PROPOSAL FOR
A STUDY OF
SIGNIFICANT ENVIRONMENTAL FEATURES
IN THE
FOOTHILLS MODEL FOREST, ALBERTA

Prepared by:

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For:

Foothills Model Forest
Hinton, AB

December 1993

1.0 INTRODUCTION

This is a proposal by Sweetgrass Consultants Ltd. of Calgary for undertaking a study of Significant Environmental Features (SEFs) in the Foothills Model Forest in the Hinton area of western Alberta.

The study will involve a literature and database review to document the significant biological and physical resources of the area. The final products will consist of:

1. a comprehensive non-technical summary report which combines maps and easily understood text; and
2. technical background information in file and database form.

The combined experience of the study team spans almost a hundred years. Members of the study team include experts in field studies as well as literature review and significant features' analysis. Team members have an excellent understanding of the status of various features and species in the Rocky Mountains and Foothills. Their extensive work with Environmentally Significant Areas' studies as well as rare, threatened and endangered species enables them to readily identify significant physical and biological features.

Expertise of the study team extends beyond significant features identification and analysis into database and GIS applications as well as parks systems' planning and theme analysis.

Team members have worked together on numerous projects including several environmentally significant area studies. As a result, project management is simplified and considerably more time can be devoted to essential data analysis.

2.0 PROJECT TEAM

The study team consists of five researchers with a variety of backgrounds in natural history studies. Team members have worked together on previous interdisciplinary projects involving the identification, management and interpretation of significant natural resources. They have directly related experience working on significant features and park systems' analysis projects in mountain and foothill environments.

Sweetgrass Consultants Ltd. would handle the contractual agreements for all personnel and would be the prime contractor to the Foothills Model Forest.

Key personnel employed on this project will be:

Wayne Smith, *Independent Wildlife Researcher*
Robyn Usher, *GIS and Database Specialist*, GAIA Consultants
Cliff Wallis, *Environmental Researcher*, Cottonwood Consultants
Cleve Wershler, *Environmental Researcher,* Sweetgrass Consultants
Ray Wershler, *Independent Wildlife Researcher*

Cleve Wershler will be overall project coordinator and wildlife specialist responsible for the animal component.

Cliff Wallis will be the biophysical specialist responsible primarily for the plant and landscape components.

Robyn Usher as GIS and database specialist will be responsible for coordinating input into the electronic databases and ensuring compatibility with existing Foothills Model Forest GIS and database systems.

Wayne Smith and **Ray Wershler** will be technical assistants who will help in gathering information from all sources.

All personnel are available for the full term of the project.

3.0 CORPORATE AND PERSONNEL BACKGROUND

Sweetgrass Consultants Ltd. has been conducting research on aspects of Alberta's natural history since 1978, and its researchers and associates have a history of wildlife, significant features and protected areas research extending back to the 1960s. We have had considerable experience in the identification and evaluation of significant landscapes and habitats, and rare plants and animals. Much of our knowledge has been gained first-hand from field research programs.

Research in the western Canada's mountain and foothill environments has included:

1. biophysical surveys at Bow Valley Provincial Park and the Kootenay Plains;

2. significant plant surveys along the Trans-Canada Highway in Banff National Park;

3. assessments of the environmental impacts of tourism development in the Canmore Corridor;

4. monitoring of environmental change at Many Springs and Mt. Yamnuska;

5. wildlife studies as part of the Ecological Land Classifications for Banff/Jasper, Kootenay and Mt. Revelstoke/Glacier National Parks;

6. amphibian, reptile and bird surveys in the West Castle drainage of southwestern Alberta; and

7. theme analysis and representation of potential protected areas in the Rocky Mountains and Foothills of Alberta and Columbia Mountains of British Columbia.

In addition to the regionally related research, team members have also managed or been directly involved in the research for **Environmentally Significant Area studies in several mountain/foothill corridors and plains environments in the Calgary Region, Edmonton Region (County of Strathcona, M.D. of Sturgeon), David Thompson Highway Corridor, Oldman River Region (M.D.s of Cardston, Pincher Creek, Taber and Willow Creek; and Counties of Vulcan, Lethbridge and Warner), Red Deer Region (Counties of Stettler, Lacombe, Paintearth, Red Deer and Mountain View; M.D. of Clearwater), Palliser Region (M.D.s of Acadia, Kneehill and Starland), Lower Red Deer River Corridor, County of Barrhead, Municipality of Crowsnest Pass and Towns of Lacombe and Canmore.**

Wayne Smith has a history of volunteer and professional biological experience, including wildlife surveys and monitoring, dating back to the late 1960's. Wayne has been working on a number of Environmentally Significant Area and wildlife projects, including surveys and management plans for rare, threatened and endangered amphibian, reptile, bird and mammal species. He has recently completed wildlife surveys in mountain environments in the Bow River Corridor and West Castle drainage areas. Wayne is a team member for the wildlife

component for the Ecological Land Classification in Yoho National Park and is currently working on the Environmentally Significant Areas Inventory for the Town of Canmore.

Robyn Usher has over fifteen years experience in conducting biological studies and over the past four years has developed considerable expertise in the databases and GIS, integrating and analyzing natural resource data. This has included studies for a variety of federal and provincial environment and wildlife agencies. She has designed a digital database for work in the City of Calgary to include geological, hydrological and aquatic special features and wildlife habitat importance values. This digital database was used for GIS base mapping, testing and development of management scenarios, and provision of the digital data to other computerized databases. As a result, Robyn is particularly familiar with how to effectively construct a computerized database for data storage, maintenance and retrieval purposes, and for use with SPANS and other GIS software products. Robyn is a team member for the wildlife study in Yoho National Park.

