

The Forestry Corp.

Elk Habitat Analysis

Foothills Model Forest - GIS Project Definition

November 20, 1996

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1. Overview

The purpose of the Elk Habitat Research is to assess habitat selection by elk at a landscape and stand level. Landscape selection will be the selection of a home range by elk within the boundaries of the study area based on attributes of the home range as compared to random home ranges. Selection at a stand scale will be the selection of habitat types within the animals home range, with the habitat types comprising the home range as the available habitat. This analysis is part of a larger elk habitat study conducted by Mr. Paul Jones (an M. Sc. student at the University of Alberta) and supported by the Foothills Model Forest.

Although the actual analysis portion of the model forest project will not be completed spatially, most of the data required for the analysis does have a spatial component. Therefore, a number of data preparation steps within GIS will be required before the final analysis can be completed. Included are such things as converting a ASCII text files into home range layers in the GIS, summarizing areas by given attributes and overlaying various data layers to determine attribute associations. This project definition outlines the GIS processing to be performed by The Forestry Corp to complete the study.

2. Methodology

2.1 Overview

The analysis portion of the Foothills Model Forest Elk Habitat analysis project requires area and length summaries by attribute for 9 actual and 18 random home ranges. These summaries will be created by overlaying elk and random home ranges with existing GIS data layers (forest cover, cut history, roads and seismic line layers). The required attributes are stand density, stand height, species composition, stand origin, cut block number, year cut, home range area, length of roads within each home range and length of seismic lines within each home range.

Most, if not all, of the home ranges are within the following management units or operating compartments:

- FMU E9
- Athabasca 6, 7, 8, 9, 13, 17, 18
- McLeod 12, 14, 15, 16

2.2 Generation of Home Ranges

Four GIS coverages will be generated and will form the basis for summarizing the forest cover and other attributes. These coverages will be actual home ranges (9 polygons), equal area home ranges (9 polygons), variable area home ranges (9 polygons) and the total study area (1 polygon). The Arc/Info feature type 'regions' will be used to identify overlapping home range polygons. A description of each of these coverages follows.

Actual home ranges - A GIS coverage will be generated that contains the boundaries of each of the 9 actual home ranges using ASCII text files provided by Paul Jones. These text files will contain the UTM coordinates which represent the outside boundary of each home range (along with an ID number identifying the corresponding animal). It is understood that the actual home range boundaries will be generated by Paul Jones using a PC-based application and that the polygons created using the GIS will simply be a recreation of those originally generated on the PC.

Equal area home ranges - A GIS coverage will be generated that contains 9 equal area random home ranges formed by creating a circular buffer around each of 9 points. The UTM coordinates and ID numbers for each of the points will be provided by Paul Jones and the buffer radius for all points will be 2709m.

Variable area home ranges - A GIS coverage will be generated that contains 9 variable area random home ranges formed by creating a circular buffer around each of 9 points. The UTM coordinates, ID number and individual buffer radii will be provided by Paul Jones.

Study area - A GIS coverage will be generated which contains one polygon representing the total study area. UTM coordinates for this polygon will be provided by Paul Jones.

2.3 Spatial Analysis

Since forest cover and cut history spatial data currently exist in separate GIS layers, the two must first be combined into one updated forest cover layer. The cut block boundaries will be used to clip out the existing forest cover so that the blocks will appear as polygons in the forest cover layer and the year of cut will become the stand origin for those polygons. This new updated forest cover will be considered the 'habitat' layer for the remaining analysis.

Then each of the 27 GIS home range coverages will be overlaid with the habitat, road and seismic line data layers. Output coverages will be 'clipped' at the home range boundary so that the total area of polygons within each coverage will equal the total area of the applicable home range.

2.4 Data Summaries

Two files of summary data will be created. The first file will contain the total area (in hectares), the total length of roads (in metres) and the total length of seismic lines (in metres) for each of the 27 home ranges and the total study area. Also included in this file will be a unique identifier for each home range, the value of which will depend on the identification used by Paul Jones (e.g. a home range number or an animal identification number). This identifier will be used to link this data with the second summary file.

The second summary file will contain a list of the habitat polygons within each home range. Each record will include the unique home range identifier as well as the stand identifier, forest cover type (density, height and species composition), forest stand origin and area. Cut blocks will be represented by the block number in the stand ID field and the year cut in the stand origin field. It is already known that there will be some areas which are missing habitat data. In such cases the stand id and origin fields will be left blank and the cover type field will contain the value 'UNKNOWN'.

2.5 Output Maps

A paper map will be produced for each of the 27 home ranges at a scale of 1:20,000 along with a single study area map scaled to fit and E size map. These maps will contain the following:

- home range boundary(s)
- habitat polygons with labels (home range maps only)
- roads
- seismic lines
- hydrology
- elk point locations (actual home ranges only)
- north arrow and scale text
- title

2.6 GIS Project Managers

The GIS project managers are responsible for day to day communication regarding the GIS project, ensuring the terms of this definition are fulfilled, and managing the timelines in regards to other GIS project timelines. The project managers for this GIS project will be:

Foothills Model Forest : Dan Farr

The Forestry Corp.: Carol Doering

Since this project is actually being completed for Mr. Paul Jones, it will be the responsibility of the Foothills Model Forest project manager to keep Mr. Jones informed of the project status and to ensure that this document correctly identifies his requirements. Should direct contact with Mr. Jones be required, his email address is jonesp@agt.net and his phone number is 865-4543.

