breeding season, by people walking on the moors. During the pre-incubation period, the birds were sensitive to the presence of people within about 200m, and flew more often. During incubation, golden plovers incubated for 96% of the time if they had not been disturbed. They flushed more readily in response to the presence of dogs than people on the moor, and took much longer to resume incubation when people were around. In the post-hatching, chick-guarding, period, adult golden plovers spent about 11% of the observation day reacting to people; they flew more often, increasing their energy expenditure by 15%. Their chicks hid in response to the alarm calls of their parents, so could neither feed or be brooded. In some cases, parents led their broods away from what had been satisfactory nest sites into quieter areas of moor, and encountered considerable resistance from neighbors whose territories they invaded.

Keywords

human disturbance
wildlife

Wilkes, B.

The myth of the non-consumptive user.

Source: Canadian Field Naturalist (vol. 91) **Pages:** 343-349 **Date:** 1977

The concept that some outdoor recreation activities are nonconsumptive of the resource base is examined and rejected. Impacts of such activities on vegetation, wildlife, and the quality of the environment are noted. User restrictions, a proposed theory for non-use planning, and justification for landscape preservation are discussed.*

Keywords

soil/vegetation
recreation
wildlife

Wilkinson, P.F.

An environmental perspective on recreation: The 'environmental-recreation interaction model'

Source: Journal of Applied Recreation Research, 17(2):178-210 **Pages:** 178-210 **Date:** 1992

The 'environmental-recreation interaction model' (ERIM) was developed to identify the required information and provide a process for analyzing the relationships between recreation, environment, and public attitudes and perceptions in order to suggest policy options for dealing with the impacts - both positive and negative - of recreation activities and facilities.

Keywords

human disturbance
management
recreation

The ERIM consists of four phases: the changing context, emerging problems, environmental analysis, and policy options.

Willard, B.E. and J.W. Marr

Effects of Human Activities on Alpine Tundra Ecosystems in Rocky Mountain National Park

Source: Biological Conservation, 2(4):257-265 **Pages:** 257-265 **Date:** 1970

The activities of summer visitors to the tundra of Trail Ridge in Rocky Mountain National Park results in the rapid destruction of vegetation in the areas seen by most visitors at close range - especially near parking areas. Ecosystems differ in their reaction to trampling; those with high soil-moisture are most easily damaged. Tall herb ecosystems are next, and then fellfield. Turf types are the most durable. Other activities affecting tundra are rock collecting, littering, crushing by car tires and flower picking.

Keywords

human disturbance
soil/vegetation

Wilshire, H.G., S. Shipley, and J.K. Nakata

Impacts of Off-road Vehicles on Wildlife and Habitats

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol.43) **Pages:** 131-139 **Date:** 1978

Observations of the impacts of off-road vehicles on soils and vegetation have been made at more than 400 sites in seven western states during the past three years. This type of land use has both direct and indirect impact on vegetation: direct effects include crushing and uprooting plants, and indirect effects include modification of the soil so that plant damage is extended beyond the areas directly impacted by the vehicles and restoration of the plant cover is inhibited.

Keywords

soil/vegetation
OHV

Wanek, W.J., and L. H. Schumacher

A continuing Study of the Ecological Impact of Snowmobiling in Northern Minnesota.

Source: The Center for Environmental Studies, Bemidji State University-- **Pages:** 34pp. **Date:** 1975
Bemidji, Minn.

Five years of research have shown conclusively that snowmobiles have an impact on the physical environment and plant communities of northern Minnesota. The impact may vary from year to year due to differing temperature extremes and snowfall. The extent of plant injury often depends on the intensity of snowmobile traffic and the susceptibility of each species to physical or cold temperature damage. The environment beneath the snow compacted by snowmobiles is substantially colder than that under natural snow cover. This can cause damage to herbs and perennials. Many woody plants are particularly vulnerable to physical damage by snowmobiles.

Keywords
soil/vegetation
snowmobile

The damage to plant communities reported during this study should not be considered maximal. In all cases snowmobile traffic began after six inches of snow had accumulated, a condition which is usually not met during normal snowmobiling activity.

Ward, A.L., and J.J. Cupal

Telemetered heart rate of three elk as effected by activity and human disturbance.

Source: in: K. Downing, ed Symp. on dispersed recreation and natural resource management. Utah State University, Logan. **Pages:** 47-56 **Date:** 1979

Studies of telemetered elk in Wyoming showed that elk react most strongly to sonic booms, gunshots, people on foot, and stopped occupied vehicles. They show less concern for airplanes, steady traffic on interstate highways, and abandoned vehicles. In areas where elk are not able to hide or obtain cover, the distances of effective response should be expected to be greater than in forested areas, particularly on open, alpine areas in early summer, or the foothills and high meadow winter ranges, and open prairie. This could have a major impact on the location of hiking trails in high alpine areas, including wilderness areas, on elk summer range, and on human activities such as cross country skiing and snowmobiling, on elk winter ranges.

Keywords
human disturbance
recreation
wildlife

Ward, A.L., J.J. Cupal, A.L. Lea, C.A. Oakley, and R.W. Weeks.

Elk behavior in relation to cattle grazing, forest recreation, and traffic.

Source: Transactions of the North American Wildlife and Natural Resources Conference. (vol.38) **Pages:** 327-337 **Date:** 1973

Studies of telemetered elk in Wyoming show that logging and recreation roads with moving vehicles had little effect on elk movements. Elk preferred to stay about one-half mile from people who were camping and picnicking. In planning recreational facilities in elk habitat, efforts should be made to keep human concentration areas at least one-half mile from elk feeding sites and to provide buffer zones with adequate cover.

Keywords
human disturbance
recreation
wildlife

Wanek, W.J.

Observations on Snowmobile Impact.

Source: Minn. Vol. 34 (199) **Pages:** 1-9 **Date:** 1971

Preliminary findings of research concerning environmental impacts of snowmobiles are summarized, including reactions of deer and other animals to snowmobile use. Impacts on physical environments, soils, and plants are also discussed.*

Keywords

snowmobile
soil/vegetation
wildlife

Wanek, W.J.

