



Title:

Using geographic information system (GIS) technology to study the impacts of roads on Canada's national parks

Author:

[Seaby, Michael](#), Public Works & Government Services Canada
[Rivard, Don](#), Ecological Integrity Branch, Parks Canada

Publication Date:

08-24-2003

Publication Info:

Road Ecology Center, John Muir Institute of the Environment, UC Davis

Permalink:

<http://www.escholarship.org/uc/item/70g4c25b>

Additional Info:

Seaby M and Rivard D. 2004. Using geographic information system (GIS) technology to study the impacts of roads on Canada's national parks . IN: Proceedings of the 2003 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: p. 669. (Abstract)

Keywords:

Parks, Canada, ecological, integrity, technology, temporal, road, density

Abstract:

At the national level, Parks Canada employs GIS to support reporting on the ecological integrity of the nation's national parks, using road development as an indicator. GIS is a critical technology for addressing the spatial and temporal relationship between land use and conservation. Historical and contemporary digital road data were mapped in and surrounding Canada's 39 National Parks and National Park Reserves. Internal park road density, park area and the ratio of alien to native species were employed as indices to the ecological integrity of the parks. Road density surrounding Canada's national parks was correlated with other infrastructure, land use and human population to demonstrate that the former was a valid quantitative, spatially and temporally explicit index to the latter. External road density and land use, as well as landscape fragmentation and the measures of loss of park ecological integrity, increased spatially from north to south. External road density increased temporally from the 1950's to the 1990's but internal park road density increased in only a minority of parks. Historical and contemporary road data provide a readily available quantitative measure of the constraints to restoring and maintaining the ecological integrity of the national parks with predictive utility for tracking future trends in land use and fragmentation of the native ecosystem. At the field unit level, GIS technology is used as a tool to examine the ecological impacts of roads. The locations of wildlife-vehicle collisions on major highways in the



Rocky Mountain Parks were examined to assess factors influencing the frequency of wildlife-vehicle collisions and identify various mitigation measures. On the high traffic volume, high speed, divided section of Highway 1 in Banff National Park various types of overpasses and underpasses are used in combination with fencing to link wildlife habitats and reduce road kill. On lower traffic volume highways it is difficult to justify the cost of this intensive mitigation. Other measures need to be examined. A highway safety study of existing and proposed wildlife warning sign locations along Highway 93 South in Kootenay National Park found that most of the existing highway wildlife warning signs were not located at high animal kill sites (which corresponded to where watershed valleys intersected the highway). The new locations for the highway animal warning signs correspond to accident clusters involving wildlife. Another lower traffic volume highway is Highway 16 in Jasper N.P. The GIS database was used to examine driver (photo log) images of kill sites. The analysis of wildlife kill sites along this route indicated that the physical characteristics of the highway and corridor were good predictors of kill sites. Common factors of high kill sites included good roadside habitat, water supply nearby and long wide straight stretches of road. GIS will be used at the project level for the next phase of twinning Highway 1 in Banff. GIS can produce project displays and base maps to either help conceptualize the project, explain it to the public, or provide base mapping or other data for study and/or planning purposes. GIS has proved to be an essential decision-support tool for integrating road project and ecological information to facilitate more environmentally sensitive management of roads in national parks.



USING GEOGRAPHIC INFORMATION SYSTEM (GIS) TECHNOLOGY TO STUDY THE IMPACTS OF ROADS ON CANADA'S NATIONAL PARKS

Michael Seaby (Phone: 819-997-9292, Email: Mike.seaby@pc.gc.ca), Professional Engineer, Client Service Team for Canadian Heritage and Parks Canada, Operations Branch, Public Works & Government Services Canada, 25 Eddy Street, 4th Floor, Room 372, Hull, Quebec, Canada, K1A 0M5

Don Rivard (Phone: 819-953-4444, Email: Don.Rivard@pc.gc.ca), Professional Biologist, Ecosystem Scientist, Ecological Integrity Branch, Parks Canada, 25 Eddy Street, 4th Floor, Room 381, Hull, Quebec, Canada, K1A 0M5

Abstract

At the national level, Parks Canada employs GIS to support reporting on the ecological integrity of the nation's national parks, using road development as an indicator. GIS is a critical technology for addressing the spatial and temporal relationship between land use and conservation.

Historical and contemporary digital road data were mapped in and surrounding Canada's 39 National Parks and National Park Reserves. Internal park road density, park area and the ratio of alien to native species were employed as indices to the ecological integrity of the parks.

Road density surrounding Canada's national parks was correlated with other infrastructure, land use and human population to demonstrate that the former was a valid quantitative, spatially and temporally explicit index to the latter. External road density and land use, as well as landscape fragmentation and the measures of loss of park ecological integrity, increased spatially from north to south. External road density increased temporally from the 1950's to the 1990's but internal park road density increased in only a minority of parks. Historical and contemporary road data provide a readily available quantitative measure of the constraints to restoring and maintaining the ecological integrity of the national parks with predictive utility for tracking future trends in land use and fragmentation of the native ecosystem.

At the field unit level, GIS technology is used as a tool to examine the ecological impacts of roads. The locations of wildlife-vehicle collisions on major highways in the Rocky Mountain Parks were examined to assess factors influencing the frequency of wildlife-vehicle collisions and identify various mitigation measures. On the high traffic volume, high speed, divided section of Highway 1 in Banff National Park various types of overpasses and underpasses are used in combination with fencing to link wildlife habitats and reduce road kill. On lower traffic volume highways it is difficult to justify the cost of this intensive mitigation. Other measures need to be examined. A highway safety study of existing and proposed wildlife warning sign locations along Highway 93 South in Kootenay National Park found that most of the existing highway wildlife warning signs were not located at high animal kill sites (which corresponded to where watershed valleys intersected the highway). The new locations for the highway animal warning signs correspond to accident clusters involving wildlife. Another lower traffic volume highway is Highway 16 in Jasper N.P. The GIS database was used to examine driver (photo log) images of kill sites. The analysis of wildlife kill sites along this route indicated that the physical characteristics of the highway and corridor were good predictors of kill sites. Common factors of high kill sites included good roadside habitat, water supply nearby and long wide straight stretches of road.

GIS will be used at the project level for the next phase of twinning Highway 1 in Banff. GIS can produce project displays and base maps to either help conceptualize the project, explain it to the public, or provide base mapping or other data for study and/or planning purposes.

GIS has proved to be an essential decision-support tool for integrating road project and ecological information to facilitate more environmentally sensitive management of roads in national parks.

Reference

Rivard D., Seaby M., 2003. Road Systems As Indicators Of Status And Trends In Land Use In And Surrounding Canada's National Parks. SAMPAA (The Science and Management of Protected Areas Association).