3. Data Requirements

3.1 Elk Data

Foothills Model Forest will provide ASCII text files containing the boundary UTM coordinates for each of the 9 actual home ranges and a unique identifier for each. As well they will provide UTM coordinates for the 18 random home range generation points, identifiers for each one, and the individual buffer distances where required. These points will be used to generate 9 circular equal area home ranges and 9 circular variable area home ranges. Foothills Model Forest will also provide 9 Arc/Info GIS coverages containing the elk location points for each of the 9 animals in the study and a list of UTM coordinates used to delineate the full study area boundary.

3.2 Base Data

The analysis requires GIS data for forest cover, cut history, roads and seismic lines. These layers will be provided by Foothills Model Forest in conjunction with Weldwood of Canada. The road and seismic line data will come for the 1:20,000 provincial digital base maps purchased by Weldwood. Forest cover data will come from a joint Weldwood/Foothills Model Forest GIS layer which contains a combination of older Phase 3 Forest Inventory and newer Alberta Vegetation Inventory (AVI) data. It is known that some pieces of the elk study area do not currently have any forest cover data and this will be reflected in the final project summary files. The cut history will come from a coverage provided by Weldwood.

In addition to the data required for analysis, hydrologic data will be required for the output mapping. This data will also be provided by Foothills Model Forest through Weldwood's 1:20,000 digital base.

4. Deliverables

4.1 Generated Analysis Data

The following data will be provided to the Foothills Model Forest (or their designate) on floppy diskettes in ASCII format.

1. a comma delimited ASCII file containing the home range identifier, total area, total road length and total seismic length for each of the 27 home ranges and the total study area (28 lines in the file).
2. a comma delimited ASCII file containing a list of all habitat polygons within each home range. Fields included will be the home range identifier, stand identifier, stand density, stand height, species composition, stand origin and area. Cut block polygons will be identified by the block number in the stand id field, a value of 'CC' in the species composition and the year of cut in the origin field. If possible a similar file will be generated for the entire study area but the size may be prohibitive.

4.2 Digital GIS Data

All Arc/Info coverages created as part of this project will be delivered to the Foothills Model Forest and installed on their system. This includes the following:

1. elk location point coverages (9)
2. actual home range coverage (1)
3. equal area home range coverage (1)
4. variable home range coverage (1)
5. study area boundary coverage (1)
6. habitat coverage for the study area (1)

4.3 Paper Maps

Paper maps for each home range and the study area will be provided to the model forest. Each map will include some or all of the following: the home range boundaries, labelled habitat polygons, roads, seismic lines and hydrology. The actual home range maps will also contain the elk location points.

5. Time Frame

Analysis and data preparation will be completed by December 20, assuming the required data is received from the Foothills Model Forest by November 18, 1996. Should the data not be received by the required date, the project completion date shall be adjusted accordingly. The Forestry Corp. will provide to Foothills Model Forest the two ASCII summary files and the Arc/Info coverages by the above date. However, due to current work loads, delivery of the output maps may be as late as December 31 but will be completed as soon as possible. If possible Foothills Model Forest will complete the mapping portion of the project on their own.

6. Costing & Payment Schedule

6.1 Cost Formula

Costing will be based on a not to exceed basis as defined in the overall Foothills Model Forest / The Forestry Corp. GIS services contract.

Current project cost in relation to progress on deliverables shall be reviewed after each step in the process by both the company and consultant project managers. Potential problems of costs above original expectations will be addressed by both parties at that time. The Foothills Model Forest project manager may request that the work be stopped at any point and The Forestry Corp. will be reimbursed for all work completed to that date.

It is expected that the mapping portion of this project will be completed in house by the Foothills Model Forest and that The Forestry Corp. will not be required to do so. However, those deliverables were included here as a backup should the model forest not be able to carry them out themselves.

6.2 Payment Schedule

The Forestry Corp. will provide a single invoice after all deliverables are complete or once Foothills Model Forest requests that work on the project be stopped. This invoice shall be charged against Foothills Model Forest account # 100.

7. GIS Project Acceptance Form

Completion of the following Project Acceptance Form indicates acceptance of the GIS project by both the Foothills Model Forest and The Forestry Corp. under the terms stated in this Project Definition document.

Foothills Model Forest / The Forestry Corp.
GIS Project Acceptance Form

453-3986

Project Description:

Project Title: Elk Habitat Analysis
FMF Project Code: 200
FMF Contact Person: Dan Farr
TFC Contact Person: Carol Doering

Project Details:

Start Date: November 18, 1996
End Date: December 31, 1996
Total Project Cost: Not to exceed \$3000 (excluding GST)
Costing Formula: Fixed Not to Exceed Time & Materials

Project Acceptance:

Project Managers:	Foothills Model Forest	The Forestry Corp.
Signature:	<u>Daniel R Farr</u>	<u>Carol Doering</u>
Name (printed):	<u>Dan Farr</u>	<u>Carol Doering</u>
Phone Number:	<u>865-8180</u>	<u>452-5878</u>
Date:	<u>19 Nov 1996</u>	<u>Nov 20 / 96</u>

8. Supporting Documentation

Attached to this section are documents relating to the overall model forest elk habitat analysis project which may be of assistance in the performance of this GIS project. Included are the following:

1. Detailed Activity Work Plan (DAWP) for the model forest project, received from Dan Farr November 18, 1996
2. Copy of rough GIS requirements notes as provided by Dan Farr and Paul Jones.
3. UTM coordinates for 9 home ranges (on diskette), received from Dan Farr November 18, 1996. This also included home range identifiers.
4. UTM coordinates for home range generation points, 9 equal area and 9 variable area, along with the identification numbers and variable radius values. Received on paper from Dan Farr, November 18, 1996.
5. UTM coordinates for the study area, received on paper from Dan Farr, November 18, 1996.