Access Management Planning Manual

For Resource Development

Prepared by

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Executive Summary

Access management strives to balance a range of competing interests. Without planning and management, land use activities (e.g., resource development, wildlife conservation/management, recreation, industrial development and urbanization) may evolve to a level that causes damage to the environment and/or conflict among users.

Done well, access management involves a mutually supporting system that includes clear goals and objectives, planning, communication, physical measures, enforcement, monitoring and review. Specific tasks in access management planning may include:

- Identification of primary road corridor and secondary road plans;
- Pipeline plans;
- Restoration, deactivation and reclamation plans for roads and other linear disturbances;
- Traffic control; and
- Effective mitigation.

Roads increase human activity for things like resource extraction and recreational opportunities, which results in the alteration of natural habitats and biological populations. Planning and management of road access in forests helps to minimize impacts on landscapes and wildlife populations.

Historically, resource development in Alberta (and elsewhere) was managed on a "plan-as-you-go" basis, which resulted in unnecessary disturbance, with users sometimes building redundant roads in a region. The need for coordinated or integrated planning only became evident as the levels of use and conflict increased between users.

Individual resource companies in a region can experience many advantages through a collaborative approach to access planning and management. In addition to reducing the environmental impacts of roads and other lineal disturbances, a coordinated approach offers resource managers specific benefits, including: reduced costs among stakeholders; data sharing between groups; certainty of access, streamlined compliance approvals; shared knowledge, innovation, and communication; shared risk; landscape level consultations; and enhanced government relations.

Alberta has seen numerous access management plans developed with varying degrees of success. One of the more successful plans is the Berland Smoky Regional Access Development Plan 2011 (BSRAD Plan). Both industry and government benefited from the learning process during the development of the BSRAD Plan, which was established as a "living document" with commitments by industry to provide sustainable funding through annual dues. The BSRAD Plan is a first ever attempt to forecast an integrated access development plan at this scale with a commitment for adaptive management, continuous improvement and annual monitoring to targets. The BSRAD Plan will also provide a unique opportunity to assess cumulative effects jointly.

The BSRAD Plan is the first of its kind in Alberta, and was selected as a template for this manual because of its initial successes in enlisting the participation of industry, government, research agencies and others. Government set the thresholds, and government and industry cooperated in its development.

This manual provides guidance to those designing, implementing and managing an access management plan for resource development on public lands in Alberta. It identifies key steps, processes, and data management practices, and includes lessons learned from other access management processes that will help with establishing a successful access management plan.

The manual also outlines the potential involvement and participation of government, industry and other stakeholders, identifies barriers to successful planning, recommends options for consideration and assesses and describes "how to" measures and practices. While the collaborating groups in each applicable area will determine the goals and objectives, the exact order of steps, and the structure of the access management plan, the following overall process can be used as a guide:

1. **Initial Planning and Setup**
    a. Form a group of interested parties for access management
    b. Gather initial data (e.g., boundaries, existing lineal disturbances)
    c. Develop a Terms of Reference, including a structure to govern operations
    d. Define objectives and goals for access management (part of the Terms of Reference)
    e. Seek senior government approval of the Terms of Reference
    f. Build a Planning Team
2. **Outreach and Communication**
    a. Planning team communications
    b. Communicate objectives of the plan to outside groups
3. **Design Process**
    a. Acquire data
    b. Select route
4. **Plan Assessment**
    a. Determine road buffers
    b. Select road density thresholds
    c. Conduct GIS analysis
5. **Risk Assessment**
6. **Data Management**
    a. Data needs for access management
    b. Determine data sources and collection methods
    c. Plan for data maintenance
    d. Determine required data types and supporting resources
    e. Determine data accessibility
    f. Assign data stewardship and custodianship responsibilities
    g. Identify security, data storage and backup locations
    h. Data types
    i. Data formats and structure
    j. Data currency
    k. Support infrastructure
    l. Data governance, policy and practices
7. **Mitigation**
    a. Planning and implementation
    b. Include mitigation skills on planning team
    c. Set priorities for road removal and reclamation
8. **Monitoring**
    a. Adaptive management
    b. Identify the kinds of monitoring to be used
    c. Design a monitoring program

Access management is not a one-off plan that can be developed and used only for periodic guidance when required. A plan can quickly become out-of-date, and needs to be updated continually to achieve the desired outcomes. To be the most effective, access management plans must be reviewed and adapted at least annually.

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Introduction

This manual provides guidance to those designing, implementing and managing an access management plan for resource development on public lands in Alberta. It identifies key steps, processes, and data management practices, and includes lessons learned from other access management processes that will help with establishing a successful access management plan.

The manual also outlines the potential involvement and participation of government, industry and other stakeholders, identifies barriers to successful planning, recommends options for consideration and assesses and describes "how to" measures and practices.

What is Access Management?

Planning and management of road access in forests is desirable to minimize impacts on landscapes and wildlife populations. Without planning and management, land use activities (e.g., resource development, wildlife conservation/management, recreation, industrial development and urbanization) may evolve to a level that causes damage to the environment and/or conflict among users.

Definition of Access Management:

"The placement, management and reclamation of linear infrastructures (i.e., roads) and the associated impacts arising from the use of that infrastructure by industry and all other public groups."[1]

Resource development and extraction in Alberta, and elsewhere in Canada, occur on both public and private lands. On public lands, people and groups with a range of interests can increase demands on lands, which may lead to disputes among users. Resolving these issues requires the participation of government, First Nations communities, multiple industrial users and the public.

Figure 1shows the hierarchy of processes involved in access management. Specific tasks in access management planning may include the following:

- Identification of primary road corridor and secondary road plans;
- Pipeline plans;
- Restoration, deactivation and reclamation plans for roads and other linear disturbances;
- Traffic control; and
- Effective mitigation.

Environmental Impacts of Roads

Roads increase human activity (e.g., resource extraction and recreational opportunities), which results in the alteration of natural habitats and biological populations. The following environmental effects caused by road construction, traffic and maintenance activities highlight the need for effective access management planning:

[1] Forest Landscape Management Forum 2008.

1. *Roads can change the physical environment.*

    - Roads can affect soil density, temperature and water content.
    - Road layout and construction can change runoff patterns by diverting surface and subsurface water flows from their natural pathways.
    - Stream crossings are a source of erosion and sediment deposits into streams and rivers.
    - Poorly designed bridges and culverts can change the way streams flow.

2. *Road use and maintenance can change the chemical environment of soils and water.*

    - Chemicals added to the environment can include heavy metals, salts, and organic pollutants such as hydrocarbons, ozone and nutrients (e.g., fertilizers).

3. *Roads can change aquatic populations.*

    - Erosion and sediment deposits, as well as the addition of chemicals and nutrients into streams and rivers, are a threat to aquatic plants, invertebrates and vertebrates.
    - Stream crossings can be barriers to the movement of fish by concentrating or widening flow, creating obstacles, or creating water level changes.

4. *Road networks can affect wildlife habitat and animal numbers and movement by fragmenting the landscape.*

    - Road construction can kill or injure immobile or slow-moving organisms in the path of a road.
    - Animal mortality by collision with vehicles increases with traffic volume as animals either cross or are attracted to altered habitat at roadsides.
    - Fragmentation of wildlife habitat can change or shift home ranges, and alter movement patterns and escape responses of animal populations.

5. *Roads can affect the spread of exotic plants and animals/organisms.*

    - Altered habitats, disturbed/modified soils, loss of forest cover and transport of seeds and other organisms by vehicles can increase the dispersal of exotic plants, insects and diseases.
    - Use of non-native species in reclamation activities can also contribute to spread of exotics.

How the Access Management Process Works

Done well, access management involves a mutually supporting system that includes clear goals and objectives, planning, communication, physical measures, enforcement, monitoring and review. Access management is usually adopted as the result of a planning process that strives to balance a range of competing interests.

The tools employed by jurisdictions wanting to manage access on public land range from legislative tools such as Alberta's *Public Lands Act*, to physical measures such as gates and road decommissioning.

Figure 1shows the basic mechanism for making decisions about what types of tools to employ.

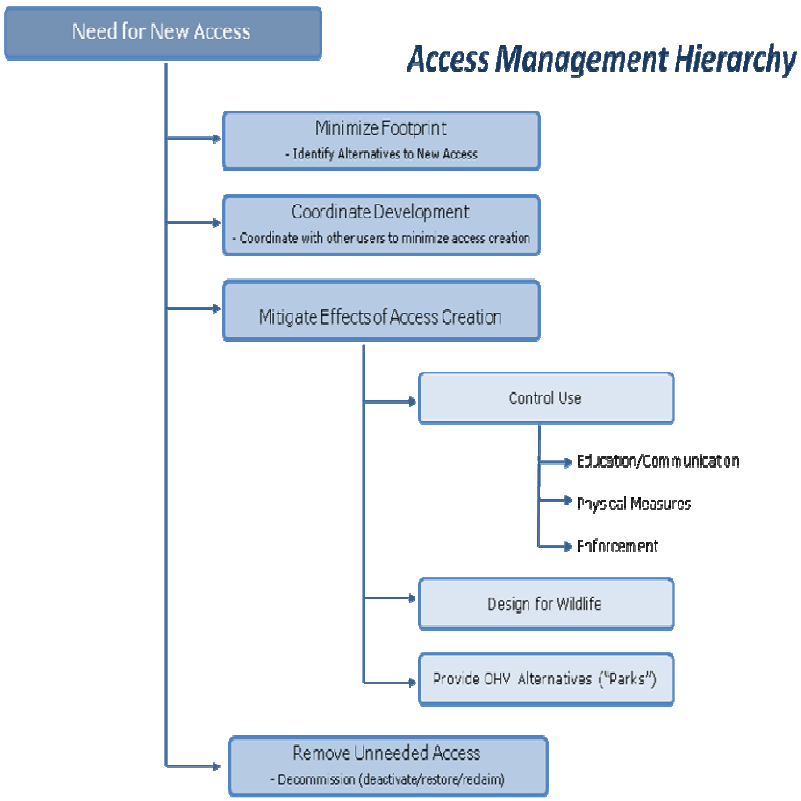

Figure 1 Access management hierarchy[2]

Benefits of Regional Collaborative Access Planning and Management

Historically, resource development in Alberta (and elsewhere) was managed on a "plan-as-you-go" basis. This approach resulted in unnecessary disturbance, with users sometimes building redundant roads in a region. The need for coordinated or integrated planning only became evident as the levels of use and conflict increased between users. In these situations, governments often responded in a leadership and mediator role to resolve the differences between and among different groups; however, there is no mechanism to deal with redundant roads owned by different companies (i.e., who pays to restore?).

A collaborative approach to access planning and management by resource industries in a region offers many advantages that cannot be experienced by individual companies.

In addition to reducing the environmental effects of roads and other lineal disturbances, a collaborative approach to access planning and management offers resource managers the potential for reduced costs, up-to-date data sets on the status of access development, certainty of continued access and effective and stronger representation in dealings with the government. Specific benefits include:

[2] Eos Research & Consulting Ltd. FLMF Review of Access Management Strategies and Tools 2009

Reduced Costs

- Opportunities for shared funding in access planning, research, management and implementation
- Enhanced capability when planning is shared (this approach will reduce road construction, maintenance and reclamation costs)
- An excellent mechanism to create a forum for establishing mutually beneficial business arrangements (e.g., removes angst among road authorities)
- Expectations of Aboriginal communities can be addressed collectively

Data Management

- Data sharing between groups that can facilitate a comprehensive, updated and well-maintained database for access in a region (data management at this scale is next to impossible for individual companies). The database would include the following inventory:
    - Gates (barriers)
    - Standard and up-to-date, ground verified access layer by road class
    - Disturbance classification layer
    - Annual reporting of reclaimed, restored, closed and as built access

Certainty of access

- Economic solutions that prove industry and other values (e.g., caribou) can co-exist on the landscape
- A planned approach to development with up-front approval at the landscape level
- Proactive Integrated Landscape Management (ILM) that supports industry access to markets through national certification
- A mechanism for a proactive engagement process and opportunity for economic participation with Aboriginal communities
- A mechanism for cooperative strategic consultation

Compliance

- A collaborative response to government expectations related to cumulative effects management through ILM, which could facilitate more streamlined approvals
- Partners meeting and developing relationships with other industrial operators to harmonize their impacts on each other's operations
- Improved ability to mitigate the effects of access on other values (reduced number of roads compared to "plan-as-you-go")
- Collaborative groups can be an example of better management for others to follow

Sharing:

- The opportunity to share knowledge, innovation, communication, and avoid duplication
- An opportunity to share in the benefits of restoration or recovery plans with a high return (this could include investments in reclamation of off lease areas and, with another company's holdings, achievement of landscape level objectives; it could also mean a share in the potential benefits and liabilities)

Protection

- A structured group will give companies an opportunity to state their business interests under the umbrella of an association without being singled out by outside influences
- Risk is spread and shared among the members of a group

Consultation

- Provides for the ability to elevate consultation requirements (e.g., Aboriginal) to the landscape level, rather than one-off, disposition-by-disposition
- Disposition level communication becomes notification only

Government relations

- Collaborative groups can be leaders in developing affordable solutions
- A single voice on behalf of several companies can also be a strong message to government with respect to policy development, guidelines and recovery strategies

Linkages between Access Management and Other Initiatives

Land use plans, including access management plans, ensure that public lands are managed in accordance with applicable laws, regulations and policies. The best approach to access management is to begin planning as early as possible. The best case scenario, although rarely practiced or possible in many areas, is pre-disposition planning guided by a land use plan. Most access plans occur post development (or disposition), after tenures have been awarded without a land use plan, leaving limited opportunity for changing land use decisions. In addition, the cumulative disposition access requirements are seldom fully known or understood until well after the initiation of "one-off" access development, making it difficult to manage.

Types of access planning:

- Pre-development planning
  - Pre-tenure planning
  - Coordinated operational planning
- Post-development planning
  - Integrated Resource Planning (Alberta)
  - Coordinated Access Management Planning (B.C.)
  - Travel Planning (US federal lands)

Land use plans can be developed to describe the overall goals (e.g., values, objectives, indicators and targets) for the land base involved. These plans will provide the umbrella under which all resource development plans are developed. The more detailed development plans, created by those industries that have been awarded the rights for the extraction of various resources, will describe the intentions for development of their particular resource allocation broadly over a set period of time.

Relationship to Alberta's Land-use Framework

Good land use decisions require accurate, timely, and accessible information. Greater collaboration between land users, shared information, and a sound system of monitoring, evaluation and, reporting are all needed for proper land management. The Land-use Framework (LUF) sets this collaboration in motion.

An important component of the information, monitoring, and knowledge system of the LUF will be the Biodiversity Monitoring Program, carried out by the Alberta Biodiversity Monitoring Institute. In addition, successful ILM will form an important part of the planning process as follows:

1. ILM planning is an important part of cumulative effects management, provided it includes:
   - Full integration of all industrial sectors constructing and planning access;
   - A data management system for storage, maintenance (e.g., as built access, reclaimed access, and decommissioned access), and distribution; and
   - A long-term projection of access requirements. ILM is a proven and progressive approach to land and resource management, and can be applied as a continuous, adaptive management process.
2. Having an ILM plan will provide land management decision makers with vital information to ensure land use is publically acceptable and sustainable.
3. ILM planning will reduce the amount of access required to support land-use decisions on resource extraction effects on other values.