Cliff Wallis has considerable expertise in coordinating and undertaking natural history surveys since the early 1970s. He has worked in a variety of Natural Regions including the Rocky Mountains, Foothills, Canadian Shield, Boreal Forest, Aspen Parkland and Grassland. He is conversant with vegetation, physical features, and wildlife identification and evaluation. Cliff has played a major role in coordinating many of the Environmentally Significant Areas studies conducted in Alberta and has had extensive experience determining theme representation for Alberta Parks' systems planning. He has conducted a variety of field studies on vascular plants, amphibians, reptiles, birds and mammals, as well as on-line computerized literature searches and extensive searches of archival material in government files, museums and universities. Cliff is project coordinator for the wildlife component for the Ecological Land Classification in Yoho National Park and is currently working on the Environmentally Significant Areas Inventory for the Town of Canmore.

Cleve Wershler is one of Alberta's principal natural history researchers, with volunteer and professional experience dating back to the mid-1960s. He was employed with Alberta Parks in Edmonton as a resource management specialist prior to starting his career in environmental consulting in the mid-1970s. Cleve has been involved in most of the Environmentally Significant Areas studies conducted in Alberta and was project manager for several Environmentally Significant Areas' studies conducted in Alberta's Foothills and Rocky Mountain Natural Regions, including the M.D. of Clearwater and the Crowsnest Pass, David Thompson, Bow River and Crowsnest Pass corridors. He has conducted biophysical studies in a variety of environments and has undertaken a wide array of management, monitoring and research projects for birds, amphibians, reptiles, mammals, and rare plants and habitats. Many of these involved the identification, evaluation and management of significant features. This varied project experience included field studies as well as archival research and major reviews of the literature. Cleve is a team member for the wildlife component for the Ecological Land Classification in Yoho National Park and is currently working on the Environmentally Significant Areas Inventory for the Town of Canmore.

Ray Wershler has had a variety of experience conducting wildlife surveys, including three field seasons with the Ecologial Land Classification wildlife components for Kootenay and Mt. Revelstoke/Glacier National Parks. He has undertaken bird surveys, amphibian and reptile research, as well as a variety of mammalian surveys in mountain environments. He has also had considerable experience with the wildlife components of Environmentally Significant Areas studies in southern Alberta. Ray is a team member for the wildlife component for the Ecological Land Classification in Yoho National Park and is currently working on the Environmentally Significant Areas Inventory for the Town of Canmore.

Sweetgrass Consultants and its associates have in-house computer facilities for word processing, data base management (dBase, Paradox, Access, Alpha4), GIS, and audio-visual and video production. We have programs for converting data and word-processing files to and from other software packages. We subscribe to INET 2000 and CAN/OLE giving direct computer access to hundreds of data bases around the world.

Brief summaries of our corporate and personnel experience are attached. More detailed resumés are available on request and we would be available for an interview.

4.0 STUDY AREA AND STUDY APPROACH

The study area includes the entire Foothills Model Forest as indicated in the Request for Proposal. Considerable natural resource information is available, primarily in government reports and database files and those of the Foothills Model Forest. Additional information can be obtained through interviews with local naturalists and reviews of their data.

Criteria for Significant Environmental Features identification will be largely based on those used for most of the environmentally significant areas studies in Alberta. This excludes hazard lands but includes:

1. areas which perform a vital environmental, ecological or hydrological function such as aquifer recharge;

2. areas which contain rare or unique geological or physiographic features;

3. areas which contain significant, rare or endangered plant or animal species;

4. areas which are unique habitats with limited representation in the region or are a small remnant of once larger habitats which have virtually disappeared;

5. areas which contain an unusual diversity of plant and/or animal communities due to a variety of geomorphological features and microclimatic effects;

6. areas which contain large and relatively undisturbed habitats and provide sheltered habitat for species which are intolerant of human disturbance;

7. areas which provide an important linking function and permit the movement of wildlife over considerable distances, including migration corridors and migratory stopover points;

8. areas that are excellent representatives of one or more ecosystems habitats, or landscapes that characterize a natural region (as outlined in 1993 by Alberta Parks and Recreation in the "Natural History Themes of Alberta";

9. areas with intrinsic appeal due to widespread community interest or the presence of highly valued features or species such as game species or sport fish; and

10. areas with lengthy histories of scientific research.

In addition to the established criteria, the Foothills Model Forest has identified two criteria specific to this project:

1. areas containing old-growth forest values or older forest stands; and

2. areas that perform a vital function for wildlife in the area, e.g. overwintering areas, calving.

Size will play some role in the evaluation. Areas will not necessarily be rejected because of small size; however, their levels of significance may be reduced if larger units of similar features are found elsewhere.

Aesthetic factors will not be used as primary criteria for evaluating sites. Nevertheless, many of the diverse landscapes and natural habitat areas will be aesthetically pleasing to many people and will add to the value of the Significant Environmental Features.

We have developed a simple data recording form or checksheet which can be used during all phases of data collection. Information will be mapped on 1:50,000 NTS maps for later transfer to the 1:250,000 final report maps.

Literature and Database Review

The principal original information sources will be:

1. the biophysical information contained in the scientific journals, consultant reports and the reports, maps, databases, files and collections of the Alberta Parks Service; Alberta Forest Service; Alberta Fish and Wildlife Division; University of Alberta Herbarium; Alberta Research Council; Provincial Museum; Canadian Wildlife Service; and Geological Survey of Canada;

2. the database of the Foothills Model Forest;

3. recent aerial photographs; and

4. interviews with experts and other knowledgeable people in government, industry and non-government organizations, both local and provincial.