Snowmobiling Impact on Vegetation, Temperatures and Soil Microbes.

Source: in: Proceedings of The Snowmobile and Off-the-Road Vehicle **Pages:** 21pp. **Date:** 1971
Research Symposium, Michigan State University, June 15, 1971

The study was conducted during the winter of 1970-71 to research the effect of snowmobiling on vegetation, temperatures and soil microbes. Soil temperatures are generally higher after compaction by snowmobiles. The soil microbe data is inconclusive but indicates that snow compaction may reduce the population of soil bacteria. Young conifers appeared to be more resilient to traffic than white spruce. Damage to vegetation generally increased with increasing snowmobile traffic but not proportionately with the number of traverses. Young trees became imbedded in the snow after about three compactions and were not contacted by the machines after this.

Keywords

snowmobile
soil/vegetation

Wanek, W.J.

The Ecological Impact of Snowmobiling in Northern Minnesota.

Source: The Center for environmental studies--Bemidji State College **Pages:** 57-76 **Date:** 1973
Bemidji, Minnesota

Snowmobiles have an impact on the physical environment and biota of northern Minnesota. The impact varies with the severity of the winter, the depth of snow accumulation, the intensity of snowmobile traffic, and the susceptibility of the organism to injury, caused by cold temperatures or physical contact.

Keywords

soil/vegetation
recreation
snowmobile

Temperatures beneath the snow compacted by snowmobiles are considerably colder than those under undisturbed snow cover. The growth of early spring flowers is retarded, and reproductive success is reduced where snowmobiles travel. Many herbs with massive underground storage organs, alfalfa included, are winterkilled in the modified environment under snowmobile tracks. Woody plants are particularly vulnerable to physical damage by snowmobiles.

Snowmobile traffic can be beneficial by reducing the stature of woody vegetation in area where it needs to be controlled. However, traffic is unwise in places where forest regeneration is being encouraged, or where the esthetic or economic value of fragile communities necessitates their preservation.

Volmer, A.T., B.G. Maza, P.A. Medica, F.B. Turner, and S.A. Bamberg

The impacts of off-road vehicles on a desert ecosystem.

Source: Environmental Management (vol. 1) **Pages:** 115-129 **Date:** 1976

The effects of operating a 4-wheel drive truck in a 9 hectare area of the mojave desert were evaluated. Severity of damage to shrubs was directly related to intensity of driving area. Estimates of numbers of side-blotched lizards indicated similar densities before, during, and after the experiment. Counts of whiptail lizards in control and experimental areas were the same after the experiment, but counts of gridron-tailed lizards were much lower in the driven area.

Keywords

OHV
wildlife

Vos, D.K., R. A. Ryder, and W.D. Graul

Response of breeding great blue herons to human disturbance in north central Colorado.

Source: Colonial Waterbirds (vol. 8) **Pages:** 13-22 **Date:** 1985

Reactions of nesting Great Blue Herons to human disturbance were studied during 1980-82 at heronries in north central Colorado. Sixty-seven percent of all human intrusions caused no herons to flush from their nests. Temporary abandonment of nests occurred towards 27% of the human disturbances but only 6% resulted in temporary colony-wide nest abandonment. Herons were most disturbed by land-related activity and least by boating activity. Heron response to human activity changed as the breeding season progressed each year. Fledging success ranged from 2.65 to 2.82 young/nesting attempt/colony and from 2.82 to 2.96 young/successful nest/colony, and was sufficient to maintain a stable population. Recommendations to reduce human disturbance of breeding Great Blue Herons are discussed.

Keywords

human disturbance
wildlife

Wall, G., and C. Wright

The environmental impact of outdoor recreation

Source: University of Waterloo, Ontario, Dept. Geogr. Publ. Ser. 11 **Pages:** 69 **Date:** 1977

A comprehensive review of environmental impacts of outdoor recreation is presented, including a chapter on wildlife impacts. Sections describe disturbance of wildlife, loss and gain of habitats, and changes in populations and species composition. The nature and scope of research on wildlife impacts are critically evaluated.

Keywords

soil/vegetation
recreation
wildlife

Walter, H.

Impact of Human Activity on Wildlife.

Source: in: K.A. Hammond, G. Macinko, and W.B. Fairchild, eds.

Pages: 241-262 **Date:** 1978

Sourcebook on the environment: A guide to literature. University of Chicago Press, Chicago, Ill. and London, England.

Literature concerning human impacts on wildlife is reviewed. Effects of human population expansion and utilization of energy and resources are emphasized, but nonconsumptive uses are also mentioned. Sections discuss general surveys, attitudes toward wildlife, changes in wildlife population levels, species diversity, and wildlife conservation, among others.*

Keywords

human disturbance
recreation
wildlife

DRAFT - SECOND VERSION

TRAILS AND WILDLIFE BIBLIOGRAPHY

Section 2: Indexed by Key Words

(See Section 1 for full citation)

Provided by Colorado State Parks - Trails Program

Printed 1/6/98

Gutzwiller, K.J.

Assessing recreational impacts on wildlife: the value and design of experiments. 1991

BIKE

Boyle, S.A., and F.B. Samson

Non-consumptive outdoor recreation: An annotated bibliography. 1983

Carter, A.R.

Relative impact of off-road bicycle and hiker traffic on soils: an experimental study. 1994

Chavez, Deborah J.

Mountain Biking: Issues and Actions for USDA Forest Service Managers. 1996

Cole, D.N.

Vegetational changes associated with recreational use and fire suppression in the Eagle Cap Wilderness, Oregon: Some Management Implications. 1981

Haefeli, Patricia

The Crystal River Valley Bicycle Trail Study 2/16/94

Jacoby, Jill

Mountain Bikes: A new dilemma for wildland recreation managers 1990

Makel, W.J.

All-terrain vehicles and trail bikes in the forest: A management approach. 1988

Miller, Clint K.