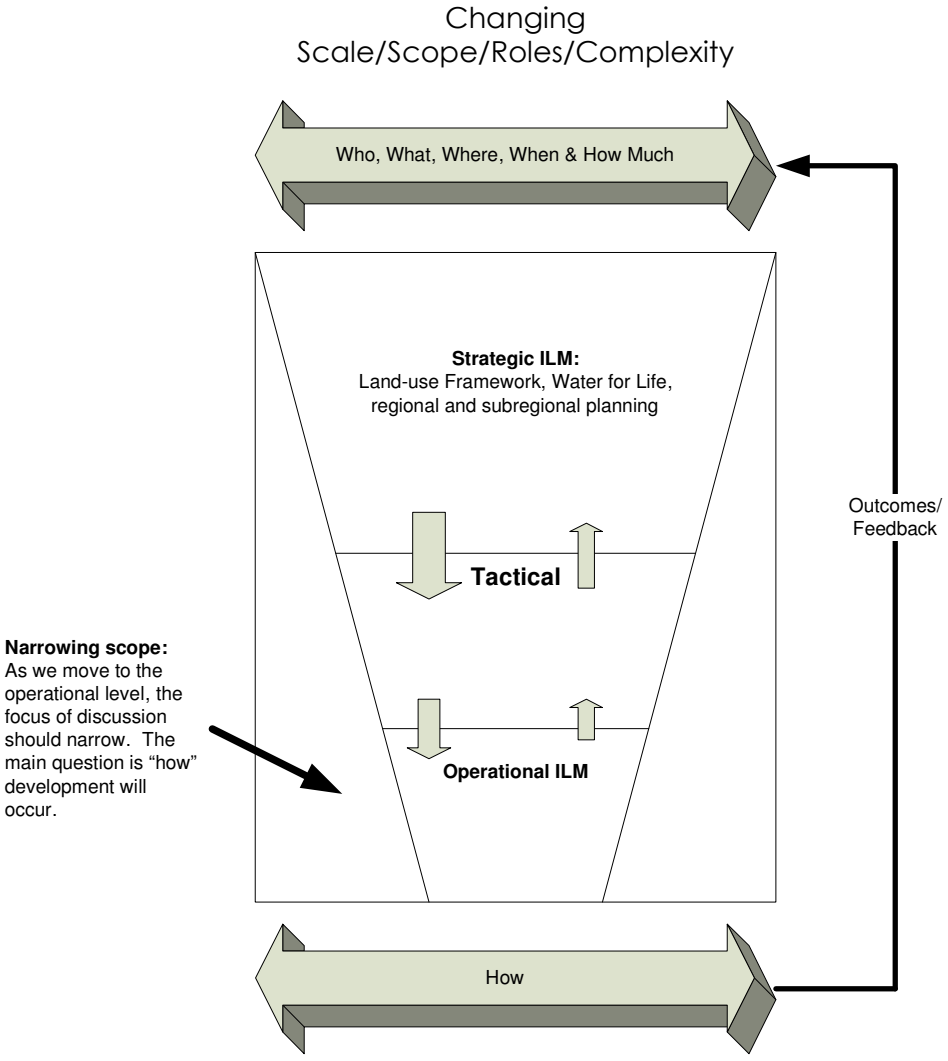

Figure 2 Sustainable land use

A Template for Access Management Planning

Numerous access management plans have been developed in Alberta, with varying degrees of success. One of the more successful plans is the Berland Smoky Regional Access Development Plan 2011 (BSRAD Plan). The BSRAD Plan is a working example of access management, and was selected as a template for this manual because of its initial successes in enlisting the participation of industry, government, research agencies and others in the development of a plan for the headwaters of the Berland and Smoky rivers. This secondary road plan is the first of its kind in Alberta, with thresholds set by government, and with government and industry cooperating in its development. Groups involved in the BSRAD Plan were:

- Forest Landscape Management Forum (FLMF) on behalf of 15 industrial partners;
- Foothills Research Institute (FRI); and
- Land Management Branch, Alberta Sustainable Resource Development (ASRD).

This manual also draws upon the work done for the FLMF Integrated Industry Access Plan 2005 (IIAP), and Berland Smoky Access Plan (2008) and lays out the steps chronologically. Further, it highlights the successes of the process as well as gaps and recommendations for improvement.

Examples from the BSRAD Plan are highlighted in text boxes throughout this manual to illustrate planning processes (that may differ when applied to other regions).

Additional recommended options for consideration, based on lessons learned from the BSRAD Plan, are also included in shaded boxes throughout this document.

Funding and Administration

Access management plans, like the BSRAD Plan, may include multiple participants (industry, government, public groups). In such situations, costs and funding are often shared responsibilities, which can be an advantage. Issues to be resolved through consultation may include:

Who will do the work (e.g., road removal and reclamation)

- Individually by partners
- Cooperatively among partners
- Contracted out to third parties
- A mixed model of all of the above

Sources of funding

- Annual member dues (if such exist)
- Contributions by members
- Grants by application to foundations/governments
- A mixed model of all of the above

This was used in the BSRAD Plan process, with support from government.

Ongoing member dues provides for sustainability for annual monitoring and reporting. This allows the plan to become a living document as opposed to sitting on a shelf.

Administration and financial reporting

- Communications
- Meetings/scheduling
- Planning/design team
- External stakeholders
- Workshops
- Database management
- Assessment/selection of final access plan
- Mitigation
- Planning
- Engineering
- Reclamation
- Monitoring

Access management is not a one-off plan that can be developed and used only for periodic guidance when required. In this case, a plan quickly becomes out-of-date and needs to be redone continually to achieve the desired outcomes. To be the most effective, access management plans need to be updated and adapted at least annually, which requires sustainable funding. The BSRAD plan was developed as a "living document" with commitments by industry to provide sustainable funding through annual dues to maintain an as-built layer, including decommissioned, restored and newly built access layers, and report annually on targets.

Reviewing and Amending an Access Management Plan

Government and industry partners should review the RAD plan jointly every two years. The review should:

- Validate the need for any un-built access routes;
- Identify access routes' suitability for retrieval of energy resources, given new energy sources (e.g., shale gas) or new technologies; and
- Identify changes to environmental or social values resulting from land-use planning efforts, monitoring and reporting results, new research, or additional area land users.

When a change is needed to the RAD plan, based on industry access needs, the following amendment processes should be implemented.

EAP Class I – Primary Road Corridor Amendment Process

When any company (FLMF member or not) determines that they require a primary corridor (EAP Class I) that is not identified in the RAD plan to meet their needs, the following steps will apply:

- The company's representative should convene a technical meeting with the objective of examining alternatives to meet their access needs from an ILM perspective. If the company pursuing the amendment is not an FLMF member, they will contact the FLMF coordinator to start the process.
- If alternative routes are available, the FLMF will conduct a ranking process with the company proposing the plan amendment and seek input from other FLMF member companies to determine if any issues or conflicts exist. The purpose of this review and ranking is to maintain the integrity of the RAD plan and its objectives of meeting ILM goals and reducing impacts on other values. Once this review is complete, a letter will be offered to the company from the FLMF outlining the FLMF findings and assessment of meeting objectives.
- This letter should be provided by the company representative to the Executive Director, Land Management Branch, SRD, Edmonton, along with a request to update the RAD Plan.
- If the amendment is accepted, the RAD Plan will be updated and approval documents prepared by SRD in time for the next scheduled EAP update (which occurs in March and October).
- The regular application process through the EAP would then be required.

EAP Class II – Secondary Road Corridor Amendment Process

The EAP process allows for the construction of all-weather access EAP Class III (with justification, i.e., roads are needed for > 100 days) so most will not require any amendments to the RAD plan and will simply be tracked as part of the FLMF access road monitoring program. Therefore amendments to the secondary corridor plan should be only required if the right of way clearing of a Class III is insufficient to adequately construct the road (i.e. terrain, safety, etc). If it is determined that the business need dictates a higher standard of access is required (i.e. upgrading from an EAP Class III to an EAP Class II) then the following process will apply:

- The company representative proposing the change should contact FLMF and advise them of the need for an amendment. The FLMF will coordinate dialogue, assessment and a timely meeting with FLMF partners accordingly. The FLMF will conduct a brief review to determine if the new route is in the proximity of a "planned secondary corridor" to see if the new route can replace the planned one. If so, the planned route would be dropped from the secondary corridor plan at the time of submitting the annual monitoring report and replaced with the "as built" Class II or III. This will not require any formal review or ranking on behalf of the FLMF as outlined in the primary corridor amendment.
- Letter approving the revision.

2. Access Management Plan Process

While each collaborating group will determine the goals and objectives, the exact order of steps, and the structure of their access management plan, the following overall process can be used as a guide for the design and implementation of your access management plan:

1. **Initial Planning and Setup**
   a. Form a group of interested parties for access management
   b. Gather initial data (e.g., boundaries, existing lineal disturbances)
   c. Develop a Terms of Reference, including a structure to govern operations
   d. Define objectives and goals for access management (part of the Terms of Reference)
   e. Seek senior government approval of the Terms of Reference
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8. **Monitoring**
   a. Adaptive management
   b. Identify the kinds of monitoring to be used
   c. Design a monitoring program

Step 1: Initial Planning and Setup

Interested Parties Form a Group

Regardless of who initiates an access management plan, a first step is to identify and communicate with interested parties in the region of concern. The identification of road networks or access corridors is a consultative process that engages the primary users of existing and proposed roads. This may be an unstructured process in the early stages, but over time it will evolve into the creation of a group that represents the interests of industrial companies (e.g., oil and gas, forestry, mining), Aboriginal communities, environmental groups, hunters, fishermen, trappers, recreationists, individual members of the public and the government (local, provincial and federal).

Initial Data Gathering

Prior to making access management decisions, the group must describe the area of interest and collect pertinent data to form a "status quo" report for the area. More detailed data gathering, processing and analysis will follow later in the plan. Items to identify at this stage include:

- Physical boundary and extent of the area;
- Primary resources and their management and development;
- Existing access networks (include road standards);
- Other lineal disturbances (e.g., seismic, power lines, pipelines);
- Environmentally sensitive areas and species;
- Rivers, streams, and lakes; and
- Non-industrial land uses.

A comprehensive plan should be developed for the processing and storage of data and subsequent information (see Step 6). Good record keeping and an efficient data retrieval system will enhance and expedite data analysis in the design and testing of proposed road networks.

In some cases, collection of data may take years. When the need for an access plan is imminent, you must start with the best available data that you have. At a minimum, vegetation inventory, Detailed Forest Management Plans, digital elevation models, gas and oil dispositions, and lineal base inventory provide a good starting point.

Terms of Reference

A well-defined governance structure that outlines the roles and responsibilities of all participants in the planning process is essential for success. For example, the terms of reference for the BSRAD Plan (see the Structure of Governance in Figure 3) involved the government and industry (represented by the FLMF). Government's role was consultative, with a Project Steering Committee responsible for setting direction, monitoring progress, and approving processes and deliverables of the project management team (i.e., BSRAD Planning Team).

> *Day-to-day operation for the BSRAD Plan was overseen by two Co-managers—one from the government, and the other representing the FLMF—responsible for management oversight, creation of a work plan and task teams, approval of work schedules, monitoring progress, assessing outcomes, chairing BSRAD Planning Team meetings and allocation of shared government and FLMF resources. The Area Manager and Land Manager for the region appointed two advisors to serve on the BSRAD Planning Team to provide oversight on application of the plan. Task Teams were appointed by the Co-managers to prepare detailed work schedules, identify resource needs, establish timelines and resolve operational issues.*

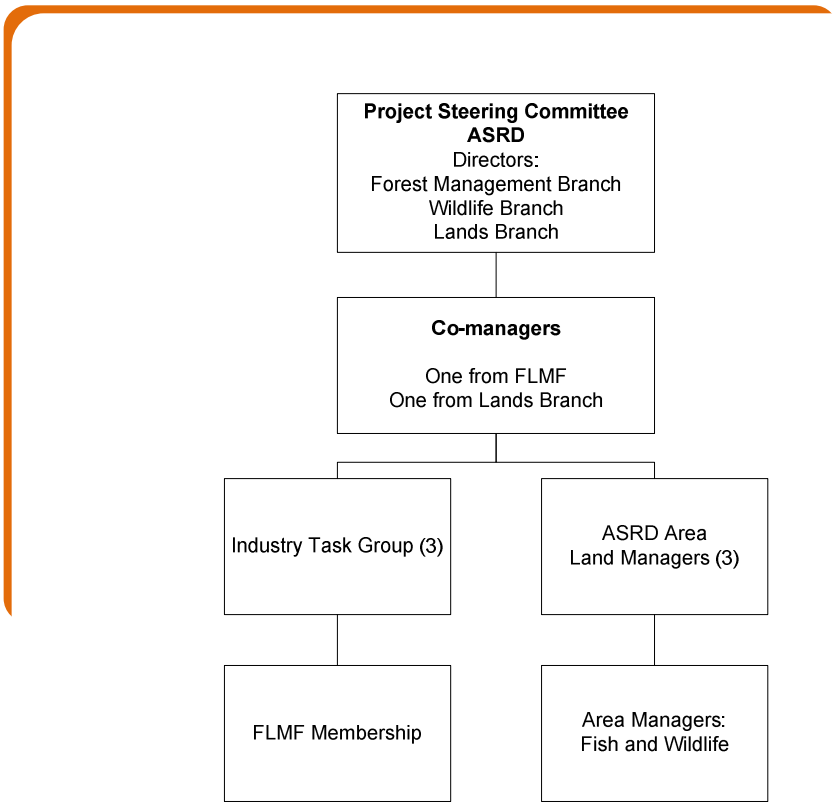

Figure 3 Structure of governance for BSRAD Plan

One of the first tasks of the planning team is to define the goals and objectives, which will vary depending on the needs and scope of the access management plan. They may include some or all of the following:

- To create an integrated network of roads that will serve the needs of all users.
- To recognize and predict future access needs through identification of corridor locations.
- To minimize industrial disturbance (footprint) on the landscape.
- To minimize the effects on wildlife habitat and aquatic resources.
- To monitor and report on the extent of road development and maintenance and its subsequent social, economic and environmental effects.
- To recognize and accommodate non-industrial users.
- To develop access life cycle planning "from cradle to grave".
- To reduce the number of roads before they are built.
- To return access that is no longer needed back to a suitable vegetative state as quickly as possible.
- To manage human use of areas opened up by access.

Previous access plans in Alberta have had a variety of group membership, goals and objectives. For example:

- The Ghost-Waiparous access plan, located west of Calgary, focused on controlling recreational access.
- Alberta-Pacific Forest Industries' access plan reduced access and disturbance by reducing seismic line widths and by sharing data with the oil and gas industry.
- The Kakwa-Compton Industrial Access Corridor Plan combined the access needs of oil and gas and forestry, minimized the industrial footprint and identified opportunities to reclaim roads no longer required.
- Planning by Canfor in the Grande Prairie region involved sharing roads and resource information with oil and gas companies.

Seeking senior government approval (e.g., Assistant Deputy Minister level) of the Terms of Reference is a vital component in the process. It is recommended that the group not proceed without this.

Building a Planning Team

The composition of a planning or design team (or committee) needs to be considered carefully. Such teams will often include personnel from government, industry, research agencies and the public. The success of the planning team is not only dependent on the expertise/experience of members, but also their ability to work together as a cohesive team. There is a range of different talents and experiences needed for a well-balanced planning team:

- *Agency Knowledge*—Members of a team should understand the opportunities, constraints, policies and working environment of their individual agencies. Each member's agency will have different mandates and responsibilities for resources other than what might be the focus for an access management plan (e.g., caribou or grizzly bears) and should inform the team of existing or emerging issues or guidelines.
- *Legislative Knowledge*—A review of federal and provincial legislation and provincial regulations and codes of practice should be completed. Table 5 identifies legislation and other agreements or other plans that may affect the construction and operation of resource roads in Alberta.
- *Scientific Knowledge*—Scientific knowledge will usually address wildlife, fisheries, and water quality issues. The source of such information will most often be wildlife/fisheries biologists, forest researchers, hydrologists, and road engineers. Members of the design team should be familiar with research techniques/methods used to obtain data. Participation of social scientists in some situations may be helpful. Consultation with others outside the planning team, such as local land managers (e.g., area managers in the BSRAD) will also be beneficial.
- *Traditional Knowledge*—An appreciation for and understanding of traditional knowledge and cultural values of Aboriginal communities will be important in access planning. Aboriginal communities located in forested/wildland setting will be directly affected by resource access. Protection of traditional areas (hunting, berry picking, sacred sites) is of prime concern to Aboriginal people.
- *Data Management*—Data management is an essential task of a planning team. Good record keeping and a data retrieval system is important, as databases could be revisited months and years later. If Geographic Information System (GIS) mapping and spatial analyses are part of a program, the planning team should have a GIS manager because of the large number of intermediate and final maps produced.