Aerial photography will be used to identify the following types of areas:

1. areas of vegetation diversity

2. major rock outcrops

3. regionally rare landforms, e.g. sand dune areas

4. diverse riparian habitats

6. interesting or unusual landscape and vegetation features, e.g. grassy slopes

7. major wetlands, especially patterned peatlands

Database

The data collected for the project will be stored in a format and structure that is compatible with the Foothills Model Forest database. All mapped information will be digitized for use in the GIS.

Digitizing will be undertaken using SPANS digitizing software, TYDIG-Version 5.3 All Significant Environmental Feature boundaries will be traced, line work error checked, and a reference point placed in each polygon in order to tie the Significant Environmental Feature polygons to their associated attributes. Line work will be imported from TYDIG into SPANS for purposes of map and attribute database creation.

The attributes of GIS spatial elements are generally stored in a relational database management system. We propose storing and maintaining the Significant Environmental Feature attributes in dBase IV. A primary advantage of storing the Significant Environmental Feature attributes in a relational database is a significant reduction in the work required to maintain consistency among polygon attributes. In addition, Significant Environmental Feature attributes can be easily exported to text files and imported to other software packages for analysis.

Information exported from the database files into attribute text files will be used to produce maps of Significant Environmental Features. Area analyses will be conducted to determine the area and percent occurrence of Significant Environmental Feature map classes and other specific features. These analyses may be used to demonstrate important statistics such as the relative abundance of significant, critical or rare fetures. We will also develop some simple SPANS applications to demonstrate how the attribute data can be used for query and analysis.

A translation utility supplied through SPANS allows the translation of its spatial and attribute data to a format compatible with ARC/INFO. This utility, with some modifications, has been successfully used by GAIA to create vector and attribute text files for use in ARC/INFO.

Analysis of Significance and Theme Representation

Using the criteria previously outlined, Significant Environmental Features will be classified on the following bases:

International - features that are unique in the world.

National - features that are limited in distribution at a national level or that are the best or only representative in Canada.

Provincial - features that are limited in distribution at a provincial level or that are the best examples of a feature in Alberta.

Regional - features that are of limited distribution or are the best examples of a feature in the study area.

Each Significant Environmental Feature will be evaluated for its potential to contribute to the Special Places 2000 initiative of the Alberta Government. This will involve an assessment of the Level I and II natural history themes represented. These themes are described in the 1992 Alberta Parks' document "Natural Regions and Natural History Themes: Targets for Alberta". For Level 1 themes where representation in existing protected areas in Alberta is considered inadequate, an approximate area for those themes that occur in each significant environmental area in the Foothills Model Forest will be calculated.

Sensitivity Analysis

We will assess the potential sensitivity of each significant environmental area to the following activities and disturbances:

1. Recreation, including hunting, fishing, hiking, wildlife viewing, primitive camping, and cross-country skiing

2. Timber Harvesting, including clear cutting and selective cutting

3. Motorized Vehicles, including snowmobiles, ATVs and four-wheel drive vehicles

4. Linear Disturbances, including access roads, seismic lines, and trail development

5. Facility Development, including buildings, septic fields, wellsites and developed camping

6. Mining, including open pit and underground

These activities and disturbances may be regrouped into logical categories that have similar impacts to the environment.

The sensitivity of significant environmental features to anthropogenic disturbance will be evaluated as follows:

High - disturbance/activity can be expected to result in a complete loss of the significant natural feature or require major mitigation and very restrictive operating conditions to maintain the vital ecological functions of the feature.

Moderate - disturbance/activity will result in considerable loss or modification of the significant natural feature. Significant mitigation and restrictive operating conditions are likely required to maintain the vital ecological functions of the feature.

Low - disturbance/activity will result in minor loss or modification of the significant natural feature. Some mitigation and normal operating restrictions may be required to maintain the long-term viability and vitality of the feature.

Insignificant - disturbance/activity will have no measurable impact on the significant ecological feature.

Final Report

The information collected during the literature and database review and interviews will serve as the basis for the final report. While the final report should be technically accurate, it should also be readily understood by the general public.

We propose to provide the following:

1. copies of technical reports, notes and file materials not already in the Foothills Model Forest collection that relate to the significant biophysical features of the region;

2. a non-technical summary report which presents all the Significant Environmental Features in map and text form; and

3. aerial photographs depicting the boundaries of Significant Environmental Features identified in the final report and maps.

The summary report will be laid out so that the reader can, at a glance, determine the following for each Significant Environmental Feature:

1. name of the area;

2. location (general and legal);

3. level of significance (international, national, provincial, regional) and rationale for rating;

4. major biophysical features which characterize the area;

5. current status of area (policy reserve, recreation area, IRP zone, etc.)

6. assessment of resource conflicts;

7. management considerations;

8. references which will provide more detailed information;

9. potential for representing natural history themes identified by Alberta Parks and Recreation.

In order to maintain the usefulness of the report, the number of maps will be kept to the minimum required to clearly display the information. Maps will be at a scale of 1:250,000 and display significant environmental features and their levels of significance (regional, provincial, national or international).

In addition, there will be page size maps at various scales to define boundaries of smaller sites. A scale of 1:15,000 will probably be appropriate for the majority of these sites.

The summary report will also include brief overviews of:

1. the study approach and criteria for inclusion of Significant Environmental Features and methods of evaluating their level of significance, sensitivity and theme representation;

2. the general environment of the region, including climate, bedrock geology, surficial geology, vegetation, wildlife, and fisheries;

3. general management considerations for types or categories of Significant Environmental Features;

4. limitations, data gaps, and future research requirements;

5. the database work completed and a description of the method for importing data into ARC/INFO for map and attribute creation.

