Assessing Cumulative Impacts of Alternative Land Use Scenarios On Breeding Bird Habitat

Brenda Dobson
Parks Canada, Jasper National Park
Box 10, Jasper, AB, T0E 1E0, Canada
brenda_dobson@pch.gc.ca

ABSTRACT

Increasing recognition of the importance of understanding, assessing, and mitigating cumulative effects has led national park managers to seek methods that can assist in land use decision-making and the environmental assessment process. The objective of this research is to develop a geographic information system (GIS)-based model to investigate the cumulative impacts of alternative land use scenarios on 2 ecological indicators. The model incorporates ecological data and habitat models for a suite of ecological indicators and human use data managed by ARC/INFO software. A grizzly bear cumulative effects model has been developed for Jasper National Park to assess the effects of human activities on grizzly bears and their habitat. This model is useful in exploring the implications of land uses at the landscape scale, but has limited ability to assess alternative development scenarios at fine scales. To address this concern, 2 ecological indicators, ecosite representation and breeding bird richness, are being developed based on data collected in the Banff and Jasper National Park Ecological Land Classification. The responses of these indicators will be compared for scenario development at a fine scale, namely, the high human use montane area around Jasper Townsite. The results of the application of the scenarios to the ecological indicators will be measures of breeding bird habitat effectiveness and ecosite representation. This poster focused on the breeding bird richness indicator. Habitat effectiveness is the comparison between the habitat and the disturbance components of the models and represents an area's ability to support the indicator. A first run of the model is complete with preliminary results presented. Sensitivity analyses and scientific review of the zones of influence surrounding land use features are in progress.

Key words: Alberta, birds, breeding habitat, cumulative effects assessment, ecological indicators, habitat effectiveness, Jasper National Park.

The primary focus for most of the development proposals in Jasper National Park is an area called the Three Valley Confluence which includes the townsite, outlying resorts, a ski hill, and a golf course.

The Jasper Town Plan and many major land use proposals have stimulated the development of a cumulative effects assessment (CEA) framework for the park.

The breeding bird habitat effectiveness model presented here is being developed to facilitate the use of breeding bird habitat quality as an CEA indicator. Other elements of the framework include grizzly bear habitat effectiveness, linkage zone analysis, ecosite representation, and socioeconomic indicators.

The objective of this study is to investigate the cumulative impacts of human use on breeding bird habitat through the use of a geographic information system (GIS)-based spatial model which uses existing ecological data and applies alternative land use scenarios.

METHODS

The Banff–Jasper ecological land classification was developed between 1974 and 1981. It is based on an integrated resource inventory mapped at 1:50,000. Seventeen hundred 500-m call-count transects were completed within Jasper and Banff National Parks. Several samples of each ecosite were required due to the large study area and probability that wildlife use would vary across the same ecosite type. A transect was located within a single ecosite, with multiple transects per ecosite type.

Bird richness was calculated for 125 ecosite types. Each bird species was rated against disturbance criteria based on the scientific literature to predict displacement from habitat within a zone of influence (ZOI) surrounding a human use feature (the preliminary breeding bird classification by category was provided to obtain input from conference participants).
The coefficients of disturbance represent the percentage of breeding birds within a suite which are predicted to be displaced from the ZOI based on the disturbance criteria (Fig 1).

**SAMPLE CALCULATION FOR BREEDING BIRD HABITAT EFFECTIVENESS**

PT4 ecosite types have a bird richness of 50. The area of this PT4 ecosite is 60 ha. Given the richness and the area, the habitat potential for PT4 is $50 \times 60 = 3,000$.

The area of the resort within PT4 is 40 ha. The zone of influence (ZOI) designated for a resort is 100 m, and the total area of zone of influence within PT4 is 5 ha.

Of the suite of species occurring in PT4 ecosites, 10 out of 50 are predicted to be disturbed within 100 m of the resort. Therefore, the coefficient of disturbance within the ZOI is $(50 - 10)/50 = 0.8$.

The habitat value within the ZOI is $5 \times 0.8 \times 50 = 200$.

This resort represents 40 ha of habitat with no value for breeding birds. The realized habitat is $(60 - 40 - 5) \times 50 + 200 = 950$. Habitat effectiveness (realized habitat/potential habitat) is $950/3,000 = 0.32$ or 32% habitat effectiveness.

**STATUS OF THE MODEL**

This model is in progress. A first run of the model is complete. Coefficients are being refined and land use scenarios are being developed. A sensitivity analysis for the model is planned.

**REFERENCES**


*Figure 1.* Data layer requirements for the breeding bird habitat effectiveness model for Jasper National Park, Alberta, Canada.