Table 1 Legislation, regulations, codes of practices, existing management plans and best management practices that may affect planning, construction and operation of resource roads

ALBERTA LEGISLATION
Public Lands Act
Water Act and Codes of Practice for Stream Crossings
Forests Act
Wildlife Act
Environmental Protection and Enhancement Act
FEDERAL LEGISLATION
Fisheries Act
Navigable Waters Act
Canadian Environmental Assessment Act
International River Improvements Act
Endangered Species Act
Migratory Birds Convention Act
EXISTING REGIONAL MANAGEMENT PLANS
Long-term Industrial Access Plans
Northern East Slopes Integrated Resource Management Strategy
Alberta Woodland Caribou Recovery Plan
West Central Alberta Caribou Steering Committee (WCACSC) 1966 Operating Guidelines
WCACSC Habitat Supply Committee Initiatives
Landscape Fire Management Initiatives
A Fish Conservation Strategy for Alberta (2000)
Alberta Grizzly Bear Recovery Plan 2008-2013
BEST MANAGEMENT PRACTICES - ALBERTA
Oil and Gas Access – Best Practices within the West Central Caribou Range
Enhanced Approval Process (EAP) for upstream oil and gas
Detailed Forest Management Plans
Alberta Forest Management Planning Standard
Timber Harvest Planning and Operating Ground Rules (1994)
Surface Water Quality Guidelines for Use in Alberta (1999)
Fish Habitat Manual: Guidelines and Procedures for Watercourse Crossings in Alberta
Standards and Guidelines for Operating Beside Watercourses in Alberta
Code of Practice for Watercourse Crossings (2001)

The participation of the public or interested non-government groups should be addressed early in the setup and operation of a planning team. This will be decided largely by the scope and objectives of a plan and its potential impacts, and can be approached in two ways:

1. The first is to allow non-voting specialists from outside groups to observe the process and provide input.
2. The second would be to allow outside specialists as team members.

Deciding which organizations will participate in the planning process is a more difficult decision. One option is to identify groups or organizations with opposing viewpoints and have their leadership appoint a committee member; however, appointees must bring technical skills that will be beneficial to the team.

Step 2: Communication and Outreach

Outreach or engagement is the process of identifying groups that will be involved in or affected by the creation of an access management plan. This includes the groups/organizations that are directly involved with the development and implementation of an industrial access management plan (e.g., industrial resource companies and the government), and outside groups that will be affected in some way (e.g., the public, Aboriginal communities, outdoor recreationists, conservation groups).

Planning Team Communications

Communication between members of a planning team is important, as differences and lack of understanding between members on resource and access issues can be a barrier to success. Difficulties sharing data and plans for resource development can also be a barrier, especially where financial resources are involved. Building trust and respect among members in a planning team is essential and requires time.

The Advantage of FLMF's Participation in the BSRAD Plan

Participation of the FLMF in the BSRAD Plan was a real advantage for success. The FLMF is an association of oil and gas and forestry companies with a common goal of minimizing the industrial footprint. FLMF, from its inception, worked at building relationships and trust among its members and government employees over several years. A key element in this process was the Managing Director for FLMF, who served as an unbiased member of the planning team to mediate differences among members.

The FLMF:

- *Provided independent management and facilitation*
- *Provided consistency and sustainable industry engagement*
- *Was an established group*
- *Was a membership representing forestry and oil and gas interests*
- *Had sustainable mechanisms for funding*
- *Had access to GIS specialists within FRI to assist in the analysis and preparation of data for:*
    - *Route selection and design*
    - *Landscape description of critical wildlife habitat*
    - *Analysis and testing for meeting thresholds*
    - *Preparation of maps*
    - *Risk assessments*
    - *Monitoring and reporting*
    - *Other?*

The extension of FLMF, or creation of similar associations in other regions, would facilitate access planning across Alberta. The role of such a group would be to facilitate and ensure company plans are consistent with ILM principles and maximize mitigation of access on other values. The group would not get involved in the core business need for access.

For the successful performance of a planning team, it is important that agencies commit their representatives for the duration of the planning process and that members regularly attend meetings. Building access management plans takes time. It has taken 6 years for the FLMF and government to get to where the BSRAD Plan is. Frequent turnover or replacement of members slows progress and requires backtracking to educate new members. The same applies for members who miss meetings. Furthermore, team members, while representing their agency's concerns, should be allowed to work independently from their own organization to minimize agency bias.

Methods and tools to facilitate and sustain planning success may include:

- Scheduling regular meetings far enough in advance so that all members can attend.
- Prompt transmission of minutes and notes of meetings to all team members (a web site is a very efficient way of distributing minutes and other useful information).
- Scheduling workshops to inform and educate team members. These can be very effective, as experts and specialists from other regions can be invited to make presentations and share experiences.
- Identification of one contact person who is responsible for the distribution of information (e.g., meeting minutes, circulation of emails, invitations to meetings, maps/products produced).

It's normal for there to be disputes or differences of opinion between members of a planning team. Ideally, when there is a dispute, discussion by the two members involved, or all members of the team will resolve the issues at hand. If the issue is of a technical nature, a search of the literature and follow up at the next meeting may be called for. If the difference is beyond the experience and knowledge of the committee, known experts can be invited as unbiased sources. Often the leader(s) of the planning team can act as an unbiased person to settle the differences. A last resort would be to conduct a vote by the planning team on the issue in dispute.

Communication with Outside Groups

Communication with outside groups can be as important as communication within a planning team. The scope and extent of communication with outside groups will vary with the extent and magnitude of road impacts on the landscape, wildlife and other users (e.g., public, recreationists, other industries, conservation/wilderness groups). Communication about the purpose, goals and objectives of an access plan should be an open, transparent process that identifies both positive and negative outcomes; ignoring negative effects of a proposed plan is a guarantee for loss of trust and credibility. If negative effects exist in a plan, address them directly and describe or propose measures to eliminate or mitigate them. It's also very important to engage all users if planning for restoration (e.g., trappers, recreation use).

Numerous methods exist for communication with public groups. One way is to have an outsider as an observer or participant on the planning team. Such a person should have some technical understanding of the planning/design processes being used, and be able to communicate them to the members of his group/organization. Another approach is direct engagement with outside groups by attending their meetings and making presentations.

Engagement in the BSRAD Plan

Engagement and communication with outside groups in the BSRAD Plan was facilitated through the Public Advisory Committees for each Forest Management Agreement holder in the region. Several information meetings were also held for the following groups: Sturgeon Lake First Nations Chief and Council, Canfor Public Advisory Committee, Grande Cache Mayor and Council, County of Yellowhead, Municipal District of Greenview, Town of Hinton, Foothills Ojibwas and Hinton Wood Products Forest Resource Advisory Group public meeting. Actual participatory engagement in the BSRAD Plan was minimal, except for information sharing about this plan being underway.

The intent is that the BSRAD Plan will be used as industrial input into more comprehensive planning processes such as the LUF. The FLMF is also investigating an implementation plan for future plans, called the Foothills Land Stewardship Project, which would include active engagement of Aboriginal communities, ENGOs and other stakeholders to manage four primary pillars: industrial footprint, vegetation, human use, and wildlife populations into one plan.

Workshops can be effective for communication, especially if designed to present various sides of the issues with representatives/presenters from industry and government. Open houses are another option that can be effective; however, open houses often are characterized by low attendance. Brochures sent to interested groups can also be effective.

Aboriginal community consultation requirements could be met at the landscape level with an Integrated Landscape Management plan, rather than at the disposition level.

Step 3: ***Design Process***

Data Acquisition

In this process, a range of different data sources should be used to assure access needs and the protection of wildlife habitats and aquatic resources, including, but not limited to:

- Networks of existing primary and secondary roads;
- Existing resource management and natural resource extraction plans for the region;
- Areas for future resource development; and
- Ecologically sensitive areas (e.g., wildlife habitat, stream crossings, endangered plants). These can be identified by consulting with local wildlife managers, available habitat maps, existing policies and guidelines and GIS analysis.

Over the past 6 years, the FLMF utilized various data sets to assist in the development of the BSRAD Plan. In addition, the FLMF and government have collected and enhanced relevant data sets to assist in planning. The BSRAD Plan area now has very rich data sets that include the following:

Alberta Vegetation Inventory

The Alberta Vegetation Inventory (AVI) is a photo-based digital inventory developed to identify:

1. The type, extent and conditions of vegetation;
2. Where vegetation exists; and
3. What vegetation changes are occurring.

AVI occurs on land managed by the Crown, land managed under a Forest Management Agreement (FMA) and others.

Light Detection and Ranging

Light Detection and Ranging (LIDAR)-derived elevation maps use aircraft-mounted lasers to record elevation measurements and provide one-metre resolution digital representations of topography.

Timber Companies' Detailed Forest Management Plans

For purposes of access management, the timber harvest sequencing part of Detailed Forest Management Plans (DFMPs) provides an excellent data source for projection of access needs from a timing and location point of view.

- *Wet Areas Mapping (WAM)*—based on determining flow channels, wet and dry areas, and the cartographic depth-to-water index (DTW) from bare-ground digital elevation models; this process is further refined to ensure that the digitally derived flow channels conform to all already mapped open water features such as streams rivers, lakes and shorelines.
- *Water and Stream Layers*
- *Digital Elevation Model*—A digital elevation model is a raster of elevation values. Rasters represent the world as regular arrangements of pixel cells. Rasters lend themselves to systematic analysis of the relationships among places and their properties.
- *Aerial Photos*—An aerial photograph is a photographic image of a portion of the earth's surface taken with a camera mounted in a fixed-wing aircraft. Aerial photography is flown so each frame overlaps the previous frame by at least 60 percent. This overlapping

area, although of the same portion of ground, has been photographed from two different angles, providing two different perspectives of that portion of ground. When adjacent photos are viewed through a stereoscope, the difference in perspective allows the viewer to see the image in three dimensions, or stereo.

- *Lineal Disturbance Layer* (FRI)—Since 2005 the FLMF has been working with various data sets including ASRD, FMA land use layers, and company files to validate and maintain an up-to-date lineal data set. Lineal disturbance includes pipelines, seismic lines, access roads, railroads, power transmission lines, and well sites.
- *Caribou Resource Selection Function (RSF) Maps*—A resource selection function (RSF) is any model that yields values proportional to the probability of caribou use of a resource unit
- *Grizzly Bear RSF*—Any model that yields values proportional to the probability of grizzly bear use of a resource unit
- *Open Route Density*—An open route is an access route (right of way, trail or existing road) that is accessible to a motorized vehicle (vehicles with an overall width of 1.65 m (65") or greater
- *Inventory of Existing Barriers (e.g., gates)*—The FLMF, in partnership with ASRD in 2009, collected data on existing physical access barriers on location, ownership and effectiveness of access controls.
- *Seismic Line Vegetation Inventory*—The FLMF and Government of Alberta collaborated on the collection of vegetation status of each lineal disturbance. The benefits include:
    - providing a foundation for the development of a landscape level restoration plan;
    - managing operational re-vegetation initiatives;
    - development of a re-vegetation decision support system;
    - development of long-term field monitoring programs;
    - enabling effective management of access routes used recreationally by the general public;
    - enabling effective management of new oil and gas developments, which require re-clearing of existing lineal features, most commonly seismic lines; and
    - identification of other regions of preferred habitat not currently utilized by caribou herds.

Route Design

Road design is defined here to include the identification of need for access, kind of access (e.g., all-weather permanent, secondary, temporary), and its physical location on the landscape with respect to wildlife and sensitive ecological sites. Design should be based on the following information and activities:

1. Obtain spatial data for the region that defines:
    a. Existing access
        i. Ownership of roads
            1. Forestry
            2. Oil and Gas
            3. Others
            4. Recreational access "ownership"?
        ii. Use of roads, not just ownership (this will help with consultation and engagement)
            1. Aboriginal
            2. Recreation (including hunting and fishing)
            3. Trapping
            4. Transportation corridors?

b. Areas planned for new short- and long-term access development
    i. Origins and destinations for new access
    ii. Forestry
    iii. Oil and Gas
    iv. Transportation, municipalities, recreationists
c. Streams, rivers, lakes
d. Topographic, soil and ecological features that will be limiting on road location construction and maintenance
    i. Steep slopes
    ii. Erodible soils
    iii. Poorly drained sites
    iv. Stream crossings
        1. Fish bearing and non fish bearing streams
        2. Wetland areas (bogs, fens), poorly drained sites, seepage zones
e. Oil and gas developments
    i. Well sites
    ii. Pipelines
    iii. Compressor stations
f. Wildlife/aquatic habitats of concern
    i. Species at risk/species of concern
    ii. Spawning areas
    iii. Other sensitive areas

2. Develop draft plan for location of new access
    a. Plan 2-3 possible options based on
        i. Information collected
        ii. Existing regulations, ground rules and legislation pertinent to road location and construction
        iii. Economic analysis for new access
    b. Conduct field reconnaissance of proposed sites to confirm office work

3. Consult and seek input and approval for proposed routes from others involved in the plan (may involve ASRD land use field staff at this step). Keep in mind that the BSRAD Plan is unique in that government was a co-manager, which may not be the case on future plans. However, you should never proceed without a government sanctioned Terms of Reference at a senior level (see Step 1).
    a. Make adjustments if necessary based on input from others.
    b. Conduct joint field reconnaissance of proposed sites to confirm adjustments.

4. Conduct ecological assessments of new access
    a. Were objectives to minimize/prevent disturbance satisfied?
        i. Industrial footprint
        ii. Road density targets
    b. Were objectives to minimize/prevent disturbance to wildlife and aquatic resources satisfied?

5. Make final selection for new access
    a. Shared decision among all parties involved in the plan

6. Consult with (possible) external stakeholders for input and acceptance of the plan
    a. Municipalities
    b. Public
    c. User groups (ATV, Conservation, Fish and Game Clubs)
    d. Aboriginal groups

7. Submit to Government of Alberta for approval.

The selection process in the BSRAD Plan was to identify primary access corridors, secondary roads and pipelines to serve the needs of the oil and gas and forestry industries in the headwater areas of the Berland and Smoky rivers. The access corridor was for medium- to long-term (>30 years) all-weather roads. In the process, forest companies first developed their needs and road layout because of their easier predictability and longer tenure on the landscape. Road design was based on engineering for safety, economic needs and environmental protection. A road layout was superimposed on a map of ecological resources that described sensitive areas (e.g., intact vegetation patches, rare habitats, protected species, streams, wetlands and topography to identify areas of concern). This plan was then shared with oil and gas companies to achieve ILM objectives and compatibility. Discussions followed, leading to adjustments and a plan acceptable to both groups. This process will often include a series of iterations.

Proper access planning is very important because wildlife in particular is sensitive to the effects of roads and human activity. The protection of wildlife, specifically resident caribou and grizzly bear populations, was a goal in the BSRAD Plan.

Criteria and guidelines used in the BSRAD Plan to locate new access routes and rank the potential for disturbance are outlined in Table 2, Table 3 and Table 4.

Table 2 Guidelines for identifying existing roads and criteria for new access development in the BSRAD

IDENTIFICATION OF EXISTING ROADS WAS BASED ON:	
FLMF road mapping and grizzly bear data. Information to note included: ownership of the road, existence of access controls (e.g., gates) and road classification.	
CONDITIONS AND ISSUES TO CONSIDER IN THE LOCATION OF NEW ACCESS	
Caribou RSF	A resource selection function (RSF) is any model that yields values proportional to the probability of use of a resource unit (in this instance for caribou).
Grizzly Bear RSF	A resource selection function (RSF) is any model that yields values proportional to the probability of use of a resource unit (in this instance for grizzly bears).
Terrain:	Slope, natural surface deposits, need for cut and fill
Fens, Bogs and Wetlands	Poorly drained sites to be avoided
Intactness Zones	Degree of fragmentation of habitat 0-5; zero equals no effect, 5 creates fragmentation
Stream Crossings	Perennial, transient, intermittent, slope approaches, bank material
Streams	Fish bearing, non-fish bearing
Major Stream Crossings	Class A or B (Forest Practices Code), Probability of fish bearing (FRI model)
Creation Loop Roads	Roads that create more than one entry or exit point to a defined area.
Redundant Roads	Identify as redundant road
Road Standard/Class	Primary, secondary, winter road, trail
Road Utility	Forestry and energy users (yes or no), pipeline users (yes or no)

Table 3 Ranking system used to assess relative impacts for new access development in BSRAD

Route Options	Intactness Ranking (0-5)	Grizzly RSF (0-4)	Caribou Pt Locations (0-4)	Future Activity (0-5)	Integrate with Pipeline (0-5)	Safety (0-5)	Carbon (0-3)	Integrate with Forestry (0-5)	Ability to Reduce Footprint (0-5)	Total (low ranking is best)

Definition of Rankings:

- Intactness (0-5): 0 is no impact on primary intact areas (i.e., habitat), 5 creates fragmentation of primary intact areas.
- Grizzly bear and caribou relative ranking based on RSF and Point Data (0-4).
- Future Activity: based on an estimate of suitability of additional users from the energy sector, meaning many wells or operators (5 = suitability limited to few wells and primarily 1-2 operators).
- Ability to integrate pipeline (0-5): 0 = access route can accommodate both the road and pipeline; 5 = pipeline requires its own corridor (double the footprint).
- Safety (0-5): Less distance for workers to travel from point of origin; 0= least distance 5 = most.
- Carbon (0-3): 0=least impact (burning of fuel to service from point of origin).
- Forestry integration (0-5): If the route is suitable for the forest sector; 0= best; 5 = least desirable.
- Ability to reduce footprint (0-5): if the route can reduce or eliminate existing or planned routes; 0=best

Table 4 Guidelines for industrial users in development of the BSRAD Plan

1. Plan main/secondary roads to within approximately 3-5 km of all sequenced wood regardless of intactness considerations and the need to be projected is in excess of 20 years (these routes should be used as the only access by all industrial users).
2. Provide the status of all main roads in digital format. Use a colour coding to indicate status/class or roads. The existence of a road does not necessarily mean it is the best from an ILM point of view. A general assessment for reduction of overall footprint needs to be completed as part of the plan development.
3. Plan secondary ILM routes in the caribou area with all oil and gas roads and provide identification as "maintain", "build" (e.g., required for 20+ years), "light deactivation" (erosion protection, grass seeding, access barriers, identify if needed again within 10 years), "heavy deactivation" (most creek crossings are removed, if need is not likely for more than 10 years), or "reclaim" (all crossings removed, de-compacted, regeneration planned). Provide proposed deactivation timing (related to block sequence). It is assumed that all routes are permanent (e.g., 20+ years).
4. The following considerations should also be included in the category of route planning: silvicultural requirements, fire protection, other users, cost and safety considerations and public access.
5. Provide spatial block timing sequence over time (forest sector uses).
6. Route selection should also determine any potential to reduce overall footprint.
7. The level of use (if it can be quantified as High (H), Medium (M), & Low (L)).
8. Known public, trapper, traditional use concerns.