There is a considerable body of literature being developed on the topic of forest fragmentation. The discussion in the report will review this literature and address the consequences of habitat fragmentation on different types of significant environmental areas and should recognize the differing impacts on "forest interior" and "forest edge" species. In addition, we will explore the potential damage to regional ecosystems that may result from disturbing individual significant environmental areas.

One copy of the draft report and twenty copies of the final report along with a camera-ready unbound copy, the wordprocessing computer diskette in Wordperfect format, and GIS and database diskettes in compatible formats will be submitted.

Client Liaison and Public Information

Sweetgrass will meet with the Foothills Model Forest representatives on at least three occasions to review the terms of reference and further define the work plan; to discuss and review the draft report and maps; and to present the final report at a public open house.

5.0 PROJECT TIMETABLE AND PAYMENT SCHEDULE

Phase I - to start immediately on signing of contract

Literature Review (Site Identification) - completion by January 31, 1994
Aerial Photograph Interpretation - completion by January 31, 1994
Interviews - completion by January 31, 1994

Products: brief Progress Report
Payment: 25% of total fee on submission of Progress Report, by January 31, 1994

Phase II

Data Analysis, Compilation of Check Sheets and Sample Maps, and Working Database Compilation - completion by Feburary 21, 1994

Products: Progress Report, Check Sheets and Sample Maps, Working Database
Payment: 25% of total fee on submission of Progress Report, Check Sheets and Sample Maps, Working Database Feburary 21, 1994

Phase III

Draft Final Report, Assembly of Technical Data and Final Database Compilation - completion by March 10, 1994

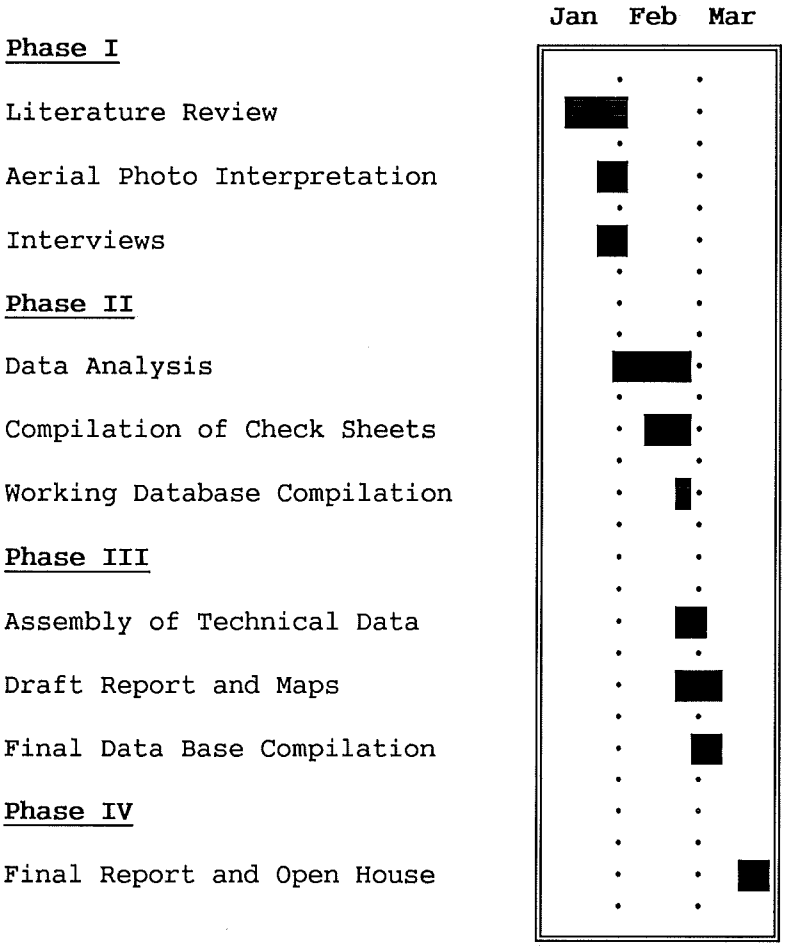
Products: Draft Final Report with Draft Final Maps, Final Database
Payment: 25% of total fee on approval of Draft Final Report and Draft Maps, March 10, 1994

Phase IV

Project Completion - completion by March 31, 1994
Products - Final Report including Database, Public Presentation

Payment: 25% of total fee on acceptance of completed product

SCHEDULING


Jan
Feb
Mar
Phase I
Literature Review
Aerial Photo Interpretation
Interviews
Phase II
Data Analysis
Compilation of Check Sheets
Working Database Compilation
Phase III
Assembly of Technical Data
Draft Report and Maps
Final Data Base Compilation
Phase IV
Final Report and Open House

6.0 DETAILED COSTS

The following is a detailed cost breakdown for the study. Assumptions for the purposes of budgeting include the following items as client responsibilities:

1. the provision of maps and aerial photographs;
2. mylar base maps (1:250 000) and two paper copies; and
3. digital data from the Foothills Model Forest.