Environmental Impacts of passive recreational trails in riparian areas. 1994

Palmer, Don

Developing Mountain Bike (non-motorized) Opportunities on the Pisgah Ranger District. 1991

Ream, C.H.

Impact of backcountry recreationists on wildlife: an annotated bibliography. 1980

Summer, R.M.

Impact of horse traffic on trails in Rocky Mountain National Park. 1980

Wilson, J.P., and J.P. Seney

Erosional impact of hikers, horses, motorcycles, and off-road bicycles on mountain trails in Montana. 1994

HIKE

Bayfield, N.G.

Some effects of walking and skiing on vegetation at Cairngorm. 1971

Bayfield, N.G.

Penetration of the Cairngorms Mountains, Scotland, by vehicle tracks and footpaths: Impacts and recovery 1985

Byrne, Sheila

The Effect of Off Road Vehicle Use in the Mojave Desert on Small Mammal Populations. 1973

Chester, J.M.

Human-wildlife interactions in the Gallatin Range, Yellowstone National Park. 1976

City of Pheonix. Parks, Recreation, and Library Department

Camelback Mountain Cholla Trailhead Trail Use Impact Analysis. 1995

Cole, D.N.

Recreational trampling effects on six habitat types in western Montana. 1985

Cole, D.N.

Trampling effects on mountain vegetation in Washington, Colorado, New Hampshire, and North Carolina. 1993a.

Cole, D.N.

Changes on Trails in the Selway-Bitterroot Wilderness, Montana. 1991.

Cole, D.N., and R.L. Knight

Impacts of recreation on biodiversity in wilderness. 1990

Douglas, C.L.

Coordination of bighorn research and management in Joshua Tree National Monument. 1976

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler

Responses of mule deer to disturbance by persons afoot and in snowmobiles. 1986

Hicks, L.L. and J.M. Elder

Human disturbance of Sierra Nevada bighorn sheep. 1979.

King, M.M. and G.M. Workman

Response of desert bighorn sheep to human harassment: management implications. 1986

Klein, M.L.

Waterbird behavioral responses to human disturbances. 1993

Kuss, F. R.

The Effect of Two Hiking Intensities on Wildland Trail Wear 1986

Kuss, F.R.

Hiking boot impacts on woodland trails 1983

Losos, E., J. Hayes, A. Phillips, C. Alkire, and D. Wilcove

Taxpayers Double Burden: Federal Resource Subsidies and Endangered Species. 1993

MacArthur, R.A., V. Geist, and R.H. Johnston

Cardiac and behavioral responses of mountain sheep to human disturbance. 1982

Manini, B.P. Neuhaus, and P. Ingold

Behavior of Marmots under the influence of different hiking activities. 1993

Quinn, N.W. and R.P.C Morgan

Simulation of soil erosion induced by human trampling 1979.

Ream, C.H.

Human-wildlife conflicts in backcountry: Possible solutions 1979.

Tinsley, B.E. and E.B. Fish

Evaluation of trail erosion in Guadalupe Mountains National Park, Texas 1985

Van der Zande, A.H., and P. Vos

Impact of semi-experimental increases in recreation activity on the densities of birds in hedges and groves on a lakes shore in the Netherlands. 1984

Van der Zande, A.N., J.C. Berkhuizen, H.C. Van Latesteijn, W.J. ter Keurs, and A.J. Popelaars

Impact of outdoor recreation on the density of breeding bird species in woods adjacent to urban residential areas. 1984

Vohman, Erika C.

Effects of Roads and Trails on Wildlife, Plants and Ecosystems 1997.

Zalowski, D.

Looking into Soles and Other Weighty Matters. 1981

HUMAN DISTURBANCE

Adams, Lowell W., and Alfred D. Geis

Effects of Highways on Wildlife. 1980

Amstrup, S.C., and J. Beecham.

Activity patterns of radio-collared black bears in Colorado. 1976

Andersen, D.E., O.J. Rongstad, and W.R. Mytton

Home-range changes in raptors exposed to increased human activity levels in southeastern Colorado. 1990

August, P.V., J. W. Clarke, M.H. McGaugh, and R.L. Packard

Demographic patterns of small mammals: A possible use in impact assessment. 1979.

Bansner, U.

Mountain goat-human interactions in the Sperry-Gunsight Pass area, Glacier National Park. 1976

Bart, J.

Impact of human visitations on avian nesting success. 1977.

Belanger, L., and Bedard J.

Responses of staging greater snow geese to human disturbance. 1989.

Belanger, L., and J. Bedard

Energetic cost of man-induced disturbance to staging snow geese. 1990.

Bird, D.M.

Birds of Prey: A plea for ethics. 1978

Bollinger, J.

Effect of snowmobile noise and deer and rabbits in their natural habitat. 1974

Buehler, D.A., T.J. Mersmann, J.D. Fraser, and J.K. Seegar

Effects of human activity on bald eagle distribution on the northern Chesapeake Bay. 1991

Cole, D.N.

Minimizing conflict between recreation and nature conservation. 1993.

Cooke, A.S.

Observations on how close certain passerine species will tolerate an approaching human in rural and suburban areas. 1980

Cowan, I.M.

Management implications of behavior in the large herbivorous mammals. 1974

Deforge, J.R.

Stress: Is it limiting bighorn? 1976

Des Granges, J.L. and A. Reed.

Disturbance and control of selected colonies of double-crested cormorants in Quebec. 1981.

Dunaway, D.J.

Human disturbance as a limiting factor of Sierra Nevada Bighorn Sheep. 1971

Dunaway, D.J.

Status of bighorn sheep populations and habitat studies on the Inyo National Forest. 1970

Dunaway, D.J.

Bighorn sheep management on the Inyo National Forest, a new approach. 1971.

Enderson, J.H.

Status of the Peregrine Falcon in the Rocky Mountains in 1973. 1974

Engel, J.M., F.R. Courtsal, R.L. Martin, J.R. Messerli, T. H. Hooper, R.E. Mumford, and L.E. Terry

Recovery Plan for the Indiana Bat 1975.