Step 4: Plan Assessment

Assessment of an access management plan will depend upon how a road network is planned and modeled. Eight spatial models/theories have evolved to provide a base to study road ecology. They have evolved from studies connected to:

- Road effects on water flow;
- Erosion and sediment transport;
- Wildlife movement and road kill;
- Mitigation measures for wildlife;
- Roadside vegetation; and
- Impacts on aquatic systems.

After selecting models, further assessments are conducted in a GIS analysis to quantitatively describe the effects of a road network on a landscape.

*Models used in the **BSRAD** included the following:*

- *Ecological road fitting. This is the equivalent of road layout on the ground with respect to topography and ecologically sensitive sites as done in the design of a road network (Step 3).*
- *Road Buffers (i.e., Road-Zone Effect) to describe/capture human disturbance of a road network on the landscape (industrial footprint).*
- *Road Density/Mesh Size to describe the density/concentration of roads on the landscape (open route densities).*

A perforated road model also might be used to describe the effects of roads on waterways, aquatic habitats, water flows, water quality and terrestrial wildlife movements.

Road Buffer (Road-Zone Effect)

Roads affect numerous ecological factors, but most effects only extend outward a few meters or a few tens of meters from the road; however, some factors produce effects that can extend farther, sometimes 100 m or 1 km from a road. The extent of a road-effect zone will vary as it intersects different habitats and topography in the landscape.

Selection of a road buffer width should be based on the following steps:

1. Review pertinent literature for access management plans in similar conditions (e.g., vegetation, species, topography, road standards and road classes, traffic levels, resource extraction/management);
2. Consult with local wildlife and fisheries managers and researchers;
3. Identify acceptable road buffer widths based on previous steps;
4. Conduct a series of GIS simulations to compare existing industrial footprint and that associated with proposed new access to acceptable thresholds (i.e., road buffers) identified in previous step, with respect to plan objectives; and
5. Conduct risk analyses to evaluate the potential effects of different road buffers on sensitive environmental, economic and social parameters (e.g., wildlife, aquatic habitats, recreation opportunities and economic tradeoffs).

Reduction of the industrial footprint in the BSRAD Plan was addressed by establishing a 250m buffer on both sides of all human-caused features, including roads. A buffer of this width was assumed to be an effective method to capture and report on the ecological effects of roads. The objective was to reduce the number of hectares of this buffer by 15% of current values based on a 2009 baseline. The rationale for this was that it allowed for flexibility to manage the area, minimized fragmentation in undisturbed areas, while enabling recovery in others and allowed time for the planning team to focus on restoration/reclamation activities. When the plan is implemented, the number of human-caused disturbed hectares will be reported annually to monitor how it changes as roads are built, reclaimed or decommissioned.

Road Density

Road density is effective as an indicator of disturbance because of its association with roadside mortality, disturbance avoidance and access by humans to remote areas. No universally acceptable threshold for road density exists.

Road density can also be used with other variables such as peak flows, which can be increased in small mountain streams as road densities increase. Plotting population numbers, forest fire size and frequency, peak flows, and human access on road density can produce useful response curves. Impacts on water quality and aquatic habitats can also be assessed when plotted on the number of stream crossings in a watershed.

Selection of road density thresholds should be based on the following steps:

1. Review pertinent literature on road densities versus wildlife species of interest in other jurisdictions.
2. Consult with local wildlife and fisheries managers and researchers.
3. Identify acceptable threshold levels for road densities based on previous steps.
4. Conduct a series of GIS simulations to compare existing road densities and proposed access to acceptable threshold levels with respect to plan objectives.
5. Conduct risk analyses to evaluate the potential effects of different road densities on sensitive environmental, economic and social parameters (e.g., wildlife, aquatic habitats, recreations opportunities and economic tradeoffs).

Threshold road densities used in the BSRAD Plan were based on those cited in the Alberta Grizzly Bear Recovery Program (ASRD Alberta Grizzly Bear Recovery Plan June 2007). Open route densities were calculated for each grizzly bear watershed unit, which are management units based on major watersheds subdivided along topographic divides and watercourses to approximate the size of an adult female grizzly bear home range (~700 km^2). Open route (road) densities are defined as access routes on which use of motorized vehicles are controlled in time, space, or activity. Within the BSRAD Plan, both target and thresholds were reported on.

For future operational scale regional access development plans, use open route density targets that align with grizzly bear recovery thresholds of 0.6 km/km^2 for core, and 1.2 km/km^2 for secondary grizzly bear habitat.

GIS Analysis

Assessment of access management plans are usually developed with GIS, which is any system that captures, stores, analyzes, manages and presents data that are linked to location. GIS, in simple terms, is the merging of maps and database technology. GIS is widely used in resource management and many other fields. GIS can be used to:

- Model road networks, structures, topography, watercourses and habitats into two- and three-dimensional formats; and
- Formulate queries to test for given conditions.

GIS analyses should be based on the following steps:

1. Define objectives and spatial model to be assessed or tested (e.g., industrial footprint in terms of road buffers and road density, number of road-stream crossings, traffic levels).
2. Assemble database necessary for GIS analyses.
3. Select appropriate spatial software and methods to be used.
4. Describe and compare existing access (e.g., industrial footprint: road buffers, road densities, number of stream crossings) and proposed new access with respect to acceptable threshold levels
    a. Calculate industrial footprint in terms of selected models (e.g., road buffers, road density).
    b. Test by comparison to determine if thresholds satisfied or exceeded.
        1. Thresholds exceeded: adjust plan and retest.
        2. Thresholds satisfied: implement plan and monitor.

> *GIS tools used in the BSRAD Plan were ESRI ArcGIS (9.2) and ArcView. Steps followed to model the industrial footprint and open route densities in the BSRAD Plan were completed with "ModelBuilder", which provides a design window in which spatial analysis operations can be defined, sequentially connected and implemented. In simple terms, ModelBuilder provides a diagram illustrating data input, data manipulation (i.e., tools used) and output. It is a useful tool for repetitive spatial analysis and also in evaluating changing conditions and what-if scenarios in decision-making situations.*

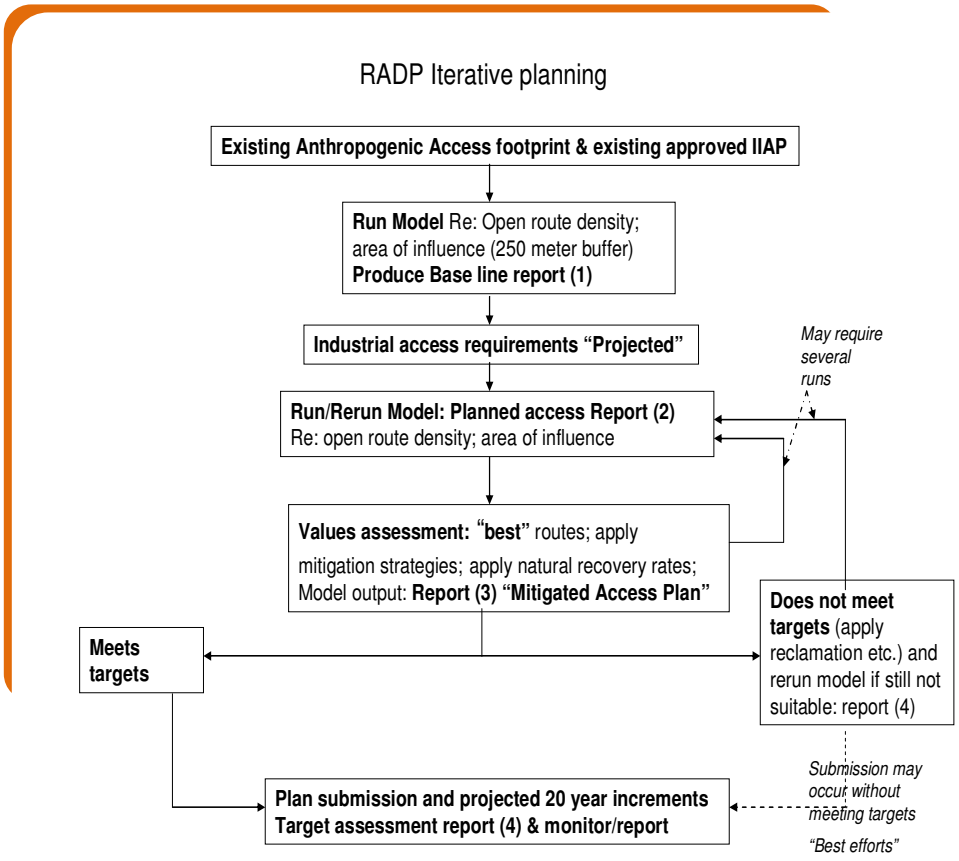

Figure 4 **Iterative planning analysis for the BSRAD Plan (source ASRD Lands Branch). Iterative runs to assess industrial footprint (250 m buffer).**

Step 5: Risk Assessment

Risk assessment predicts future outcomes of actions in the face of uncertainty. In access management, risk can be used to assess the effectiveness of road design (i.e., location, traffic and road class) on wildlife behaviour and populations. The consequences of roads can be categorized in terms of their biological or social effects. Biological effects most often include changes in animal behaviour towards roads or changes in mortality from roads. Social effects can include public demands for economic and recreational needs, opposition to road development in wilderness areas, road closures and negative impacts on wildlife and aquatic resources. Risk assessment can be done for the short- or long-term depending upon the resources at risk.

Risk assessments are easier to implement and interpret when more than one road design is considered for access into an area. More than one plan provides a base for comparison of different options and potential impacts. Risk can be assessed by:

- Qualitative models, based on expert opinion and experience in an area; or
- Quantitative models, based on parameters that can be measured in some way (e.g., animal numbers, habitat availability/selection, mortality). In regions with significant fisheries and other water-based resources, assessments will focus on stream crossings, peak flows and water quality parameters.

RSF models are statistical models that provide an objective medium to quantitatively assess the risk of habitat change on animals or populations. RSFs can be estimated by analysis of available habitat units to those actually used by a species, which can be combined with GIS to map habitats. RSFs have been considered the most promising procedures to study habitat selection when paired with GIS.

RSFs offer the opportunity to assess the effects of changes in habitats on animal numbers and behaviour. Their value to access management planning is that different road designs and conditions before and after road development can be used to assess changes in animal behaviour and presence on the landscape.

Adoption of an RSF for risk assessment will require data sets that describe habitat use in terms of used vs. unused and/or used versus available.

Access to or participation of personnel familiar with the application of RSF models in a design team should be anticipated.

Step 6: Data Management

Data management is important and essential to success in any endeavor that involves the collection and analysis of large data sets. Sufficient and quality information is the foundation of decision-making and the delivery of products and services. This is especially the case for access management plans, where large data sets for spatial analyses at landscape scales are required. Figure 5 illustrates the classic cycle of data management.[3]

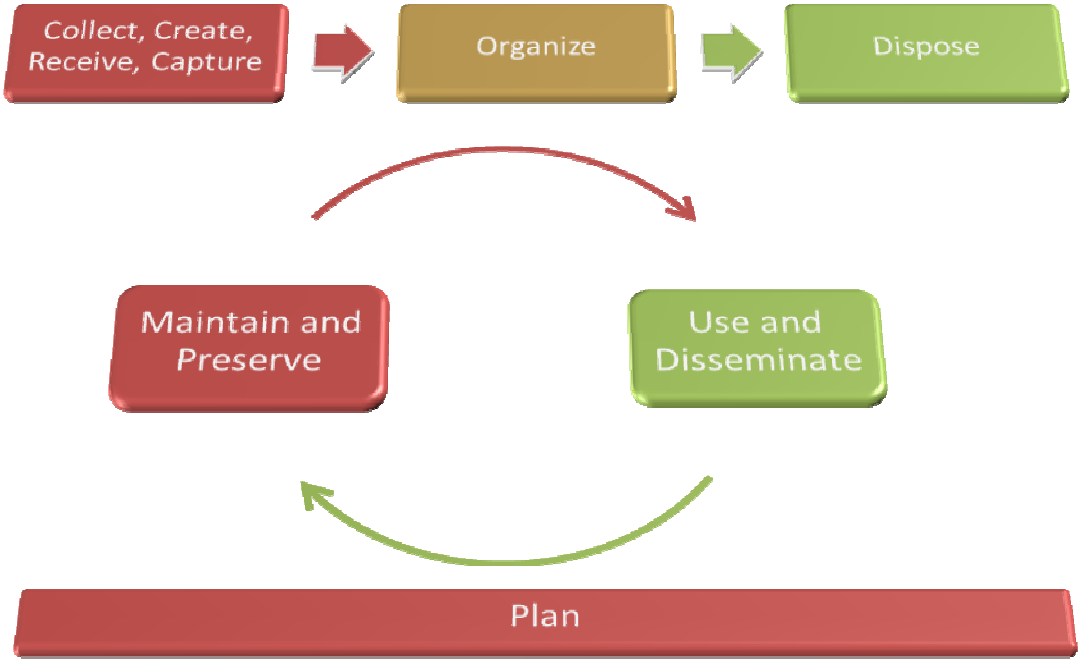

Figure 5 Data management cycle

Data Needs for Access Management

One of the principles of ILM is that planning should be informed by knowledge and science. Information contributes to better understanding of the potential consequences of options, and provides the foundation for informed and prudent decisions. Protocols and standards for collection, analysis and storage of data should be determined in the early planning stages and followed throughout the course of a project.

While specific details of data use and organization will vary from region to region, a planning/design team should contain (or have access to) someone familiar with database management. In most situations, this person will not deal directly with data management, but should be aware of the requirements for good data management, to provide some level of oversight to efficient and effective data handling and storage. It is also important that someone on the team is experienced with GIS.

A database is a collection of logically-related records or files consolidated into a common pool that can be used for one or multiple uses. Databases can be classified by the type of data they contain: bibliographic, full-text, numeric, and image. Computer software is used to organize data in a database.

[3] This diagram is based on a diagram presented by the Federal Geographic Data Committee, which illustrates the interrelationships of business requirements with the various data management stages. That diagram did not deal explicitly with data disposition, which has been incorporated for the purposes of this manual. The original diagram can be found at: http://www.fgdc.gov/policyandplanning/A16Draft/A16_Imagefiles/Figure2_DataLifecycle.jpg/view

Construction of a database for access management should include, at minimum, existing road networks, surface features, industrial infrastructure, vegetation, wildlife habitat and sensitive sites (see Table 5). These data should be up-to-date and referenced as baseline data with respect to a given start date.