Professional Time

Meetings & Coordination	3 days @ 480	✓
Phase I - Literature Review	4 days @ 400	-1
Aerial Photograph Interpretation	2 days @ 480	✓
Interviews	3 days @ 400	-2
Phase II - Data Analysis	7 days @ 480	-1
	3 days @ 400	✓
Compilation of Check Sheets and Maps	2 days @ 480	same but done by Smith or Webster
Database Compilation	3 days @ 500	~~-.5~~ -.5
Phase III - Assembly of Technical Information	2 days @ 400	-1
Draft Report	7 days @ 480	
Final Database	2 days @ 500	-.5
Phase IV - Final Report and Open House	2 days @ 480	✓

Sub-totals:	12 days @ $400 =	$4,800
	23 days @ $480 =	$11,040
	5 days @ $500 =	$2,500
	Professional Time Sub-total:	$18,340

Expenses

Travel Expense - 4 days @ $60/day	$240
Mileage - 3500 km @ .26	910
Telephone	50
Courier	25
Duplication	500
Mapping	2500
Expenses Sub-total:	$4,225
TOTAL:	$22,565

Professional fees are charged according to the following fee structure:

Wayne Smith	-	$400/day	(6 days total)
Robyn Usher	-	$500/day	(5 days total)
Cliff Wallis	-	$480/day	(11 days total)
Cleve Wershler	-	$480/day	(12 days total)
Ray Wershler	-	$400/day	(6 days total)

Budget Notes:

This budget will allow Sweetgrass to meet all the terms and conditions outlined in the "Request for Proposals". This is a fixed fee proposal. Costs will not exceed the $22,625 total unless work additional to that outlined above is requested by the client. This fee is firm until February 1994.

7.0 PERSONNEL AND CORPORATE RESUMES

WAYNE SMITH
SUMMARY

Wayne graduated from the University of Calgary in 1973 with a B.Sc. in Zoology and Botany. He has had extensive experience conducting biological surveys throughout Alberta since the mid-1960's. He has had a long standing interest in studies of shorebirds, birds of prey, and warblers.

Wayne has a broad range of interests in biological studies and, in addition to terrestrial vertebrates, has conducted surveys of native plants and butterflies. He is credited with the first Alberta discovery of the rare Weidmeyer's Admiral butterfly, which occurs along the Milk River. Wayne has been responsible for several computerized and manual literature surveys in wildlife and vegetation since the early 1970's.

Wayne is currently working on wildlife assessments in several locations in southern Alberta. He has conducted several amphibian, reptile, bird, and mammal monitoring studies and research on rare, threatened and endangered species such as the Ord's Kangaroo Rat, Baird's Sparrow, Piping Plover, Mountain Plover, Loggerhead Shrike, Northern Leopard Frog, Great Plains Toad, and Western Hognose Snake. Wayne is one of the co-authors of a two volume book summarizing highlights of Alberta bird observations in the 1970s that were derived from interviews as well as field notes, government reports, and scientific publications.

Of particular note to this project is Wayne's involvement on the study team for the Yoho National Park wildlife component of the Ecological Land Classification as well as his experience with numerous Environmentally Significant Area studies in southern and central Alberta. This included assessment of biological features at international, national, provincial, and regional levels of significance.

PROJECT EXPERIENCE

Ecological Surveys: Cypress Hills, Dry Island Buffalo Jump, Red Lodge, Winagami Lake, Gregoire Lake, Cold Lake, Hilliard's Bay, Beauvais Lake, Police Outpost and Woolford Provincial Parks

- field studies of wildlife, vegetation and unique features; assessment of significance and management considerations

Waterfowl and Shorebird Surveys: Mackenzie Valley Pipeline; Cooking Lake-Beaverhills Moraine; Reflex-Sounding Lake Sand Plain; Calgary Region; Alberta Oil Sands Environmental Research Project; Harlequin Duck

- field surveys of key shorebird staging areas and nesting and migrating waterfowl; analysis of potential environmental impacts

Birds of Prey Studies: Southern Alberta; Sheep River Migration; Foothills Owl Survey

- field research and banding of birds of prey along the Bow River and long-term studies of migration in a prime foothills location

Rare and Endangered Species: Mountain Plover; Piping Plover; Loggerhead Shrike; Western Painted Turtle; Ord's Kangaroo Rat; Great Plains Toad; Western Hognose Snake

- field studies and assessment of management problems

Resource Monitoring: Piping Plover; Milk River Canyon; Antelope Creek Ranch; Cypress Hills Grazing; Calgary Gull Project

- bird censuses along transects to determine the effects of grazing; banding gulls to determine movements and potential hazard to aviation

Systems Planning: Grasslands and Southern Rivers

- field and literature assessments of the native grassland and river corridors; studies of terrestrial vertebrates, fish, butterflies, plants and landforms

Environmentally Significant Areas: Oldman Regional Plan Area; David Thompson Corridor; Bow River Corridor; Red Deer Regional Plan Area; County of Barrhead; Southeast Regional Plan Area; Palliser Regional Plan Area; West Castle

- field and literature surveys of natural habitats to assess significance

ROBYN USHER
SUMMARY

Robyn Usher, M.Sc., is a principal of GAIA Consultants and her area of expertise is in natural resource planning and management with specific expertise in the use of GIS technology and database development for integrating and analyzing resource data. She has been involved in the completion of a wide range of biophysical inventories in western Canada for federal and provincial governments, municipalities, and industry.

Robyn has operated the SPANS GIS software since 1987 and has successfully completed more than 12 GIS studies for federal and provincial governments including the Canadian Parks Service, Canadian Wildlife Service, Agriculture Canada, Canadian International Development Agency (CIDA), Alberta Forest Service, Alberta Environment, Alberta Fish and Wildlife Division, Ontario Ministry of Natural Resources, and the City of Calgary Parks and Recreation Department. She has conducted SPANS training seminars for Environment Canada, Agriculture Canada, CIDA, and the World and Asian banks.

Related work includes a biophysical assessment of the wetland and upland resources of Yohin Lake, in Nahanni National Park Reserve, in conjunction with Ecological Land Surveys, and of the Vermilion Lake Wetlands in Banff National Park. This work involved both the biophysical inventory and development of GIS map and attribute databases.