England, Kristie

Ideas on off-highway vehicle management. 1993

Erwin, R.M.

Breeding habitat use by colonially nesting waterbirds in two mid-Atlantic U.S. regions under different regimes of human disturbances. 1980

Evans, R.D., and C.W. Wolfe, JR.

Effects of nest searching on fates of pheasant nests. 1967.

Ferguson, M.A.D., and R. Langvatn

Influence of nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. 1985

Fetterolf, P.M.

Reproductive success of minimally disturbed ring-billed gulls 1981.

French, J.M.

Distribution, abundance, and breeding status of ospreys in northwestern California. 1972

Fyfe, R.

The peregrine falcon in northern Canada. 1969.

Garber, D.P.

Osprey nesting ecology in Lassen and Plumas Counties, California. 1972

Garton, E.O., C. W. Bowen, and T.C. Foin

The impact of visitors on small mammal communities of Yosemite National Park. 1977.

Gavrin, V.F.

Effect of anxiety factor on game fowl population productivity. 1974

Geist, V.

Is big game harassment harmful? 1971.

Geist, V., R.E. Stemp, and R.H. Johnson

Heart-rate telemetry of bighorn sheep as a means to investigate disturbances. 1985

Gillett, W. H., J.L. Hayward, Jr., and J.F. Stout.

Effects of human activity on egg and chick mortality in a glaucous-winged gull colony. 1975.

Gochfeld, M.

Terns in Traffic. 1978

Gooders, J.

Wildlife and Tourism. 1975.

Goodson, N.J.

Status of bighorn sheep in Rocky Mountain National Park. 1978

Gotmark, F.

The effects of investigator disturbance on nesting birds. 1992

Gottfried, B.M.

Experimental analysis of nest predation in an old-field habitat. 1978

Graham, H.

Environmental Analysis Procedures for Bighorn in the San Gabriel Mountains. 1971.

Graham, H.

The Impact of Modern Man. 1980

Gray, J.R.

Kinds and costs of recreational pollution in the Sandia Mountains. 1977.

Grubb, T.G., and R.M. King

Assessing human disturbance of breeding bald eagles with classification tree models. 1991.

Grubb, T.G., W.W. Bowerman, J.P. Giesy, and G.A. Dawson

Responses of breeding bald eagles, *Haliaeetus leucocephalis*, to Human activities in North central Michigan. 1992

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson.

Effects of human intrusion on song occurrence and singing consistency in sub-alpine birds. 1994

Hamilton, K.S., S.A. Holl and C.L. Douglas

An evaluation of the effects of recreational activity on Bighorn sheep in the San Gabriel Mountains, CA. 1982

Hammond, M.C., and W.R. Forward

Experiments on causes of duck nest predation. 1956

Heinzman, G.

The American Bald Eagle: Despite protection, this wary bird cannot coexist with man. 1961.

Henson, P. and T.A. Grant

The effects of human disturbance on trumpeter swan breeding behavior. 1991.

Holmes, T.L., R.L. Knight, L. Stegall, and G.R. Craig

Responses of wintering grassland raptors to human disturbance. 1993

Holroyd, J.C.

Observations of Rocky Mountain Goats on Mount Wardle, Kootenaly National Park, British Columbia. 1967.

Horejsi, B.

Some thoughts and observations on harassment and bighorn sheep. 1976

Hunt, G.L. Jr.

Influence of food distribution and human disturbance on the reproductive success of herring gulls. 1972

Jenni, D.A.

A study of the ecology of four species of herons during the breeding season at Lake Alice, alachua County, Florida. 1969

Johnson, R.F., Jr., and N.F. Sloan

The effects of human disturbance on the white pelican colony at Chase Lake National Wildlife Refuge, North Dakota. 1976

1/6/98

Johnson, T.H.

Responses of breeding peregrine falcons to human stimuli. 1990

Jorgensen, P.

Vehicle use at a desert bighorn watering area. 1974

Kesteloot, E.

Perturbations causes par la presence humaine. (Disturbance due to the presence of humans.) 1967.

Kirby, R.E.

The impact of human activity upon wildlife and wildlife habitat. Statement of work. 1985

Klinghammer, E.

Man and Animals: Towards a sympatric relationship with wild animals. 1978

Knight, R.L.

Responses of Nesting Ravens to People in Areas of Different Human Densities. 1984

Knight, R.L.

Outdoor Recreation: The Highest And Best Use Of Our Public Lands? —

Knight, R.L., and S.K. Skagen

Effects of recreational disturbance on birds of prey: A review. 1988

Koford, C. B.

The California condor. 1953

Lenington, S.

Predators and Blackbirds: The "uncertainty principle" in field biology. 1979.

Levenson, H. and J.R. Koplin

Effects of human activity on productivity of nesting ospreys. 1984

Light, J.T. Jr.

An ecological view of bighorn habitat on My. San Antonio. 1971

Light, J.T., Jr.

Analysis of bighorn habitat in the San Gabriel Mountains. 1973

Luckenbach, R.A.

An analysis of off-road vehicle use on desert avifaunas. 1978

March, D., and C. Adams

A front range concept: The need for the Noddles-Rampart-South Platte recreation Area. 1973

Mathisen, J.E.

Effects of human disturbance on the nesting of bald eagles. 1968

Matlack, G.R.

Solid logical edge effects: Spatial distribution of human impacts in suburban forest fragments. 1993

McCool, S.F.

Snowmobiles, animals, and man: Interactions and management issues. 1978

McLellan, B.N. and D.M. Shackleton

Immediate reactions of grizzly bears to human activities. 1989.

Michael, Edwin D.

Effects of Highways on Wildlife. 1976

Miller, S.G. and R.L. Knight

Wildlife Responses to Pedestrians and Dogs. —

Murphy, J.R.

Nest site selection by the bald eagle in Yellowstone National Park. 1965

Neil, P.H., R.W. Hoffman, and R.B. Gill

Effects of harassment on wild animals--an annotated bibliography of selected references. 1975.