Ideally, these data should be in a spatial format ready for use in a GIS environment. Otherwise, documents/images will need to be scanned and/or digitized to convert them into appropriate formats for use. Considerable effort should be made in processing these data with respect to construction of tables and naming of attributes.

Modeled data will include the location of proposed new access and the description of its disturbance in terms of an industrial footprint (e.g., road buffer zones) and open route access (road density) on the landscape as done in the BSRAD Plan. In most cases, these spatial data will be generated by GIS.

A good data management system should include the following:

- Adequate data storage capacity
- Data that are readily available to users (easy to retrieve and store)
- Data that are protected by database security
- Data that are accurate and up-to-date
- Minimization of redundant data
- Logs of data access (who logged on and dates for changes made to data)
- Consistent method for naming objects (e.g., data files/tables) that will identify their purpose to future programmers and users
- Documentation of definitions of objects and columns to make it clear what is being modeled
- Acceptable performance (confirmed by testing of the system before widespread use)

Issues related to data include:

1. Determining what data is actually required to support planning (not all data is of equal value and more is not necessarily better);
2. Having understanding and procedures in place to compile and integrate the data;
3. Understanding what data maintenance is required and how to accomplish this;
4. Being able to identify data security issues and put in place procedures to actually secure the data;
5. Metadata -- data that describes the data that is actually meaningful and useful and easily accessible;
6. Understanding what the technological needs are to utilize the data (technical infrastructure) from both the hardware and software perspective;
7. Having documented policies related to access, privacy, and data sharing that everyone understands;
8. Having a clear understanding of data products (which are documented) – the purpose of the data products, for whom, and why is clear – the processes and methodologies are clear;
9. Clear understanding of the concepts of data stewardship and custodianship.

Data Determination and Planning

In general, an analysis is required to determine what data is required, what will be required to prepare the data for use, what software application(s) will be used to manipulate the data, and what physical products/results will be produced from that data.

You must consider whether the data is essential or desirable to perform the required activity, whether the data is at hand or how the data may be obtained. Issues of data quality and data completeness must be addressed.

For the BSRAD Plan, this data determination process was generally based on personal knowledge, interaction, and discussion with other staff. It was also constrained by the geographical extent of the project area (primarily the range of the Little Smoky and A la Peche caribou herds in west central Alberta).

Depending upon the requirements, you may need to acquire "fresh" data. There may be uncertainty regarding the validity and currency of data on hand, and products/results need to be as up-to-date as possible. Efforts should be made to have the most current data available, especially related to access.

Many datasets can be used that can be grouped into categories (depending upon use, a dataset may be linked to a different category or be applicable to more than one):

DATA GROUP	COMMENT
Base Data	This usually consists of: provincial roads, terrain, hydrography, imagery, and similar. Most of this data is supplied directly or indirectly by ASRD
Disposition	Digital Integrated Dispositions (DIDs[4]). GOA data
Access Data	Access roads, gates, and stream crossings (from industry)
Forestry Data	Management areas, plans, cutblocks (this may also be considered access) from industry
Oil & Gas	Seismic, pipelines, wellsites (from Alberta Energy and industry)
Habitat Data	Caribou and Grizzly are the primary datasets for the BSRAD Plan (from University of Alberta and ASRD)

Other datasets may also be needed. These can include:

- Other wildlife;
- Vegetation;
- Cultural (e.g., First Nations, archeological); and
- Water (which is not supplied as part of hydrography).

Incoming Data Tracking

Incoming data tracking is accomplished using a spreadsheet data management approach. This file captures the following:

FIELD	DESCRIPTION
Company	The agency supplying the data (e.g., ASRD)
Contact Name	Name of individual to contact
Contact Email	Email of contact
Contact Phone	Telephone number of contact
Comments	Comments that provide understanding of any issues involved with the data
Regular Procedure to Obtain Data	A description of the process to obtain the data (who, what, etc.)

[4] http://www.srd.alberta.ca/ManagingPrograms/Lands/DIDS.aspx

In the BSRAD Plan, staff did not always know exactly what data was available but they did know where to find it. In the future, it may be that the Alberta government (GeoDiscover Alberta initiative) may satisfy access management planning needs. The concept is to collect information once, closest to source and make it most widely available. Currently, data is being catalogued and made available internally (for the ministries of ASRD, Energy, and Environment and Water), as part of the GeoDiscover Alberta initiative.

Data Maintenance

Access management is an ongoing process that involves the development of new access, and monitoring and mitigation programs to minimize industrial disturbance and regulate traffic at local and landscape scales. An up-to-date and efficient database is essential to monitor and control the industrial footprint on the landscape.

An access management database should be updated on an annual basis, given the high level of natural resource development in Alberta. This will require a sustained effort for managers. To ensure data are current, there needs to be a commitment to maintain the data in a current state "as built".

Data sharing agreements should be created between all participants in an access management plan and others.

- Shared data should include:
  - All access constructed in the past year;
  - All proposed new access for the upcoming year;
  - All mitigated/decommissioned roads in the past year;
  - All new infrastructure in past year (structures, pipe lines, harvest blocks);
  - Proposed new infrastructure in upcoming year (structures, pipe lines, harvest blocks); and
  - Any other supporting data that facilitates the use or management of the above listed data.
- Shared data should have:
  - Common or compatible software for storing and processing data;
  - Common spatial and numeric formats for data;
  - Established deadlines for reporting needs;
  - Identified responsibility for database management, data analyses and reporting of results; and
  - Established cost sharing agreement for database management, data analysis and reporting of results among all participants in an access management plan.

Data Sources and Collection

Spatial data of base features (roads, municipalities, infrastructure, land features, topography, hydrography, watersheds) can be obtained from commercial and government vendors. Some of these data may need to be enhanced to provide more detail (e.g., small scale to large scale). Information sources for resource roads, resource infrastructure, vegetation and forest cover will be collected directly from forest and oil and gas companies and others directly involved in access management for an area. These data may be proprietary and confidential, with limits and constraints on who can use the data and how. These issues will need to be resolved through data sharing agreements.

Data sources for wildlife and aquatic habitat may be limiting and need to be modeled based on expert opinion and available spatial data. Possible sources can include research reports, resource inventories/monitoring by government, forest companies and oil and gas companies. These data will also need to be supported by access to baseline features, especially vegetation (Alberta Vegetation Inventory), spatial covers for watershed and stream-river networks.

Table 5 Baseline data requirements for access planning

BASELINE DATA
Existing Road Networks: primary all-weather roads (gravel/paved), secondary roads (gravel/paved), trails, and harvest block roads
Stream Crossings: bridges, culverts, fords etc.
Surface Features: topography, rivers, streams, lakes, seismic lines, railroads, pipelines
Land Use Zones/Categories: Forestry, Oil and Gas, Agriculture, Urban, Recreational
Vegetation: forest, non-forest, wetlands, swamps, peatlands
Wildlife Habitat: known used habitat by large mammals (e.g., Grizzly bears, Caribou) and other endangered or at risk species
Aquatic Habitat: fish and non-fish bearing streams, and other important water based species
Sensitive Sites: steep slopes and soils subject to failure and/or erosion
MODELED DATA
Proposed New Access: GIS generated by planning team, based on road location
Watersheds: GIS generated from analysis of digital elevation models
Stream Channel Networks: GIS generated from analysis of digital elevation models, plus existing maps and spatial data
Wildlife Habitat: GIS generated, supported by field data and expert opinion
Industrial Footprint: GIS buffering of existing road and proposed new access
Open Route Access: GIS analysis for road density as km/km^2
Maps of Road Networks Existing and New: GIS generated

Metadata

Metadata is data about data. Standards for describing data allow it to be found and shared. This allows for efficiency in access and use of the data. Metadata standards provide a common framework for the documentation of data in terms of content, definition, quality, structure and accessibility. See Appendix B for information regarding metadata as it related to the BSRAD Plan.

Access to Data

Once data requirements are determined, the actual data must be accessed and obtained. Factors affecting this include:

- Is the data available at all?
- Where is the data located?
- Are there privacy/policy issues of use?
- Are there format issues?
- What is the physical process for accessing the data?

Data Published by FLMF

FLMF members and ASRD are able to access FLMF data via a FRI web-mapping portal.

The data published by FRI via their web-mapping application is shown below (and the order it is presented).

Table 6 Data published by FRI

DATA THEMES
RAD PlanBoundary
FLMF Boundary – 15km Buffer
BLMF Boundary
Townships
Sections
Proposed Roads
Barriers
Existing Roads
Proposed Future Treatment
Pipeline
Major Roads
Corridors
Surface Wells
Fish Probability Model
FMAs
CaribouRSF2004Summer
CaribouRSF2005Winter
SlopePercent
GrizzlyBearRSF
SPOT South (South refers to the southern half of the project area)
SPOT North (North refers to the northern half of the project area)
ot46f23_95.bil[5]
ot45f22_96.bil

Data Stewardship and Custodianship

Understanding the roles of data stewards and data custodians is important for effective data management. The definition of data custodians and data stewards can vary between organizations. In some cases, the roles are even reversed.

For the purposes of this document, the meaning of data custodian and steward are as follows:[6]

- The fundamental concept for data custodian is there is only one organization/agency responsible and accountable for the data that others might use. This gives users confidence in the level of integrity, timeliness, precision and completeness of data, and in the quality and soundness of decisions made based on that data.

[5] BIL files: BIL is a format for storing images. Initials stand for Band-Interleaved-by-Line.

[6] The structure of data custodian and data steward has been adopted from that proposed by the BC government (http://www.for.gov.bc.ca/his/datadmin/respdcst.htm).

- The data steward manages and provides the data. The data steward does not own the data or have full control over its use.

It is possible for the data custodian and the data steward to be the same person/organization but it is important that roles be clear and part of data planning.

Security of Data

Data Backup and Archiving

Backup and archiving should be a fundamental data practice and must be performed by all individuals managing data. For business purposes, archiving of specific data products may be useful to support business needs.

Storage of Data

Physical storage of data needs to be determined, with sufficient capacity and ease of access (e.g., folder/directory structures).

Data Types

This includes:

- Vector Data – this will be both as lines and areas.
- Tabular Data – data in databases and also spreadsheets and files containing ASCII delimited data;
- Point Data – GPS field data especially must be taken into account; and
- Raster Data – there are various forms of raster data; most often this will be used for base purposes but it may also include raster data that has been generated from modeling (e.g., various suitability ratings).

> *The BSRAD Plan utilized data of all types.*

Data Formats and Structure

As a whole, a variety of data formats and structures will be encountered in an access development planning project. These include:

- ESRI geodatabase (personal and file: PGDB and FGDB)
- ESRI shapefiles (.shp)
- ESRI Export (E00)
- CAD formats (mostly AutoCad)
- GPS formats
- LiDAR imagery
- Other imagery formats

It is important for a planning team to understand the various data formats and how to incorporate them into the system for use when building data products.

Data Scale

The scale of data used will vary primarily depending upon its source.

DATA CATEGORY	COMMENTS
Provincial Base Data	Most of this data is based on the 1:20,000 provincial base dataset. It is meant to be accurate to +/- 20 metres on the ground.
Access Data	Access data consisting of roads, gates, and similar may be captured at a higher degree of accuracy. This data varies but indications are that it is 1:10,000 or smaller.
Other	Other data sets can vary. An issue to consider is Government of Canada data if, used. Depending upon source, this data may be much coarser.

Data Currency

Data may change over time, or a component of the data (e.g., status associated with a road) may change over time.

> *The currency of the data used for the BSRAD Plan was mixed, with some being current to within a few months to a year (industry data) and other datasets not having been updated since the 1980s. Other datasets, such as AVI, were relatively current (available access) to 2005.*

Support Infrastructure

Support for information systems varies within organizations; therefore, the skills necessary to configure and support them may not be core competencies within the organization. This may lead to external agents providing a support role for such things as software, hardware and training.

Roles and Responsibilities

The functional roles assumed by those working on an access management plan are many and varied. Some of these roles are performed internally, and some externally or perhaps a combination of the two. A single individual may perform multiple roles.

ROLE	DESCRIPTION
Application Developer	Will develop customized software applications, scripts, utilities and applications.
Clerical Support	Clerical support for data issues.
Data Manager	Individual responsible for managing the data in a data warehouse or similar structure.
Data Preparation (cleaning, converting etc.)	Various data preparation services. May include the preparation of data that is acquired in a non-GIS ready form. Another type of work is acquiring attribute information from data providers and preparing it for analysis.
Data Provider Expert	Know where and how to get data and know the reliability of the source.
GIS Analyst (Junior or Intermediate)	Some of the work performed requires the expertise of a junior or intermediate GIS specialist. This work can be of a repetitive nature and provided they are adequately directed, can be done by more junior staff.
GIS Analyst (Senior)	Some of the work performed requires the expertise of a senior GIS specialist.
Land/Resource Expert	Analysis of the data used requires the expertise of an experienced land and resource management expert.
Modeler	The project requires modeling expertise to provide it with data and process models to help it manage its data.
Presentation Expert	Various presentations to committees and stakeholders involved. The project manager(s) would generally perform this.
Project Manager	Oversee the project as a whole.
Quality Assurance/ Quality Control	Resource(s) that perform quality assurance of data and products. Can be internal and external.
Research and Development	Can be internal or external.
Standards	Resource assigned to evaluating, recommending or maintaining standards. May be proactive or ad hoc.
Writer	Textual information is included with the data and products.

Core Data Expertise

An access management plan will depend upon the use of spatial data and its attributes. In addition, special software, applications, and processes are required to utilize this data correctly. This requires education and experience using this type of data and the applications.

Data Governance, Policy and Practices

Various legislative acts and guidelines will influence and constrain information use for access management planning. It can be anticipated that acts and guidelines related to land, water, resources, and the environment will impact the use of the data.

Policy Acts/Legislation
A partial list of Acts that may impact the use of data includes:

- *Alberta Land Stewardship Act*
- *Energy Resources Conservation Act*
- *Environmental Protection and Enhancement Act*
- *Federal Fisheries Act and Navigable Waters Act*
- *Forest and Prairie Protection Act*
- *Forest Reserves Act*
- *Forests Act*
- *Public Lands Act*
- *Water Act* and Codes of Practice

Project Agreements
In addition, there will be agreements required for data use among stakeholders.

> *The BSRAD Plan includes a suite of ongoing commitments from industry, including annual reporting and maintaining the access data in a current state. The BSRAD Plan is viewed as a living document, not a one-time plan. The benefits accrued by industry, such as certainty of access and having an accurate access data layer for ongoing business, justified this commitment. An MOU is in place between ASRD and FLMF, and a general data sharing agreement is in place between FLMF and its members. The principles of the MOU are to develop a single information source (GIS database) of existing (as-built) access and access control (gates) features.*

Intellectual Property and Privacy
Data sharing agreements generally address any issues related to intellectual property. Data used outside of data sharing agreements must be approved by an industry representative.

There may or may not be privacy issues related to data. This will depend upon whether the data is applicable to future company activities (e.g., related to competitiveness or the location of wells). Privacy is not an issue related to Crown data.

In terms of the *Freedom of Information and Protection of Privacy Act* (FOIP), there may be some industry concern related to resident data or proposed plans. FOIP has not been identified as an issue for Crown data.

Preparation of Data

Once data has been physically acquired, it may have to be "prepared" for further use. This usually entails various types of conversions. The type and number of conversions depends upon the data and the software tools being utilized.

The above discussion refers to spatial data, but attribute information may also have to be converted. For example:

- ASCII tables may have to be converted and loaded into appropriate software.
- Spreadsheet files may have to be converted to database files and vice versa.
- Special software may have to be executed to extract pieces of data from larger datasets.

Cartographic Data Manipulation

Map products can involve effort in data manipulation for cartographic purposes. This can include:

- Building and customizing map legends;
- Determining physical size of maps;
- Presentation considerations of various map features (e.g., styles, colors, etc.); and
- The preparation of special layers for presentation purposes (e.g., layers to represent fills – water and land are often handled in this fashion);

Step 7: Mitigation

Mitigation in access management includes the strategies and practices used to limit and/or reduce the effects of an industrial footprint on the landscape. Actions employed will vary with the need for access and the objectives of an access management plan. Objectives for mitigation can include some or all of the following:

- Protect wildlife and its habitat from human disturbance
- Reduce wildlife mortality from vehicle collisions
- Reduce wildlife sport hunting mortality
- Recover lost habitat (i.e., avoidance because of human presence)
- Reclaim disturbed lands to a natural condition
- Return land to a productive state
- Recover lost wildlife habitat
- Recover slope stability
- Reclaim stream crossings (bridges/culverts) to a natural condition
- Prevent erosion and sedimentation in stream channels
- Reclaim and protect aquatic habitat and fauna
- Prevent and reduce wild fires
- Reduce human caused fires

Mitigation includes a range of different activities that can be used to reduce industrial disturbance on a landscape. Measures for mitigation can be categorized as:

- Traffic control;
- Road closure; or
- Road removal.