Robyn has recently been involved in the development of an ecological inventory and analysis of the City of Calgary river valley resources for purposes of urban parks master planning. A GIS database of the study area's geological features, wildlife habitat suitability, and development limitations was prepared. Project work has involved digitizing, SPANS mapping, and the development of a database management structure, including spatial and attribute database creation, and data analysis.

Robyn's special skills include a thorough understanding of GIS technology and the design and development of databases for use in a GIS environment. She is familiar with the benefits and limitations associated with GIS systems and the many ways in which GIS procedures can be streamlined. Robyn is proficient in database development, map creation and mechanisms for exchanging data among GIS software packages. She is also a qualified GIS instructor, having taught extensively and developed a range of GIS and database teaching materials.

Of particular relevance to this project are Robyn's participation in the NAIA wildlife project of which the Foothills Model Forest venture is a contributor. Work was undertaken in conjunction with SENTAR Consultants Ltd., Hughes Aircraft of Canada Ltd., and the Alberta Research Council to map and predict the suitability of elk habitat in the Cache Percotte Forest using ARC/INFO contour data. Robyn is the database coordinator and GIS specialist on the Yoho Ecological Land Classification wildlife component study team.

CLIFF WALLIS
SUMMARY

Cliff graduated from the University of Calgary in 1972 with a B.Sc. in Botany and Zoology. After working with Alberta Parks conducting biophysical inventories and planning parks, he moved into the private consulting field in 1979. He is a Professional Biologist with a diverse background in protected area systems planning, tourism projects, ecological studies, rare and endangered species evaluations, significant features identification, protected area planning, interpretive planning, environmental photography, multi-media production, and sound recording. He has published numerous consulting and government reports, as well as several articles in scientific and popular journals.

Cliff has recently completed several Environmentally Significant Areas studies in southern and central Alberta. These included field and literature surveys of geological, cultural, and biological features and assessment at the international, national, provincial, and regional levels of significance. He has worked on several projects which have integrated protection and appropriate development of sensitive biophysical resources.

Cliff has had extensive experience coordinating and conducting vegetation and wildlife surveys and interpretive studies and he has managed a variety of rare and endangered plant and wildlife projects.

Of particular note with respect to this study are Cliff's involvement with a variety of Environmentally Significant Area studies and the analysis of theme representation for Alberta Parks' systems planning. Cliff is project coordinator for the Yoho ELC wildlife component study team.

PROJECT INVOLVEMENT

Significant Features Analyses: Many Springs; Saskatoon Mountain; Coal Valley; Little Fish Lake; Lost River; Calgary Region; Oldman River Region; Red Deer Region; Palliser Region; Southeast Region; Lower Red Deer River Corridor; Crowsnest Pass; David Thompson; Bow River Corridor; County of Barrhead; Shorebird Lakes in East-Central Alberta

- field studies and literature review to determine sensitive wildlife and vegetation features

Rare and Endangered Species: Trans-Canada Highway Twinning -- Banff National Park; Rare Plants of the Boreal Forest, Parkland, and Grassland; Mountain Plover; Piping Plover; Rare Amphibians and Reptiles of Alberta's Parkland and Grassland; Rare Plants Monitoring, Oldman River Region; Rare Plants and Wildlife of Sand Hills; Western Blue Flag; Milk River Canyon

- field surveys to identify rare plant and wildlife habitats, population size, and management problems; literature surveys to determine status

Resource Management Planning: Beauvais Lake, Dinosaur and Cypress Hills

- analysis of data for park management

Systems Planning: Grasslands; Peace River Parkland; Red Deer River Corridor; Columbia Mountains; and Southwestern Alberta Montane and River Valleys; Provincial Parks System

- extensive literature and field studies to determine park potential and to analyse theme representation

Biophysical Inventories: Kootenay Plains; Kazan Upland; Milk River; Bow Valley; Saskatoon Island; Young's Point; Hand Hills; Canada Olympic Park

- field studies of wildlife, vegetation, and landscapes

Tourism Studies: Trail of the Great Bear; Red Deer River; Watchable Wildlife

- field and literature studies of biophysical resources to determine tourism opportunities and constraints

Interpretive Planning: Waskasoo Park; Badlands and Bones Auto Tour; Dinosaur Provincial Park; Many Springs, Bow Valley Provincial Park; Writing-on-Stone Provincial Park; Wood Buffalo National Park

- analysis of resource sensitivity, suitability and capability for interpretation

CLEVE WERSHLER
SUMMARY

Cleve graduated from the University of Calgary in 1973 with a B.Sc. in Zoology and Botany but has been active in wildlife studies since grade school. He was a resource management specialist with Alberta Parks prior to moving into environmental consulting in the mid-1970s. He has an in-depth knowledge of the ecology and biogeography of western Canada and has considerable experience in environmental photography and natural history audio-visual productions.

Cleve has recently completed a variety of projects for the Prairie for Tomorrow program including studies of several threatened or endangered species. He has extensive experience in environmental studies including endangered species recovery plans, significant features evaluation, protected area management, interpretive planning, wildlife photography and audio-visual production. He has published several articles in scientific and popular journals.

Since high school in the mid-1960s, he has undertaken wildlife studies in significant natural habitats and protected areas. He has been involved in the assessment of biological features at the international, national, provincial, and regional levels of significance. Cleve is currently working on a number of wildlife studies throughout southern Alberta and recently co-authored a two volume book summarizing highlights of Alberta bird observations in the 1970s.

Of particular note with respect to this project are Cleve's involvement with numerous Environmentally Significant Area studies that have been conducted in Alberta as well as several research projects in the Foothills and Rocky Mountains of western Alberta. Cleve is a member of the Yoho ELC wildlife component study team.