Olsen P. and J. Olsen

Alleviating the impact of human disturbances in the breeding peregrine falcon. II. Public and recreational lands. 1980

Owens, N.W.

Responses of wintering Brent Geese to human disturbance. 1977.

Page, P.J.

Special wildlife investigations: Second progress report of the San joaquin River rookery study. 1971

Paynter, R.A., Jr.

Clutch-size and egg mortality of Kent Island eiders. 1951

Pedersen, R.J.

Management and Impacts of Roads in Relation to elk populations. 1978

Pelton, M.R.

Use of foot trail travelers in the Great Smoky Mountains National Park to estimate black bear (*Ursus americanus*) 1972 activity.

Penland, S.T.

The natural history and current status of the Caspian Tern (*Hydroprogne caspia*) in Washington State. 1976

Piatt, J.F., and B.D. Roberts, W.W. Lidster, J.L. Wells, and S.A. Hatch

Effects of human disturbance on breeding least and crested auklets at St. Lawrence Island, Alaska. 1990

Poole, A.

The effects of human disturbance on osprey reproductive success. 1981

Portnoy, J.W.

Some ecological and behavioral aspects of a nesting population of red-shouldered hawks (*Buteo lineatus lineatus*). 1974

Reeves, R.H.

Wild turkey management in Arizona. 1952

Retfalvi, L.I.

Breeding behavior and feeding habits of the bald eagle (*Haliaeetus leucocephalus* L.) on San Juan Island, Washington. 1965

Reynolds, H.V., III

Population studies of the golden eagle in south central Montana. 1969

Riegelhith, R.

Grizzly bears and human visitation. 1966

Robertson, R.J., and N.J. Flood

Effects of recreational use of shorelines on breeding bird populations. 1980

Sather, J.H.

Wildlife survey and investigations: Muskrat investigations. 1952

Schmidly, D.J., and R.B. Ditton

Assessing human impacts in two national park areas of western Texas. 1978

Schnell, J.H.

Habitat management series for unique or endangered species, report no. 18: Black hawk (*Buteogallus anthracinus*). 1979

Schoenfield, C. A., and J.C. Hendee

Wildlife management in wilderness. 1978

Schrieber, R.W.

A brown study of the brown pelican. 1982

Schultz, R.D., and J.A. Bailey

Responses of Rocky Mountain National Park elk to human activity. 1978

Schultz, T.D., and J.A. Bailey

Responses of National Park elk to human activity 1978

Scott-Williams, B.W.

Effects of visitor use on the ecosystems of Rocky Mountain National Park, Colorado, U.S.A. 1967

Singer, F.J.

Behavior of mountain goats, elk, and other wildlife in relation to U.S. Highway 2, Glacier National Park. 1975

Skagen, S.K.

Behavioral responses of wintering bald eagles to human activity on the Skagit river, Washington. 1980

Skagen, S.K., R.L. Knight, and G.H. Orians

Human disturbance in an avian scavenging guild. 1991

Skiba, G.T.

Ecological evaluation of the Dinosaur National Monument bighorn sheep herd. 1981

Stalmaster, M.V. and J.R. Newman

Behavioral responses of wintering bald eagles to human activity. 1978

Stevens, D.R.

Bighorn sheep management in Rocky Mountain national Park. 1982

Thompson, R.W.

Population dynamics, habitat utilization, recreational impacts and trapping of introduced Rocky Mountain Goats in the Eagle's nest Wilderness Area, CO. 1980

Tracy, D.M.

Reactions of wildlife to human activity along Mount McKinley, National Park Road. 1977.

Tremblay J., and L.N. Ellison

Effects of human disturbance on breeding of black-crowned night herons. 1979.

Vaske, J.J., A.R. Graefe, and F.R. Kuss

Recreation impacts: a synthesis of ecological and social research 1983

Vos, D.K., R. A. Ryder, and W.D. Graul

Response of breeding great blue herons to human disturbance in north central Colorado. 1985.

Walter, H.

Impact of Human Activity on Wildlife. 1978

Ward, A.L., and J.J. Cupal

Telemetered heart rate of three elk as effected by activity and human disturbance. 1979.

Ward, A.L., J.J. Cupal, A.L. Lea, C.A. Oakley, and R.W. Weeks.

Elk behavior in relation to cattle grazing, forest recreation, and traffic. 1973

Wershkul, D.F., E. McMahon, and M. Lieitschuh

Some effects of human activities on the great blue heron in Oregon. 1976

White, C.M., and T.L. Thurow

Reproduction of ferruginous hawks exposed to controlled disturbance. 1985

Wilkinson, P.F.

An environmental perspective on recreation: The 'environmental-recreation interaction model' 1992

Willard, B.E. and J.W. Marr

Effects of Human Activities on Alpine Tundra Ecosystems in Rocky Mountain National Park 1970

Yalden, P.E., and D.W. Walden

The influence of recreational disturbance on common sandpipers breeding by an upland reservoir in England. 1992

Yalden, P.E., and D.W. Walden

Recreational disturbance of breeding golden plovers. 1990

MANAGEMENT

Albrecht, Jean

Trail Planning, Construction and Maintenance. A bibliography supplement. 1992

Albrecht, Jean

Trail Planning, Construction and Maintenance: A bibliography Supplement, 1996. 1996

Cole, D.N., and R.L. Knight

Wildlife preservation and recreational use: conflicting goal of wildlife management. 1991

Foin, T.C., E.O. Garton, C.W. Bowen, J.M. Everingham, R.O. Schultz, and B. Holton, Jr.

Quantitative studies of visitor impacts on environments of Yosemite National Park, California, and their impacts for management policy. 1977.

Gates, J.E.

A functional approach to estimating habitat edge width for forest birds. 1981

Godin, V.B. and R.E. Leonard

Management problems in designated wilderness areas 1979.

Gutzwiller, K.J.

Serial management experiments: an adaptive approach to reduce recreational impacts on wildlife. 1993

Hammit, W.E., and D.N. Cole

Wildland Recreation: Ecology and Management 1987.