Traffic Control

Traffic control can eliminate or reduce access on roads. This has the potential to increase the quality of wildlife and aquatic habitats, reduce negative human-animal interactions, and reduce human-caused fires. Reduced traffic also has the benefits of reducing maintenance costs for a road system. These methods often need to be supplemented with legislative restrictions and active enforcement until local populations become accustomed to reduced opportunities for access.

Road Closure

Road closure is another form of traffic control. Closure is the temporary storage of a road for future use. The road remains part of a transportation network, with no traffic other than periodic traffic for inspection and maintenance. Closure can be accomplished by the use of gates or barriers and active enforcement, but is only effective if there are legislative mechanisms used. This and the previous methods minimize some of the environmental effects of roads, but do not reduce the spatial extent of roads on the landscape (i.e., industrial footprint).

Road Removal and Reclamation

While traffic control and road closures do not reduce the industrial footprint of roads on the landscape, they do reduce human presence and disturbance on the landscape and some environmental effects. The only way to reduce an existing industrial footprint on a landscape is to remove roads that are no longer needed

or are redundant from the landscape and return them to a "natural condition". Two options to accomplish this are:

1) Leave for natural recovery; or
2) Direct action to remove and reclaim roads (access).

Option 1 would include road abandonment with recovery based on growth and spread of existing nearby trees and shrubs to bring the former road to a "natural state". This may be appropriate in some situations (e.g., seismic lines), but not on sites where surface water flows can erode bare mineral soils, transport sediment to streams and contribute to slope instability. "Leave for natural" can take 10 to 20 years and will not be acceptable in areas where resource development is extensive and ongoing.

Option 2 is the most efficient and rapid method to reduce access disturbance on a landscape. It is a process of decommissioning, deactivating or dismantling the road, eliminating all travel, followed by reclamation to a productive state by natural or designed methods. Existing road grades and roadbed materials are re-contoured by earthmoving to natural (i.e., original) slope conditions. Stream crossings are returned to natural cross-sections by the removal of fill material/abutments, and channel gradients returned t
o

When a company proposes to build a new road in the RAD plan area, and that new road results in the creation of redundant LOCs (within 250m) also owned by the proponent, restoration of the redundant road will be completed within a year of the construction of the new access road.

When a proponent proposes to build a new RAD road, and that road results in the creation of a redundant road that is NOT owned by the proponent, the proponent will work with the existing owner of the redundant road to factor its restoration into the landscape level restoration plan.

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evels.

Planning Team Mitigation Capacity

Road removal and reclamation is the reverse of road building, which requires the skills of resource specialists in road construction/engineering, agrology, forestry, ecology, hydrology and wildlife and fisheries management (i.e., bioengineering). A planning team should include or have access to the following personnel:

- Forest engineer or experienced road construction contractor familiar with techniques and practices for road removal.
- Agrologist experienced in the field of land reclamation and familiar with soils and plant species suitable for road reclamation and erosion control.
- Hydrologist familiar with the design and use of drainage structures to control surface runoff from roads and the reconstruction of stream channels at road crossings.
- Plant ecologist familiar with the acquisition, treatment and culture of native species.
- Wildlife manager/ecologist familiar with the habitat requirements of local wildlife, and their responses to industrial/human disturbance.
- Fisheries manager/biologist familiar with local aquatic systems and the impacts of resource disturbance on fish and other aquatic species and habitat.
- Resource managers (forestry and oil and gas) experienced in local resource management and extraction.

Setting Priorities for Road Removal and Reclamation

Road removal and reclamation should be planned carefully, given the magnitude of work and cost involved. Costs to remove and reclaim roads can be similar to that for their construction. Planning for road removal and reclamation should be based on the following:

- Setting priorities for selecting roads;
- Setting reclamation standards;
- Identifying appropriate treatments/practices;
- Using current and accurate inventories and resource management plans to identify and prioritize reclamation;
- Providing adequate funding;
- Compliance with existing provincial and federal guidelines and legislation; and
- Using resource specialists for planning, design, and monitoring during and after reclamation.

The selection of roads for removal and reclamation should be connected to the goals and objectives of an access management plan. These can include reduction of the area of disturbance (industrial footprint), maintaining road density below thresholds, conserving/protecting critical wildlife habitat, and minimizing road-stream crossings to conserve/protect aquatic species and habitat. In general, it is best to select the most harmful roads first to reduce impacts and the extent of disturbance.

Prioritization of roads to be reclaimed may be necessary dependent upon a variety of factors and the management goal of the area (e.g., caribou habitat, open route density thresholds, use and projection of future use). This will require a specific plan for the area at the landscape level and breaking it down into smaller units as necessary.

In addition to wildlife and fisheries concerns, selections for road removal and reclamation should also be based on the need for continued access into given watersheds. Decisions on the need for resource extraction should be resolved and defended with respect to established thresholds for disturbance and road densities and wildlife and aquatic responses. The need for continued access can be reported in terms of road classes (e.g., all-weather, secondary, trails, gated access, de-activated, removed roads) and the expected need for access (e. g., long-term/permanent, short-term, seasonal).

A task team of government, energy and forest companies should be established (under a clear Terms of Reference) to identify priorities and processes for landscape level restoration, and implement the plan.

The BSRAD plan included the development of the task force above. Meetings have commenced.

Standards for Road Removal and Reclamation

Standards for road removal and reclamation on public lands in most jurisdictions will be established by government, working in consultation with resource managers and other interested parties. Standards for road removal and reclamation should satisfy the following:

- Reduction of road disturbance and associated effects;
- Protection and conservation of wildlife and aquatic populations; and
- Reclamation of disturbed sites to a "natural condition".

Standards for removal and reclamation can be categorized in terms of engineering and site reclamation activities:

- Engineering activities include re-contouring road right-of-ways by earth moving back to natural slope conditions.
- Site reclamation is the establishment of native vegetation equivalent to surrounding undisturbed vegetation in a watershed.

The combination of these practices is often called "bioengineering": the use of live and dead plant materials in engineering applications to stabilize and reclaim disturbed sites. Engineering standards or requirements for road removal and reclamation include, but are not limited to, the following:

- Remove all stream culverts.
- Remove all bridges.
- Restore surface drainage path, consistent with natural paths.
- Re-contour road and right-of-way to natural slope conditions, consistent with upslope and downslope reaches.
- Rework surface soils on road and right-of-way with appropriate amendments to create favourable soil for plat establishment and growth.
- Stabilize roads and right-of-ways with respect to:
    - Soil erosion and sediment transport into streams; and
    - Slope stability.
- Ensure safe passage and production of fish habitat.
- Establish gate or barrier to prevent access by motorized traffic.
- Ensure compliance with all pertinent federal and provincial legislation, regulations and guidelines.

Reclamation standards or requirements for road removal and reclamation include, but are not limited to, the following:

- Re-vegetation of disturbed/exposed soil surfaces to prevent erosion and sediment transport.
- Plant cover to prevent soil erosion.
- A minimum of 50% live cover and 10-20% of natural litter or organic debris scattered on site to slow overland flow and trap sediment.
- Some level of site preparation to create favourable seed bed conditions for germination.
- Use of agronomic species in early stages of reclamation to obtain effective erosion control with introduction of native species.

- A long-term strategy to return site to "natural condition".
- Use of native species for long-term reclamation of a site.
- Application of surface soil and organic layer (may be a seed source for native species).
- Planting shrubs and trees compatible with adjacent undisturbed vegetation.
- Establishing a monitoring program to evaluate success and the need for remedial measures.

Methods/Treatments for Road Removal

Methods and treatments for road removal and reclamation will vary with site conditions and the class of road being reclaimed. Methods for seasonal roads, trails, and interior harvest block access will be different from those for mainline and secondary roads. Removal and reclamation on relatively flat sites will usually be less work than on sloping sites with marked relief. Road removal and reclamation, in general, will consist of:

- Scarification/ripping to break up and de-compact road surface/beds into a granular material (with properties of aeration, texture, water retention and transmission).
- Re-contouring the right-of-way to resemble natural slope conditions for a site.
- Replacement/addition of soil and organic material on the ground surface to create soil properties favourable for plant growth, water infiltration, retention and transmission.
- Seeding and planting plant species for erosion control and returning the site to a "natural condition".
- Scattering organic debris on the soil surfaces and compacting for erosion control and as a seed source for native species.
- Establishing road barriers, as necessary, at access points to reclaimed sites to prevent vehicle traffic and allow stabilization and re-vegetation to develop.

A program to remove and reclaim access roads to natural conditions is equal to the resources and personnel required for the construction of the roads. Such programs should be carefully planned, executed and monitored to ensure objectives are satisfied.

Once plans for road removal and reclamation are in place (i.e., planning/design team, selection of sites, standards, and methods), an economic analysis of the costs and benefits of proposed work should be completed. Funding often may be a limiting factor in terms of the amount of work that can be done. This needs to be recognized and scenarios prepared for the work that is possible at different funding levels.

Any mitigation strategy used must include a monitoring and assessment process to measure effectiveness in meeting the desired outcome. Mitigation strategies in the past have been additive and without monitoring, resulting in:

- High cost to implement for low resource conservation value.
- Practices that were designed to address a single value, and when applied actually can work against other values. For example, the "use existing access" policy often results in access corridors that follow existing seismic lines instead of more appropriate routes that would be a better overall access solution to address the access need and all resource values.
- Lack of different approaches and practices to an issue, which may have produced better results for reduced cost. For example, gates on active roads to control public access are expensive and ineffective, and in some cases, they create other problems such as OHV trails bypassing a gate, causing damage to streams. An alternative approach is to regulate allowable use and increase enforcement to ensure effectiveness.
- Some practices being obsolete.

Assessment

Most existing practices were developed independently and not as part of an integrated approach to ensure best value and effectiveness.

	Low Cost	High Cost
Low Value		
High Value		

The access plan should review existing practices according to a value/cost matrix and implement a practices approach designed to improve performance at reduced cost.

Step 8: Monitoring

Adaptive Management

Monitoring consists of a series of observations collected over time that are used to assess the effectiveness of a given activity or program. Monitoring is a separate activity from resource assessments and inventories, which are used to create a baseline/benchmark for detecting change or effectiveness. It is an essential component in adaptive management, which is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Adaptive management systems have become cornerstones for natural resource planning.

In simpler terms, adaptive management is a six-step cycle (see Figure 6).

- Step 1 is recognition of a problem or need.
- Step 2 is design of a program that addresses the problem (e.g., access management).
- Step 3 is the implementation of the program.
- Step 4 is monitoring.
- Step 5 evaluates the effectiveness of the program with respect to defined objectives/goals based on monitoring observations.
- In Step 6, adjustments are made, if needed, to meet defined goals or to improve performance, followed by continuation of the program in Step 3. This cycle allows for ongoing monitoring of performance and improvements as better methods or objectives occur.

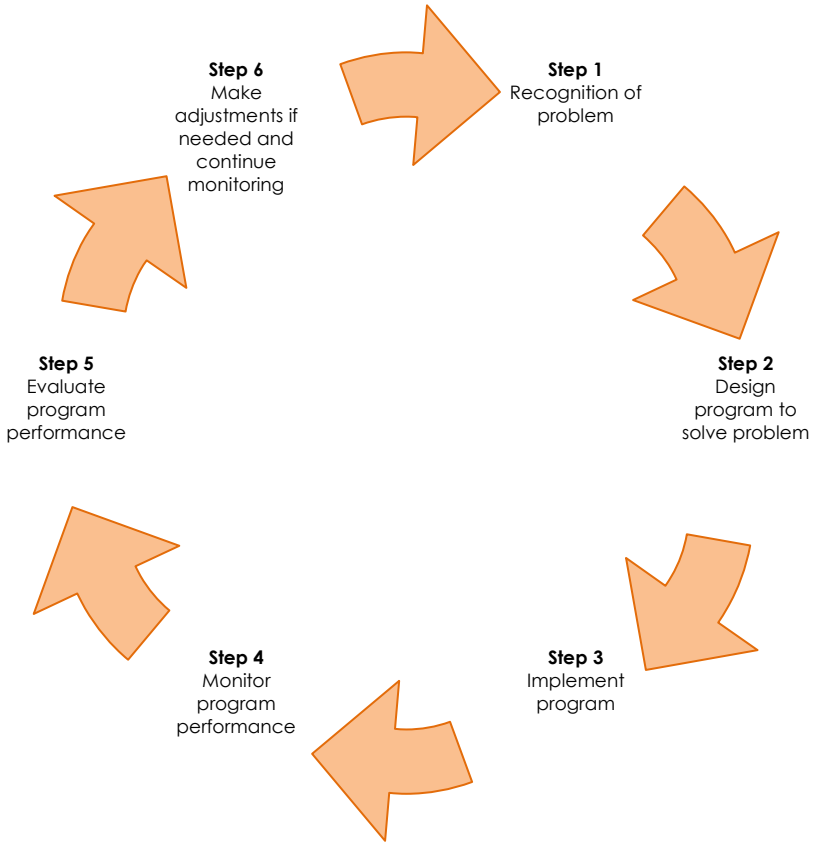

Figure 6 6 steps in adaptive management

Kinds of Monitoring

The kind of monitoring used in a program will vary with its objectives/goals.

- *Trend Monitoring*—long-term monitoring with observations taken at well-spaced intervals to determine the variability of a given parameter. Observations of this nature are not usually used to assess management practices.
- *Baseline Monitoring*—used to characterize existing conditions. These observations can be used as a benchmark for before and after comparisons of management practices. Baseline monitoring, if done for long periods, is similar to trend monitoring. Baseline monitoring can also be synonymous with the terms "inventory monitoring" and "assessment monitoring".
- *Implementation Monitoring*—assesses whether management practices/activities were carried out as planned (e.g., was access constructed as specified in the guidelines/rules). Implementation monitoring is often used to determine if Best Management Practices were used as specified in an environmental assessment or environmental impact assessment.
- *Effectiveness Monitoring*—evaluates individual management practices to determine if they were effective (e.g., were erosion control measures such as a road-stream crossings effective in preventing sediment discharge into stream waters, was access planning effective in reducing the industrial footprint in a critical wildlife zone?).
- *Project Monitoring*—evaluates the effectiveness of a given set of practices (e.g., access planning, forest harvesting, oil and gas infrastructure development) over a given area.
- *Compliance Monitoring*—focuses on specific requirements imposed by governments (e. g., water quality standards, buffer widths, access location with respect to sensitive wildlife habitat). Measures of this type will vary with different jurisdictions.

These different kinds of monitoring are not mutually exclusive. Overlap in definition and application can be expected to occur as a result of the objectives and goals for a monitoring program. Monitoring for access planning and management will, in most cases, focus on effectiveness, project and, in some cases, compliance monitoring.

Designing a Monitoring Program

Designing a monitoring program for access management should include a program for assessing the effectiveness of measures and practices to achieve or exceed objectives and goals for industrial disturbance on the landscape. A second program also should be considered for assessing the effectiveness of mitigation procedures (e.g., road removal/reclamation and traffic control/ management). Maintaining the access layer in an up-to-date state is a key step in the development of a monitoring system. Initial steps in the design of a monitoring program will include defining:

- Objectives (general and specific)
- Parameters to be monitored
    - Frequency of observations
    - Duration of monitoring

Objectives for access planning and management will usually concentrate on the reduction of industrial disturbance on the landscape and minimizing its effects on sensitive terrestrial and aquatic species and their habitats, and other user groups (public, recreationists). The scope of monitoring may vary from a few parameters (narrow) to many parameters (wide) depending on the size of the area to be managed, the wildlife species present, the level of resource management, and public activity.

Specific objectives or outcomes should be defined in quantitative terms. This will allow for easier interpretation and reporting of results. Decide early what can or cannot be done related to personnel and budget constraints, and review existing available data for the area. Based on this information, define specific objectives and the parameters to be measured and methods for analysis (e.g., statistical testing, GIS modeling). A statistician should be consulted to ensure that collected data can be evaluated statistically.