PROJECT INVOLVEMENT

Significant Features Analyses: Many Springs; Saskatoon Mountain; Coal Valley; Little Fish Lake; Lost River; Calgary Region; Oldman River Region; Red Deer Region; Palliser Region; Southeast Region; Crowsnest Pass; David Thompson; Bow River Corridor; Shorebird Lakes in East-Central Alberta

- field studies and literature reviews to determine sensitive wildlife and vegetation features

Ecological Studies: Sir Winston Churchill, Kazan Upland, Bow Valley, Cypress Hills, Coal Valley, Stoney Creek, Writing-on-Stone, Rochon Sands, Rumsey, Kootenay Plains

- field studies of wildlife and vegetation

Resource Management Planning: Alberta Parks System, including William A. Switzer, Beauvais Lake and Bow Valley Provincial Parks, Prince's Spring

- on-site inspection for park management

Natural History Framework for Alberta Parks' Planning:

- comprehensive literature review of all natural regions, detailing wildlife, vegetation, and geology

Rare and Endangered Species Research: Piping Plover, Baird's Sparrow, Mountain Plover, Alberta's Amphibians and Reptiles, Rare Plant Pilot Monitoring, Sand Hill Wildlife, Leopard Frog, Great Plains Toad, Western Hognose Snake

- literature reviews and extensive field studies to determine status, habitat requirements and management problems

Resource Monitoring: Piping Plover, Mountain Plover, Milk River Canyon, Antelope Creek, Coal Valley, Cypress Hills

- field survey design and field monitoring of the impacts of human activities and assessment of bird populations in forested, wetland and grassland habitats

RAY WERSHLER
SUMMARY

Ray graduated from the University of Calgary in 1981 with a B.Sc. in Environmental Sciences with a course emphasis in Biology (Ecology), Geography, and Geology. He has had experience conducting wildlife surveys in Alberta since the early 1980s.

Ray has a diversity of interests in wildlife research and has a well rounded background in amphibian, reptile, bird and mammal surveys. He has been involved with numerous Environmentally Significant Area studies in southern Alberta. This included assessment of biological features at international, national, provincial, and regional levels of significance. He has also conducted several amphibian, reptile, bird, and mammal surveys and research on rare, threatened and endangered species such as the Piping Plover, Mountain Plover, Loggerhead Shrike, and Western Painted Turtle.

He was a field technician for the avifauna inventory of Elk Island National Park where he conducted field surveys for migrant and breeding bird species, analyzed the data, and wrote the habitat and migration sections of the report for the Canadian Parks Service. He researched and wrote a report on the status of bird and mammal species occurring at Wager Bay, Northwest Territories, a proposed National Park. Ray also participated in wildlife surveys in the Rocky Mountain House region, conducting ungulate pellet group counts and browse surveys.

He has conducted computer-assisted literature searches and instructed a bird identification course in classroom and field environments.

Of particular relevance to this study are his experience with several Environmentally Significant Area studies and his work with the wildlife components of the ELCs for Kootenay and Mt. Revelstoke/Glacier National Parks where he collected data on mammals, birds, reptiles and amphibians. He wrote accounts for reptiles, amphibians, mammals, and birds and prepared a checklist of Kootenay National Park birds. He was one of the major reviewers for Volume II (Wildlife) of the Mt. Revelstoke/Glacier National Parks ELC report. Ray is a member of the Yoho ELC wildlife component study team.

SWEETGRASS CONSULTANTS LTD.
ENVIRONMENTAL AND INTERPRETIVE PLANNING

SWEETGRASS' prime interest lies in environmental research as it relates to significant features identification and management, rare and endangered species inventories and management, and protected areas planning, development, and management. We have many years of experience surveying vegetation, wildlife, and landscapes and analysing that information for interpretive and resource management purposes.

Our personnel have field inventory experience in natural regions ranging from the Boreal Forest, Parklands and Grasslands to the Rocky Mountains and Foothills. They have also undertaken studies for monitoring impacts of human activities on native plants and animals and have worked extensively with environmental and interpretive planning and management problems on systems and site bases.

SWEETGRASS' researchers have been assessing the significance of environmental features since the early 1970s. These assessments have, in part, been used to: plan such provincially significant areas as Writing-on-Stone Provincial Park; manage endangered species such as the Mountain Plover in the grasslands of southeastern Alberta; develop conservation strategies for Alberta Parks; develop an auto tour in the Drumheller region; plan mining activities at Coal Valley in the Alberta foothills; and evaluate environmental impacts of highway construction for the Trans-Canada Highway twinning through Banff National Park. We have been called upon to give technical support at public hearings and for government advisory committees. Our personnel have also organized and conducted public input sessions relative to environmental concerns.

Our experience in the Rocky Mountains and Foothills of western Alberta includes identification of Environmentally Significant Areas, rare and endangered species surveys, and park systems planning.

SWEETGRASS and its associates have directed a major portion of their research effort towards the inventory, evaluation and management of significant natural features (both geological and biological), including:

1. an evaluation of the significance of wildlife, flora and habitats in a spring-fed ecosystem at Bow Valley Provincial Park and the potential impact of a trout-rearing facility on the site.
2. management planning for the threatened western blue flag in the Grassland Natural Region.
3. evaluating significant environmental features (cultural, physical and biological features) in the Coal Valley, Clearwater, David Thompson Corridor, Bow Corridor, Red Deer, Palliser and Barrhead regions.
4. a study of the habitat relationships of Mountain Plovers (an endangered bird species in Canada) in the Milk River area of southeastern Alberta.
5. an assessment of significant geological and biological features in the proposed Rumsey Ecological Reserve.