Knight, R.L., and J.Y. Kawashima

Responses of Raven and Red-Tailed Hawk Populations to Linear Right of Ways. 1993

McQuaid-Cook, J.

Effects of Hikers and Horses on Mountain Trails 1977.

Pomerantz, G.A., D.J. Decker, G.R. Goff, and K.G. Purdy

Assessing impact of recreation and wildlife: a classification scheme. 1988

Robbins, C.S.

Effects of forest fragmentation on bird populations. 1979.

Robert, H.C., and C.J. Ralph

Effects of human disturbance on breeding success of gulls. 1975.

Sachet, G.A.

Integrated Trail Planning Guidelines for Wildlife Recreation, and fish resources on Mount Hood National Forest. 1990

Smith, D.L.O. and J.W. Dickson

Contributions of vehicle weight and ground pressure to soil compaction 1990

Sokale, J., and L. Trulio

San Francisco Bay Trail Project: Wildlife and Public Access Study Proposed Research Plan. 1996

Stohlgren, T.J. and D.J. Parsons

Evaluating wilderness recreational opportunities: Application of an impact matrix 1992

Ward, Paula

Tools of the Trail 1994

Zuidema, P.A., J.A. Sayer and W. Dijkman

Forest fragmentation and biodiversity: the case for intermediate-sized conservation areas 1996

OHV

Albrecht, J. and T.B. Knopp

Off Road Vehicles - Environmental Impact - Management Response: A Bibliography 1985

American Academy for the Advancement of Science.

ORV use 1974

American Association for the Advancement of Science, Committee on Arid Lands

Off-road Vehicle Use 1974

Baldwin, M.F.

The off-road vehicle and environmental quality 2nd ed. 1973

Baldwin, M.F. and D.H. Stoddard

ORV's and Wildlife: A scientific survey. 1974

Bear, G.D., and G.W. Jones.

History and distribution of bighorn sheep in Colorado. 1973

Berry, K.H.

The effects of four-wheel vehicles on biological resources. 1980

Boyle, S.A. and F.B. Samson

Effects of non-consumptive recreation on wildlife: A review. 1985

Brander, R.B.

Ecological impacts of off-road recreation vehicles. 1974

Brattstrom, Bayard H. and Micheal C. Bondello

Effects of off-road vehicle noise on desert vertebrates. 1983

Bury, R.B.

What we know and do not know about off-road vehicle impacts on wildlife. 1980

Bury, R.B., R.A. Luckenbach, and S.O. Busack.

Effects of off-road vehicles on vertebrates in the California Desert. 1977.

Bury, R.L.

Research on off-road vehicles: A summary of selected reports and a comprehensive bibliography. 1976

Bury, R.L.

Off-road recreation vehicles: A research summary, 1966-1975. 1976.

Busack, S.D., and R.B. Bury

Some effects of off-road vehicles and sheep grazing on lizard populations in the Mojave Desert. 1974

- Carter, L.J.**
Off-road vehicles: A Compromise plan for the California desert. 1974
- Cotrell, Chuck**
Roads and Habitat Fragmentation 1997.
- Davidson E., and M. Fox**
Effects of off-road motorcycle activity on Mojave Desert vegetation and soil. 1974
- Deforge, J.R.**
Man's invasion into bighorn habitat. 1972
Dept. of Interior Bureau of Land Management, Glenwood Springs
Castle Peak Travel Management Plan and Environmental Assessment. 1997.
- Ferris, R.M. and M.J. Kutilek**
Responses of black-tailed deer to off-highway vehicles in Hollister Hills State Vehicular Recreation Area 1989.
Hollister, CA.
- Godfrey, P.J., J. Brodhead, H. Walker, J. Gilligan, and A. Davis**
Ecological effects of off-road vehicles in Cape Cod National Seashore, Massachusetts. (A preliminary report) 1975
- Godfrey, P.J., J.M.B. Brodhead, J. DiMaio, J.M. Gilligan, D. Reynolds, B.G. Blodget, and N.R. Wheeler.**
The ecological effects of off-road vehicles in Cape Cod National Seashore, Massachusetts (Phase II). 1975
- Hoover, B.**
Off-road vehicle problems on federal lands. 1973.
- Jones and Stokes Assoc., Inc.**
Rock Creek off-road vehicle/deer study. Sept.
- Kellert, S.R. and J.K. Berry**
A bibliography of human-animal relations. 1985
- Knight, R.L., and K.J. Gutzwiller, eds. 1995.**
Wildlife and Recreationists: Coexistence Through Management and Research. 1995.
- Leinenger, W.C., G.F. Payne**
The effects of off-road vehicle travel on rangeland in Southeast Montana. 1979.
- Lodico, N.J.**
Environmental effects of off-road vehicles. 1973
- McReynolds, H.E. and R.E. Radtke**
The impact of the motorized human on the wildlife of forested lands. 1978
- Morgantini, L.E., and R.J. Hudson**
Human disturbance and habitat selection in Elk. 1980
- Noss, Reed**
The Ecological Effects of Roads. 1996
- Penny, J.R.**
Off-road vehicles on the public lands in California. 1971.
- Richens, V.B., and R.G. Lavigne**
Response of white-tailed deer to snowmobiles and snowmobile trails in Maine. 1978
- Russell, D.**
Occurrence and human disturbance sensitivity of wintering bald eagles on the Sauk and Suiattle Rivers, Washington. 1980
- Russell, H.**
The environmental consequences of the off-road vehicle: with profiles of the industry and the enthusiast. 1974
- Schwink, K.**
Rock Creek off-road vehicle use Environmental Assessment--Eldorado National Forest. 1986
- Snow, C.**
Habitat management series for endangered species, report no. 6: San Joaquin kit fox *Vulpes macrotis mutica*, related subspecies and the swift fox, *Vulpes velox*. 1973
- Stebbins, R.C.**
Off-road vehicles and the fragile desert. 1974

Volmer, A.T., B.G. Maza, P.A. Medica, F.B. Turner, and S.A. Bamberg

The impacts of off-road vehicles on a desert ecosystem. 1976

Weaver, T., and D. Dale

Trampling effects of hikers, motorcycles and horses in meadows and forests. 1978

Webb, R.H. and H.G. Wilshire, editors

Environmental impacts of off-road vehicles: Impacts and management in arid regions. 1983

Yarmoloy, C., M. Bayer, and V. Geist.