The number of parameters for evaluating spatial disturbances (i.e., roads, trails, pipelines, seismic lines) and terrestrial wildlife may be fewer than those required where aquatic resources and water are a major concern. Spatial disturbances will usually be expressed in terms of road density, road zone effects, and avoidance distances by terrestrial species (i.e., habitat loss). Evaluating access disturbance to streams and rivers can be more involved, with numerous stream crossings, monitoring of water flows and multiple water quality parameters and aquatic habitats.

Objectives for the BSRAD Plan were to minimize the industrial footprint on the landscape. Parameters for monitoring were a road effect buffer 250 m wide on both sides of roads expressed as total hectares (The BSRAD Plan also showed actual hectares by disturbance without a buffer), and an open route density of 0.6 km/km^2 in core grizzly bear areas, and 1.2 km/km^2 in secondary areas as well as tracking percent of density change. Evaluation was based on an up to date access database (primary and secondary roads, trails, pipelines, oil and gas infrastructure). Tracking and reporting for the BSRAD Plan was to establish a base date of as built and then track reclaimed, new construction and compare to the base case. Monitoring was ongoing with annual evaluation/adjustments.

For future operational scale regional access development plans, use actual hectares of disturbance (i.e., footprint) as the target measure as opposed to the buffered footprint.

The frequency and duration of monitoring will vary with the extent and scope of an access plan. The duration for monitoring will usually coincide with the expected lifetime of a given access plan and the sources of disturbance (e.g., permanent access, temporary access, time required for recovery). Time scales for the frequency of monitoring and evaluation/adjustments can be annual, seasonal, or at a more intense level, depending upon parameters selected for monitoring. Objectives to reduce the industrial footprint will often be set on an annual basis, supported by updating the access database for an area (e.g., extent of road buffers, road densities). Monitoring the success of mitigation practices may range from seasonal to annual (re-contouring/re-vegetation practices, wildlife responses to access disturbance). Monitoring of aquatic ecosystems may vary from daily, seasonal, to annual (e.g., water quality and flow responses to storm events, and population surveys).

Once objectives, monitoring parameters and methods for analyses are defined, conduct a re-assessment to determine if collected data and initial budget estimates will meet monitoring objectives, before implementing the program. The first monitoring cycle should be considered as a pilot program to ensure that it works as planned. Loops in the planning process allow for adjustments to the monitoring procedures and objectives. Figure 7outlines the structure for developing a monitoring program.

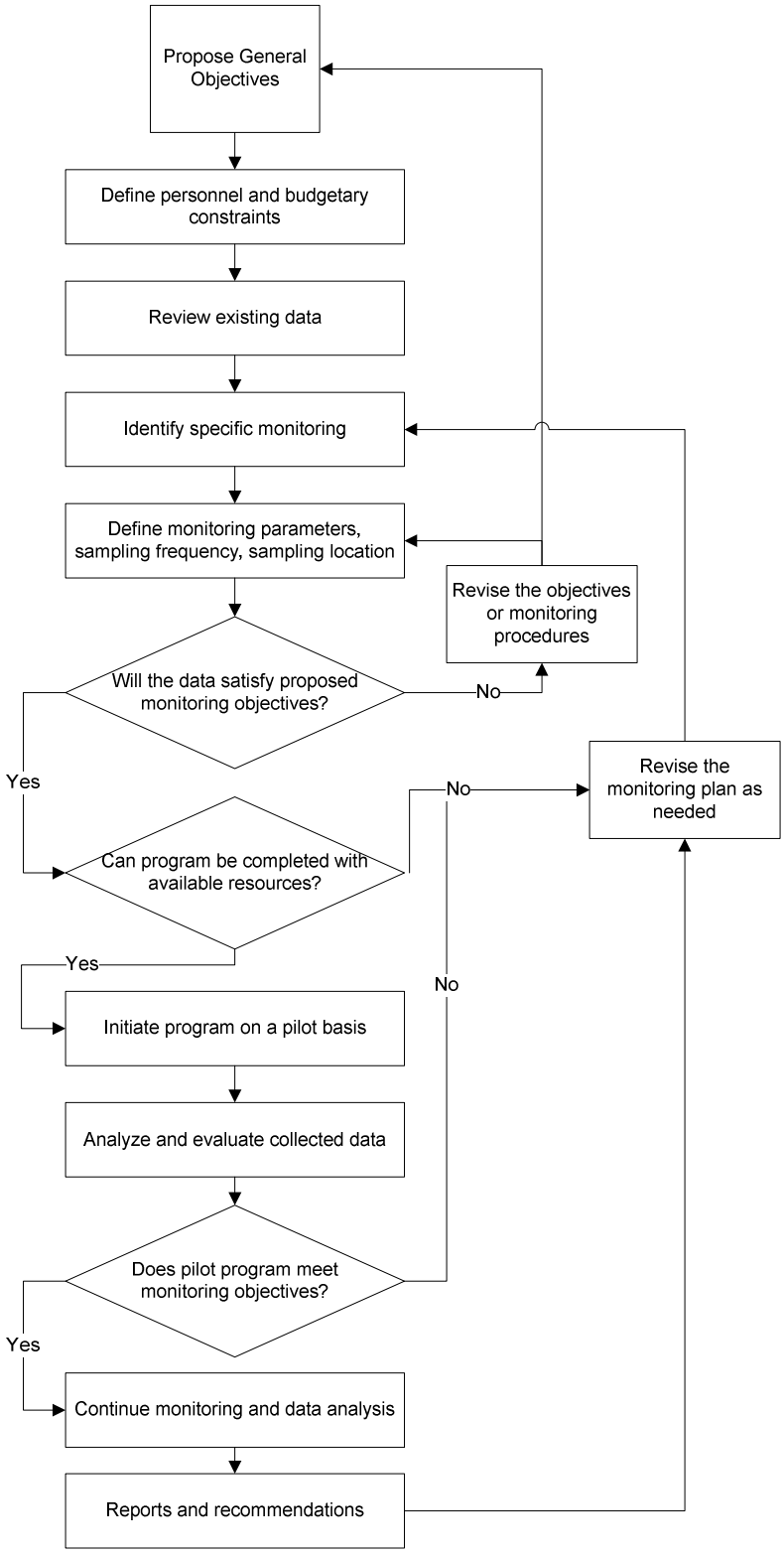

Figure 7 Development of a monitoring program (MacDonald *et al* 1991)

BSRAD Plan Successes, Lessons Learned, & Resource Management Strategies

Successes

Successes of the BSRAD Plan to date include:

- Definition of a "primary access corridor network", consisting of all-weather roads (85% pre-existing);;
- Approval of the IIAP, the first ILM plan in Alberta to include annual reporting and monitoring;
- Data sharing of sensitive information by members to produce the plan;
- Compilation of a database of all known resource data and formatting for GIS applications;
- Commitment from industry to maintain and update the access data layers; and
- The FLMF and GOA agreed to a process to implement ILM (Terms of Reference for the BSRAD).

Enhanced Approval Process (EAP)

To support future access development plans in the EAP, the following changes to the Integrated Standards and Guidelines are recommended.

The phrase "unless such access is specified in a higher level (e.g., ILM) plan" should be added to the following EAP approval standards:

- 100.1.1 For access, ensure parallel roads closer than 250 metres are not created
- 100.9.2.2 …checking re: "exception language"
- 100.9.2.3 …checking "dead end" language
- 100.9.3.2 …checking "dead end" language
- 100.9.3.4 …amend for exception
- Gates…

Unique features of the BSRAD Plan, not found in earlier access management plans, include:

- ASRD assumed a lead role
- FLMF and ASRD co-managed the process
- Secondary roads were included into the plan
- Mitigation measures included tools available to both government and industry and are to be employed together to best meet desired outcomes.
- Assessment and tracking over time using pre-set targets for open route and anthropogenic footprint to measure success.
- All of the key components of an access management plan on a large landscape were incorporated (i.e., integrated system that includes clear goals and objectives, planning, communication, physical measures, enforcement, performance measurement, monitoring and review)

Sustained commitments from industry and government

Industry commitments:

1. Maintain an up-to-date inventory of lineal disturbances at the FRI data warehouse and openly share the "as built" GIS layer with ASRD and FLMF members.
2. Contribute to and support FLMF annual reporting of targets (e.g., open route density, anthropogenic footprint density), to government and public audiences.
3. Commence the restoration of redundant roads within a year after construction of a new access road that created the redundancy, provided both roads are owned by the same company.
4. Work together and encourage new industry partner participation in the Berland Smoky planning effort.
5. Develop and support industry and government communications and education outreach strategies through FRI that support approval and implementation of the BSRAD Plan. The strategies may include: briefing sessions with ASRD and industry staff at all levels from planning, approvals, and construction through to reclamation.
6. Apply lessons learned from the BSRAD planning process to the broad objective of expanding ILM tools, processes and plan and access management planning in other areas of the province.
7. Work with FLMF partners and government to develop a Berland-Smoky landscape level lineal disturbance restoration plan as outlined in the recommendations of the BSRAD Plan.
8. Explore and support the development of Terms of Reference and implementation plan for the "Foothills Land Stewardship Project".
9. Adhere to the BSRAD Plan, where appropriate, and engage in the BSRAD Plan amendment process where circumstances warrant a re-visit of the primary and secondary road access corridors.
10. Participate in periodic review of the BSRAD Plan (i.e., first one within 2 years of approval).

Government commitments:

1. EAP documents will be updated to include the primary and secondary corridor routes identified in the BSRAD Plan, so that any road applications relevant to these access routes are confirmed as EAP "standard applications".
2. All industrial operators that have Licenses of Occupation for roads in the BSRAD Plan area will adhere to the BSRAD Plan, whether they are members of the FLMF or not.
3. A non-industrial use of access will be managed for outcomes through policy and regulatory instruments, land-user education and government enforcement (e.g., FLUZ, regulations) with less emphasis on physical barriers (e.g., gates).
4. Continuous improvement and adaptive management principles will continue to be applied to ILM in the province.

Joint government and industry commitments:

1. Produce a "how to/learnings" manual that can be used by others contemplating planning of this nature.
2. Joint development of a sustainable funding mechanism in a defined timeframe to deal with landscape level restoration and enforcement.
3. Consultation and education.
4. Continuous improvement.
5. Adaptive management.

See Appendix 1 for a copy of the BSRAD Plan.

Lessons Learned and Recommended Management Strategies

The BSRAD Plan process was in itself a learning process for both industry and government on access management. Over the past 6 years leading up to the submission of the BSRAD Plan, there have been many discussions and committees working on the development of management strategies for access (footprint), vegetation, wildlife populations, and human use. The following summarizes the lessons learned and possible management strategies that are supported by the BSRAD planning exercise.

- The forest sector follows a spatially and temporally integrated planning process based on large planning units. The energy sector follows a "plan-as-you-go" planning process with much shorter timelines based on smaller planning units. Inadequate planning integration at multiple levels creates inefficiencies and fails to address cumulative effects, which increases risk, uncertainty, and cost for both industry and government.
- Impact mitigation is primarily applied through a complex basket of regulations, policies, ground rules, disposition conditions, and industry practices. Arguably, the mitigation basket is inadequate because cumulative effects on some resource values (e.g., species at risk) have not been mitigated successfully in accordance with Government of Alberta policy. This approach also places industry in the position of trying to manage in areas where industry has an impact but no control (i.e., no responsibility or authority), such as public access (human use) and species at risk recovery. With the lessons learned in the BSRAD Plan process, industry and government can now use the BSRAD Plan and its ongoing commitments to:
    a. Partner on the development of landscape goals and objectives; and
    b. Bring their collective "management tools" together to better meet outcomes.
- To date, planning within industries occurs at a company level, with little or no coordination or integration of timing or activities to deal with landscape level issues. Confidentiality issues have restricted integration between oil and gas activities, which would support landscape level outcomes such as caribou habitat requirements. Coordination among industries has largely been limited to coordinated access at a primary road scale. Secondary road planning and pipeline plans have not been adequately developed to incorporate more advanced corridor planning. Tertiary and spur roads may be integrated through the timing of timber harvest and oil well-site development. Although much of the coordination of industrial activities, both temporal and spatial location, has been the responsibility of government, there exists no multi-scale plan framework, goals or objectives on which to base consistent decisions. Thus, decision making remains reduced to operational activities and is often ad hoc and inconsistent across landscapes.
- Multi-scale landscape planning will require a comprehensive implementation framework supported by a comprehensive educational program for government and industry. It will also require improved communication, independent management of all relevant data, and coordinated research.
- Perhaps the most important improvement the BSRAD Plan brings to the business model is to combine the areas of responsibilities of industry and government into one access management plan that provides input into other strategic planning initiatives. The BSRAD Plan is a step in that direction, whereby it outlines the opportunity to combine industrial ILM planning (footprint management) with government tools to address human use and wildlife management and its potential impact resulting from the access development (see Table 7).

The BSRAD Plan is a first ever attempt to forecast an integrated access development plan at this scale with a commitment for adaptive management, continuous improvement and annual monitoring to targets. Ultimately, the BSRAD Plan will also provide a unique opportunity to assess cumulative effects jointly.

Table 7 Roles and Responsibilities

Activity	Responsibility	How	Comments
Land Use	Government	Legislation, regulation, issuance of dispositions	Industry compliance
Management of Wildlife	Government	Population management, regulations, guidelines	Industry compliance
Management of Human Use	Government	Set Forest Land Use Zones, regulations, restrictions, enforcement	Industry compliance
Management of Anthropogenic Footprint	FLMF/Industry	Voluntary ILM, Collaboration • Annual provision of "as built" data to FLMF • FLMF maintain up-to-date inventory of lineal disturbances (provided to industry and government) • FLMF annual reporting of targets (e.g., open route density, anthropogenic lineal density) to government • Industry/FLMF amendments as required to the BSRAD plan (see amendment section) • Industry/FLMF restoration plans at individual and landscape level	Government support and use
Management of Vegetation	Industry/FLMF	Timing of activities, silvicultural practices, forest management planning, restoration • Use of lineal inventory in planning • Development of natural/artificial vegetation trajectories • FLMF development of a landscape level restoration plan	Government support and use

Foothills Land Stewardship Project

Optimal development of natural resources is directly linked to integration of various resource-specific management policies, legislation, regulations, practices and guidelines. The Foothills Land Stewardship Project (FLSP) proposes a collaborative management model to proactively address responsible resource development and the effective management of environmental values such as water and species at risk. This project draws from and builds on previous ILM work done for the FLMF IIAP (2005), Berland Smoky Access Plan (2008) and the BSRAD Plan (2011). The significant advancements the FLMF has accomplished in Alberta ILM are gaining provincial recognition by government, and the FLSP is taking accomplishments to the next step.

Figure 8 provides a simple overview of the ILM advancement steps.

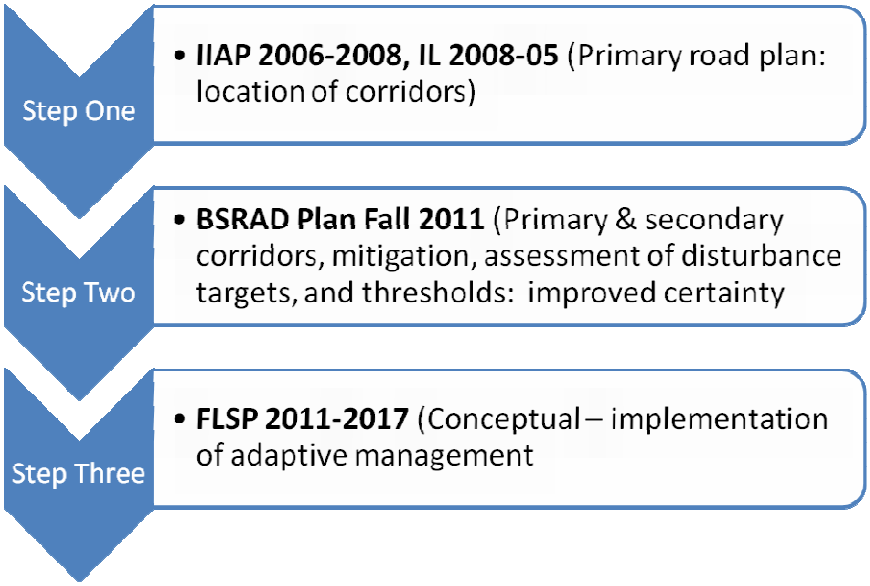

Figure 8 LMF ILM advancements in a stepped approach

The basic elements of the conceptual design of the FSLP are: a footprint plan, ecosystem plan (vegetation), wildlife population and a human use plan.