Other projects relevant to this study that we have undertaken include:

1. the development of a systems overview and planning framework for provincial parks and ecological reserves in Alberta.
2. an evaluation of theme representation in candidate protected areas in the Rocky Mountain and Foothills Natural Regions.
3. an evaluation of wildland and wildlife resources, including coordination of public input from environmental groups and other stakeholders, along the proposed Trail of the Great Bear between Yellowstone and Banff National Parks.

We have acted in advisory capacities to various government and private agencies on matters pertaining to significant features identification, park systems planning, and the evaluation of natural history data for interpretive planning and resource development and management.

SWEETGRASS maintains close contacts with other companies and individuals in related fields, such as the earth sciences, computing science, and communications planning, so that information can be integrated effectively. We are associated with the INET 2000 Network which provides us with in-house on-line computer access to more than 1,100 databases across Canada and around the world.

HIGHLIGHTS OF STUDY TEAM'S PROJECT EXPERIENCE

Coal Valley Special Features Assessment
LUSCAR 1979

Kakwa Caribou Habitat Inventory Project
ALBERTA RECREATION & PARKS 1980

Kootenay Plains Vegetation Survey
ALBERTA ENERGY & NATURAL RESOURCES 1981

Trans-Canada Highway Twinning Phase II - Significant Vegetation Analysis
THURBER CONSULTANTS/PUBLIC WORKS CANADA 1981

Saskatoon Mountain Special Features Assessment
ALBERTA ENERGY & NATURAL RESOURCES 1982

Biophysical Systems Overview of Alberta
ALBERTA RECREATION & PARKS 1982-83

Environmentally Significant Areas in the Calgary Region
R. LAMOUREUX & ASSOCIATES/CALGARY REGIONAL PLANNING COMMISSION 1983-84

Regional Analysis of Natural Region 4 - Columbia Mountains
DCH CONSULTANTS/PARKS CANADA 1983-84

Significant Features Identification - Ecological Reserves Program
ALBERTA ENERGY & NATURAL RESOURCES 1984

Lost River Significant Features Evaluation
ALBERTA ENERGY & NATURAL RESOURCES 1985

Many Springs Significant Features Management
ALBERTA RECREATION & PARKS 1985-86

Rare Amphibians & Reptiles of the Grassland & Parkland in Alberta
WORLD WILDLIFE FUND 1986

Rare Plants Monitoring: Pilot Project, Oldman Regional Plan Area
ALBERTA FORESTRY/WORLD WILDLIFE FUND 1986

Rare Plant (Western Blue Flag) Management
ALBERTA GOVERNMENT/WORLD WILDLIFE FUND 1987

Piping Plover Surveys and Management
WORLD WILDLIFE FUND 1986-91

Crowsnest Pass Environmentally Significant Areas

ALBERTA FORESTRY, LANDS & WILDLIFE 1987

Environmentally Significant Areas of the Red Deer Region
RED DEER REGIONAL PLANNING COMMISSION 1988-92

Natural History Theme Framework and Evaluation System
KANATA/ALBERTA RECREATION & PARKS 1988

Environmentally Significant Areas of the Oldman River Regional Plan Area
OLDMAN RIVER REGIONAL PLANNING COMMISSION 1987-1989

Environmentally Significant Areas of the David Thompson Corridor
ALBERTA FORESTRY, LANDS & WILDLIFE 1988

Evaluation of Assessment Criteria - Natural Areas
ALBERTA NATURAL AREAS PROGRAM 1988

Park System Evaluation - Rocky Mountains, Foothills
KANATA/ALBERTA RECREATION & PARKS 1988-89

Hand Hills Ecological Reserve Management Planning
ALBERTA RECREATION & PARKS 1989

Trail of the Great Bear Tourism Corridor Study
PANNELL KERR FORSTER/TRAVEL ALBERTA 1989-90

Watchable Wildlife and Tourism Study
HLA CONSULTANTS/TRAVEL ALBERTA 1989-90

Environmentally Significant Areas of the Bow River Corridor
CALGARY REGIONAL PLANNING COMMISSION/M.D. OF BIGHORN 1990

Prince's Spring Management Plan
WORLD WILDLIFE FUND CANADA 1990-92

Environmentally Significant Areas of the Palliser Regional Plan Area
ALBERTA FORESTRY, LANDS AND WILDLIFE 1990

Bow-Canmore Environmental Issues Analysis
ALBERTA TOURISM 1990

Environmentally Significant Areas of the Southeast Regional Plan Area
ALBERTA FORESTRY, LANDS AND WILDLIFE 1990-1991

Environmentally Significant Areas of the Lower Red Deer River
ALBERTA FORESTRY, LANDS & WILDLIFE 1991-92

River's Bend Golf Course Significant Features Assessment
R. GIBSON & ASSOCIATES 1991-92
Environmental Resources Assessment - Town of Lacombe
TOWN OF LACOMBE 1992

Ecotourism Assessment - Northern Alberta
HLA/GAIA/ALBERTA TOURISM, PARKS & RECREATION 1992

Natural Areas Theme Representation
ALBERTA NATURAL & PROTECTED AREAS 1992

Pine Sands Natural Area Vegetation & Special Features Assessment
ALBERTA TRANSPORTATION 1992

Natural History Theme Framework & Evaluation System Update
P. ACHUFF/ALBERTA TOURISM, RECREATION & PARKS 1992

Environmentally Significant Areas Inventory -- Town of Canmore
TOWN OF CANMORE 1993

Yoho National Park Ecological Land Classification - Wildlife
PARKS CANADA 1993-1995

SELECTED REFERENCES

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Alberta Parks and Recreation, Edmonton
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