Behavior responses and reproduction of mule deer, *Odocoileus hemionus*, Does following experimental harassment with an ATV 1988

RECREATION

Grier, J.W.

Bald eagle behavior and productivity responses to climbing to nests. 1969

Hammerstrom, F., D.D. Berger, and F.N. Hamerstrom, Jr.

The effects of mammals on prairie chickens on booming grounds. 1965

Hickman, S.

Evidence of edge species attraction to nature trails within deciduous forest. 1990

Ittner, R., D.R. Potter, J.K. Agee, and S. Anschell, eds.

Recreational Impacts on Wildlands Oct.

Josselyn, M., M. Martindale, and J. Duffield

Public Access and Wetlands: Impacts of Recreational Use. 1989

Light, J.T., Jr.

A progress report on bighorn habitat management in the San Bernadino National Forest. 1970

Lime, D.W., and G.H. Stankey

Carrying Capacity: Maintaining outdoor recreation quality. 1971

Lucas, R.C.

Impact of human pressure on parks, wilderness, and other recreation lands. 1978

Lyons, J.R.

Non-consumptive wildlife associated recreation in the U.S.: Identifying the other constituency. 1982

Purdy, K.G., and W.W. Shaw

Recreational use of desert bighorn habitat in Pusch Ridge Wilderness. 1980

Rost, G.R.

Response of deer and elk to roads. 1975

Tuite, C.H., M. Owen, and D. Paytner

Interaction between wildfowl and recreation at Llangorse Lake and Talybont Reservoir, South Wales. 1983

Watson, A.

Bird and mammal numbers in relation to human impact on ski lofts on Scottish hills. 1979

SNOWMOBILE

Aasheim, R.

Snowmobile impacts on the natural environment. 1980

Adams, Evelyn S.

Effects of lead and hydrocarbons from snowmobile exhaust on brook trout (*Salvelinus*) 1975

Allan, Nigel J.R.

Man, machine, and snow: A study of recreationists' landscape perceptions. 1975

American Forests

Snowmobiles and the National Parks. 1972.

Aune, K.E.

Impacts of winter recreationist on wildlife in a portion of Yellowstone National Park, Wyoming. 1981

Baldwin, M.F.

The snowmobile and environmental quality. 1968

- Baldwin, M.F., and D.H. Stoddard, Jr.**
The off-road vehicle and environmental quality. 1973
- Bollinger, J.**
Effects of Snowmobile Traffic on Non-Forest Vegetation and Grasses. 1974
- Bollinger, John G. et al.**
Snowmobile noise effects on wildlife: Report 1972-73. 1973
- Bury, R.L.**
Impacts of snowmobiles on wildlife. 1978
- Corbet, P.S.**
Snowmobiles: For pleasure, profit, and pollution. 1970
- Doan, K.H.**
Effects of snowmobiles on fish and wildlife resources. 1970
- Doherty, James E.**
Shame on the Snow. 1974
- Dorrance, M.J. and P.J. Savage**
Effects of snowmobiles on white-tailed deer. 1975
- Doyle, P.**
Progress made by the snowmobile industry since 1971 in areas of environmental concern. 1974
- Eckstein, R.G. and O.J. Rongstad.**
Effects of snowmobiles on the movements of white-tailed deer in Northern Wisconsin. 1973
- Eckstein, R.G., T.F. Obrien, O.J. Rongstad, and J.G. Bollinger.**
Snowmobile effects on movements of white-tailed deer : a case-study. 1979.
- Griffith, R.E.**
Environmental quality impact. 1969.
- Huff, D.E., and P.J. Savage.**
A correlation of deer movements with snowmobile activity in Minnesota during winter. 1972
- Huff, Dan E. et al.**
Wildlife-snowmobile interaction project; preliminary report covering period November 1971-April 1972. 1972
- Jarvinean, J.A. and W.D, Schmid.**
Snowmobile use and winter mortality of small mammals. 1971
- Klein, D.R.**
Reaction of reindeer to obstructions and disturbance. 1971
- Kopischke, Earl D.**
Effects of snowmobile activity on the distribution of white-tailed deer in south-central Minnesota, 1971-1972. 1972
- Moen, Aaron, N.**
Effects of disturbance by snowmobiles on heart rate of captive white-tailed deer. 1982
- Neumann, P.W., and H.G. Merriam**
Ecological Effects of Snowmobiles 1972
- Neumann, Peter W. and H. Gray Merriam**
Ecological effects of snowmobiles. 1972
- Schmid, W.D.**
Modification of the subnivean microclimate by snowmobiles. 1971
- Schmid, W.D.**
Snowmobile activity, subnivean microclimate and winter mortality of small animals. 1972
- Sodja, R. jr.**
Effects of snowmobile activity on wintering pheasants and wetland vegetation in Northern Iowa marshes. 1978
- Soom, A., J.G. Bollinger, and O.J. Rongstad**
Studying the effects of snowmobile noise on wildlife. 1972
- Stace-Smith, R.**
The misuse of snowmobiles against wildlife in Canada. 1975
- Wanek, W.J.**
Observations on Snowmobile Impact. 1971

Wanek, W.J.

Snowmobiling Impact on Vegetation, Temperatures and Soil Microbes. 1971

SOIL/VEGETATION

Adkinson, Gregory P.

Ecological Impacts of Trail Use in Three Indiana Nature preserves. 1991

Behrend, D.F., and R.A. Lubeck

Flight behavior of white-tailed deer in two Adirondack forests. 1968

Benninger-Traux, M., J.L. Vankat and R.L. Schaefer

Trail corridors as habitat and conduits for movement of plant species in Rocky Mountain National Park, Colorado, 1992
USA

Berry, Kristin H.

A review of the effects of off-road vehicles on birds and other vertebrates. 1980

Berwick, S.H.

Observations on the decline of the Rock Creek, Montana, population of bighorn sheep. 1968

Boucher, D.H., J. Aviles, and R. Chepote.

Recovery of trail side vegetation from trampling in a tropical rain forest. 1991

Bratton, S.P., M.G. Hickler and J.H. Graves

Trail erosion Patterns in Great Smoky Mountains National Park 1979

Bright, Julie A.

Hiker Impact on Herbaceous Vegetation along Trails in an Evergreen Woodland of Texas. 1986

Chapman, Diane

Impact of Alpine Ski Trail Corridors on a Beech-Maple Forest Community, Mon-Ste-Marie, Quebec: 1988
Spatial Variation of Edge Effects.

Chilman, K.C., J.J. Vogel, and J.L. Conley

Turkey Bay: Off-Road Vehicle Area at land Between the Lakes. Monitoring Use and Impacts Since 1973. 1991

Cole, D.N.

The wilderness threats matrix: A framework for assessing impacts. 1994

Cole, D.N.

Backcountry Impact Management: Lessons From Research 1994

Cole, D.N.

Resource Impacts Caused by Recreation. —

Cole, D.N., and N.G. Bayfield

Recreational trampling of vegetation: standard experimental procedures. 1991

Cole, D.N., and S.J. Trull

Quantifying vegetational Response to Recreational Disturbance in the Northern Cascades, Washington. 1992

Cole, D.N., M.E. Petersen, and R.C. Lucas

Managing wilderness recreation use: common problems and potential solutions. 1987.

Coleman, Rosalind

Footpath erosion in the English Lake District 1981

Dale, D., and T. Weaver

Trampling effects on vegetation of the trail corridors of north Rocky Mountain Forests. 1974

Fish, E.B., G.L. Borthers and R.B. Lewis

Erosional impacts of trails in Guadalupe Mountains National Park, Texas 1981

Garland, G.G.

Techniques for assessing erosion risk from mountain footpaths. .

Goldsmith, F.B.

Ecological effects of visitors in the countryside. 1974

Hall, C.N. and F.R. Kuss

Vegetation alteration along trails in Shenandoah National Park, Virginia 1989.

Harrison, R.T., W.J. Makel, and B.B. LaMoure

Sound Levels of Five Motorcycles Traveling Over Forest Trails: Rock Creek ORV Area. 1993

Ikeda, H. and K. Okutomi.

Effects of human trampling on multispecies competition on early-phase development of a tread community. 1990

Kristi Withrow

Tales of Trails 1997.

Kuss, F.R. and C.N. Hall

Ground Flora Trampling Studies: Five Years After Closure 1991.

Kuss, F.R. and Jenkins, W.A.

Effects of Footgear Design on Trail Wear: A Summary of Five Years of Research 1985.

Liddle, M.J.

Recreation ecology: Effects of trampling on plants and corals. Trends in ecology and evolution. 1991

Mortensen, C.O.

Visitor use impacts within the Knobstone Trail Corridor 1989.

Noake, D.W.

Camping as a factor in the ecological impact of tourism and recreation. 1967.

Noe, F.P., W.E. Hammitt, and R.D. Bixler

Park User Perceptions of Resource and use Impacts under Varied Situations in Three National Parks. 1995.

Satchell, J.E.

The effects of recreation on the ecology of natural landscapes. 1976

Speight, M.C.D.

Outdoor recreation and its ecological effects: A bibliography and Review. 1973

Thompson, Richard, W.

Effects of Forest Fragmentation at Ski Areas on Breeding Neotropical Bird Guilds. .

Wall, G., and C. Wright

The environmental impact of outdoor recreation 1977.

Wanek, W.J.

The Ecological Impact of Snowmobiling in Northern Minnesota. 1973

Wanek, W.J., and L. H. Schumacher

A continuing Study of the Ecological Impact of Snowmobiling in Northern Minnesota. 1975.

Whinan, J., E.F. Cannell, J.B. Kirkpatrick, and M. Comfort.

Studies on the potential impact of recreational horse riding in some alpine environments of the Central Plateau, 1994
Tasmania.

Wilkes, B.

The myth of the non-consumptive user. 1977.

Wilshire, H.G., S. Shipley, and J.K. Nakata

Impacts of Off-road Vehicles on Wildlife and Habitats 1978

WILDLIFE

Adams, L.W. and A.D. Geis

Effects of roads on small mammals. 1983

Altmann, M.

The flight distance in free-ranging game. 1958

Anderson, D.W.

Dose-response relationship between human disturbance and brown pelican breeding success. 1988

Atkinson-Wiles, G.

Wildfowl and Recreation: A balance of requirements. 1969.

Bell, J.N.

Wild animals are wild. 1963

Blakesly, J.A. and K.P. Reese

Avian use of campground and non-campground sites in riparian zones. 1988

Brittingham, M.C., and S.A. Temple

Have cowbirds caused forest songbirds to decline? 1983, .

Cassirer, E.F., D.J. Freddy, and E.D. Ables

Elk responses to disturbance by cross country skiers in Yellowstone National Park. 1992

Goodrich, J.M., and J. Berger

Winter recreation and hibernating black bears *Ursus americanus*. 1994

Griscom, B.

Wildlife Protected Along Many Rail-Trails. 1994

Knight, R.L., and D.N. Cole

Effects of recreational activity on wildlife in wildlands. 1991

McEwen, Douglas N.

Turkey Bay Off-Road Vehicle Area at Land Between the Lakes: An example of New Opportunities for Managers and Riders. 1978

Miller, Scott. G., and Richard, L. Knight

Recreational Trails and Avian Communities —

Severinghaus, C.W., and B.F. Tullar

Wintering Deer Versus Snowmobiles 1975

Watkins, T.H.

Infernal Machines on the public Lands. 1969

Weeden, R.

Nonconsumptive users: A Myth. 1976