Footprint Plan

The overall approach is to minimize footprint by cooperative development planning, adopting a life cycle approach with timely and progressive deactivation and restoration, and managing human use to mitigate human use impacts.

- Complete Regional Access Plans, including life cycle plan (deactivation and reclamation) for the entire land base.
  - Priority order: core caribou and grizzly bear, secondary caribou and grizzly bear, remainder
  - Cooperative planning to ensure efficiency at minimal cost
  - Conservation savings:
    - Reduce new roads in un-accessed areas 30+ % compared to status quo
    - Reduce impact of existing footprint by deactivating when not in active use
    - Reduce impact of surplus footprint by identifying and reclaiming on a priority basis.
  - Cost savings:
    - Reduce new roads in un-accessed areas 30+ % compared to status quo.
    - Approval in advance of corridor and road standard creates certainty and sets up rapid approval at disposition stage. Reduced backend costs more than compensate for new upfront costs
    - Life cycle determined at corridor planning stage
    - Reduce costs to construct corridor – build what is needed
- Adopt the Life Cycle Approach for all surface footprint
  - Plan, construct, maintain, deactivate, reclaim

    - Identify the footprint life cycle as part of the plan, and implement life cycle events according to the plan or agreed practices (e.g., deactivate when a road will not be used for a set period of time, reclaim within a specified time after road use is completed)
    - Timely deactivation and reclamation. Identify footprint that is not needed on a temporary or permanent basis and deactivate or reclaim as appropriate
- When footprint is to be constructed, adopt a best practices approach to minimize footprint (e.g., common corridors, minimize corridor width, multi-well pads)
    - Negotiate practices as part of agreement
    - Reallocate costs saved from halting low value practices to fund project
- Fund, implement, monitor, and report

Ecosystem Plan (Vegetation)

The overall approach is to maintain most forest lands within the Natural Range of Variation (NRV) by managing human disturbance (e.g., harvest, prescribed fire) and related reforestation, reclamation, or natural restoration. These forest lands will also be maintained by responding to natural disturbance (e.g., forest fire, Mountain Pine Beetle) at rates and locations that result in forest patterns (e.g., age class, patch size/shape, geographic distribution) similar to what would be present under the appropriate NRV regime. Adjustments to the NRV approach will be necessary in some areas:

- Manage forest toward the upper end of NRV in caribou range.
- Schedule forest sector harvest in core intact caribou range – wait until caribou use other areas before intact core harvest is commenced; complete harvest in areas with initial harvest already on a priority basis – promote recovery and reuse by caribou.
- NRV approach not applicable where other land uses have been designated (e.g., facilities, settlements, agriculture).

This approach is already generally being applied through the Forest Management Plan process by FMA holders, and by the Government of Alberta for Forest Management Units not allocated through FMA. The main task is to coordinate and confirm forest sector harvest schedules in caribou ranges.

To complement the overall NRV approach, vegetation management of footprint (see Footprint Plan) is necessary. The objective is to minimize footprint, and implement timely and progressive revegetation to native plant communities. On sites that previously supported forest cover, this means prompt reforestation promoting rapid crown closure as soon as the appropriate stage is reached in the life cycle of the footprint.

Building on the proposal endorsed in the West Central Caribou Landscape Plan (WCCLP)[7], FLMF forest sector members will develop harvest schedules to manage forest age class toward the upper end of NRV in caribou range. Companies will align and coordinate harvest schedules for caribou ranges with multiple forest company tenure. In core portions of caribou ranges (similar to WCCLP, to be negotiated) there will be no harvest until caribou are using other portions of their range. Short-term harvest will be focused in areas best suited for future caribou habitat to commence long-term recovery for reuse by caribou. Where practical, harvest will be geographically concentrated to minimize habitat fragmentation. Adjustments may be needed to address forest health (MPB, fire). Reforestation and vegetation management practices will be designed to complement the overall approach.

[7] The West Central Caribou Landscape Plan was developed by a Landscape Team under the oversight of the Alberta Caribou Committee and includes the 4 populations covered by the FLSP. The WCCLP was submitted to the GOA in June 2008.

Wildlife Population Management Plan

Currently, the Government of Alberta sets wildlife population targets and designs and implements wildlife management. This is especially true for species at risk which are managed through Recovery Plans developed by the province, with input from Alberta stakeholders.

Predation rates on caribou will be reduced mainly by reducing primary prey density through sport and/or Aboriginal hunting, which in turn will support reduced wolf populations. To reduce the "moose factory" and wolf immigration effects, primary prey reduction will be applied to areas encompassing wolf pack territories that overlap caribou ranges. Primary prey population targets are ≤ 100 moose/1,000 km^2 (moose equivalent[8]). Innovation is required to reduce deer populations (e.g., extended seasons and bag limits for deer hunters, Aboriginal commercial harvest). Wolf management will be implemented during the primary prey reduction phase and then if needed on a periodic basis to reach and maintain a wolf population target of ≤ 6 wolves/1,000 km^2. Monitoring hunter harvest and primary prey, predator, and caribou population response is essential.

Caribou

Two Alberta caribou populations overlap the BSRAD Plan land base: A la Peche and Little Smoky. High predation levels (primarily wolves) are the direct cause of caribou population declines. Predator population levels are supported by primary prey (moose, elk, and deer) populations, which in turn are supported by habitat change and climate change. Human-caused mortality is not a large source of caribou mortality except in localized situations such as collisions along Highway 40 south of Muskeg. Local situations will be addressed as they arise. The strategy is to alter predator-prey relationships through ecosystem/footprint mitigation and primary prey control as the main strategy in the short term. Ecosystem/footprint restoration will begin immediately and continue until energy sector development has finished in the long term. Predator (wolf) control will be applied only when necessary to support the primary prey control strategy. Adaptive management will be necessary to monitor outcomes and ensure success. Additional options such as maternity penning and population penning will be evaluated and used if needed. The long-term vision for caribou conservation is restoration of the energy footprint, ecosystems (caribou habitat) recovered and maintained, primary prey control continuing as needed, and predator control likely not needed, or needed only in periodic pulses.

Grizzly bear

The BSRAD Plan land base is important grizzly bear habitat and large portions are designated as core or secondary grizzly bear areas. Population densities in the area are among the highest in Alberta. High levels of human-caused mortality are the direct cause of Alberta grizzly bear population declines. Most grizzly bear mortality occurs during the fall hunting season. The management strategy should be to maintain low levels of human-caused mortality through footprint management and human use management. Ecosystems and populations do not require special management for grizzly bear. The future vision is for the long-term road footprint to be reduced and human activities carrying on in ways that don't elevate human-caused bear mortalities to unacceptable levels. Targets for "open route densities" to reduce the risk of human/bear interaction may be applied and met through legislated means such as: Forest Land Use Zones and enforcement and changing the hunting seasons to when bears are inactive (e.g., late winter). Physical barriers to control human use should be replaced with enforceable legislation (see human use management).

[8] Moose equivalent is based on primary prey body size: 1 moose = 2 elk = 6 deer. Total prey density must be less than the equivalent of 100 moose/1,000 km^2 (e.g. 100 moose equivalent = 20 moose, 20 elk, and 420 deer).

Native fish

Water bodies in the BSRAD Plan land base are important habitat for three species of native fish that are designated as Threatened or Special Concern: Arctic grayling, Athabasca rainbow trout, and bull trout. Threats include competition by non-native fish (brook trout), barriers created by stream crossings that don't meet fish passage standards, angler and poacher access and harvest, and sediment from roads. The management strategy must be to restore fish passage, reduce the overall road footprint, apply best management practices to control sediment, and maintain low levels of human-caused mortality through footprint management and human use management. Ecosystems do not require special management for native fish. Population management may also be required for non-native fish. The future vision is for stream crossings that meet fish passage and sediment standards reduced to the minimum needed and non-native fish and human use at conservation targets. For the BSRAD plan, the FLMF members have partnered with the Foothills Steam Crossing Association to begin inspection of creek crossing followed by a remediation plan.

Human Use Management

Human use of active roads and other access should be through regulation and enforcement, not physical barriers. For example, gates and other physical barriers on active roads will be replaced with Forest Land Use Zones (FLUZ) or other regulatory method, coupled with increased levels of enforcement. Regulations, signs and enforcement cost far less than gates, and will be more effective.

- FLUZ (or equivalent) signs instead of gates.
- Emphasize control of human activity type (e.g., seasonal access, or activities involving guns) in preference over control of any human access.
- More enforcement/monitoring/population management officers.
- Industry funds signs and enforcement officers.
- Industry does signs, government does FLUZ and enforcement.

Note that the proportion of deactivated and reclaimed roads will increase, which will lower the open route density. Barriers on deactivated or reclaimed roads and other corridors (seismic lines, pipelines, and power lines) are still a useful tool in some cases. In some cases voluntary use of gates might be desirable on active roads – company choice.

APPENDIX 1—BSRAD Plan

BSRAD Plan History and Outcomes

In November 2005, the FLMF submitted its first IIAP for consideration by government. The government endorsed the IIAP as a guiding tool on June 23, 2006, which reinforced the need to integrate and coordinate the access requirements of the forestry and oil and gas sectors, and to develop a monitoring and reclamation plan.

The IIAP was later condensed and renamed the Berland Smoky Regional Access Management Plan and submitted to the government for consideration. The main objectives of the Plan are to reduce the future industrial footprint by:

1. Improving the coordination, integration and management of access on the landscape, by all users, from cradle to grave;
2. Identifying opportunities to reduce the future long-term industrial footprint (e.g., reduced right-of-way widths, reduced access duplication, reduced number of access routes and main corridors in the caribou ranges when compared with the current "plan-as-you-go" approach);
3. Providing recommendations for operational policy relating to integrated access management in caribou ranges; and
4. Minimizing the impact of access on caribou and other identified resource values.

The government provided approval of the plan under an Information Letter signed by ASRD and the department of Energy (IL 2008-05). The FLMF believed that advanced and integrated planning by the energy and forestry industries would reduce disturbance and fragmentation (i.e., industrial footprint) compared to the current uncoordinated "plan-as-you-go" approach. Integrated planning would benefit caribou herds, other species and the environment, and reduce road construction, maintenance and reclamation costs.

Information Letter 2008-05 should be updated to reflect the primary and secondary access corridors of the BSRAD plan for other industry users.

Several developments over the past three years have reinforced the approach that industrial development needs to consider more than economic values and more than primary access:

- The Alberta Grizzly Bear Recovery Plan identified the need to manage open route densities in core and secondary areas to reduce the risk of human-caused bear mortality;
- The ILM Program identified operational principles that support engagement of stakeholders in efforts to reduce and better manage the size of the industrial footprint;
- The LUF recognized the need to manage cumulative socio-economic and environmental impacts; and
- The Action Plan for West Central Caribou Recovery called for management and planning of industrial footprint.

As a demonstration of the commitment of all participants to the ILM process, a RAD Plan was initiated by the FLMF in late 2008 to advance ILM to the next level. In 2009, the government agreed to partner with the FLMF to determine how far the process could be implemented. The environmental elements to be tested and verified with industrial footprint targets are the thresholds for both grizzly bear and caribou habitat. This level of ILM has never been tested before in Alberta, and the government indicated that the knowledge gained from this will be applied to other areas of Alberta.

At the inception of this planning process, ASRD determined that it would use and assess the feasibility of the disturbance targets recommended in the "Action Plan Recommendations for West-Central Alberta Caribou Recovery":

- Maintain the open route density targets for grizzly bear management, including within +/-10% of current values;
- Reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values; and
- Show demonstrable progress toward targets within 5 years, and project progress over 20-year intervals.

For purposes of tracking and assessing the targets, the BSRAD plan is broken into two categories: anthropogenic footprint for caribou and open route density for grizzly bear.

FINAL DRAFT

August 22, 2011

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1. PLAN PREPARATION

1.1 Background

In 2006, the Foothills Landscape Management Forum (FLMF), operating under the Foothills Research Institute (FRI), initiated a unique integrated access planning process. The process resulted in the development of an Integration Industrial Access Plan (IIAP) for the Berland Smoky which was approved through Information Letter 2008-05. The IIAP identified primary corridors that would be used by the forestry and energy industry to access resources in the Berland Smoky area.

Soon after the IIAP was approved, the FLMF, with government support, sought to test the ability to advance Integrated Land Management (ILM) planning beyond primary corridors. In June, 2009, a Terms of Reference (Attachment Appendix 1) was established between government and the FLMF that outlined the governance structure, objectives and desired outcomes of the planning process referred to as the Regional Access Development (RAD) Plan for the Berland Smoky. As a new Alberta ILM prototype project, this initiative was led by government and jointly developed by government and industry. There was significant investment and cooperation from the forest and energy industrial sectors operating in the foothills of Alberta.

The outcome of this work was the Berland Smoky RAD Plan, which identified the permanent industrial primary and secondary corridor routing (EAP Class I and II) required by industry. The corridors are expected to support both the energy and forest sectors long term needs in this one million hectare area over the next 30 years.

1.2 Context

The Berland Smoky Regional Access Development Plan was developed primarily to:

- validate original primary access corridors identified in the 2008 approved IIAP,
- rationalize the need and corridor location for secondary roads in the future (those coming off of primary corridors),
- identify whether planned roads are required as permanent or temporary access, and
- align pipeline routing.

As part of the planning process, the planning team was asked to identify, evaluate and make recommendations on:

- integrated access management and mitigation strategies that could be used across a variety of planning processes and time horizons,
- risk assessment models,
- parameters required for computer modelling, simulation and scenario testing,

- data needed to support this planning, along with data security, compilation, maintenance, and storage needs,
- information and communication strategies for government, industry and other audiences,
- opportunities to improve/enhance the current SRD approval system for such plans,
- misalignments, operational conflicts, and barriers to planning,
- monitoring and evaluation processes to assess plan implementation against targets for all new (as built) footprint.

The objectives of the work were to:

1. Use and assess the feasibility of the disturbance targets recommended by SRD:
    - maintain the open route density targets for grizzly bear management including within +/- 10% of current values,
        - reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values, and
        - show demonstrable progress toward targets within 5 years, and project progress over 20 year intervals.
2. Identify the opportunities, challenges, risks and benefits to industry and government of a target-based management approach.
3. Inform and provide input into the LUF processes.

These considerations and objectives formed part of the plan development discussions.

1.3 Direction

Direction for the RAD plan was provided through the project's Terms of Reference June 19, 2009 (attached). The following direction was also provided from SRD:

- temporary/seasonal roads, in block roads, should not be considered for primary and secondary road planning but should be counted for footprint reporting
- use the targets as a test of concept; propose alternatives as required
- Capture the challenge of reclamation in a potential mitigation strategy, but don't hold up the access planning process. Identify mitigation that industry can commit to.
- Road standards should not be prescribed. Industry should be guided by outcomes:
    - Fewer number of roads

- Least intrusive roads possible

2. THE CORRIDOR PLAN

2.1 Corridor Routing

The RAD plan was developed giving consideration to:

- habitat alteration and fragmentation for woodland caribou and grizzly bear
- coordinated/integrated lineal footprint and access routes (roads) located to meet the needs of industrial users in this area
- redundant/unneeded roads
- Sustainable Resource Development's Enhanced Approval Process (EAP)

‣ The RAD Plan corridor routing is a projection of EAP Class I and II access required by industry (to the best of their knowledge in 2011) based on current allocations of gas and oil and forest tenures. The required new and upgraded access is expected to be built over the next 30 years subject to market conditions.

‣

‣ The map (Figure 1) shows the required corridor routing within 250 meters of the centre line. The routes are identified as existing, planned and already approved new construction (as per Information Letter 2008-05), or upgraded and new construction based on RAD planning. Not all of the roads will be built at once. The opportunity for reclamation will increase over time contributing to the achievement of footprint management targets.

2.3 Reclamation

Landscape level restoration will significantly reduce footprint in the Berland Smoky area. Unused and unneeded footprint and redundant and looping access in the area will be identified. Some of this footprint and access is pre-RAD plan. Some redundancy is anticipated to occur with the implementation of the RAD plan.

In recognition of the importance of restoration, the FLMF members commit to the development of a sustainable mechanism to deal with restoration/reclamation.

a) When a company proposes to build a new road in the RAD plan area, and that new road results in the creation of redundant LOCs (within 250m) also owned by the proponent, restoration of the redundant road will be commenced within a year of the construction of the new access road.

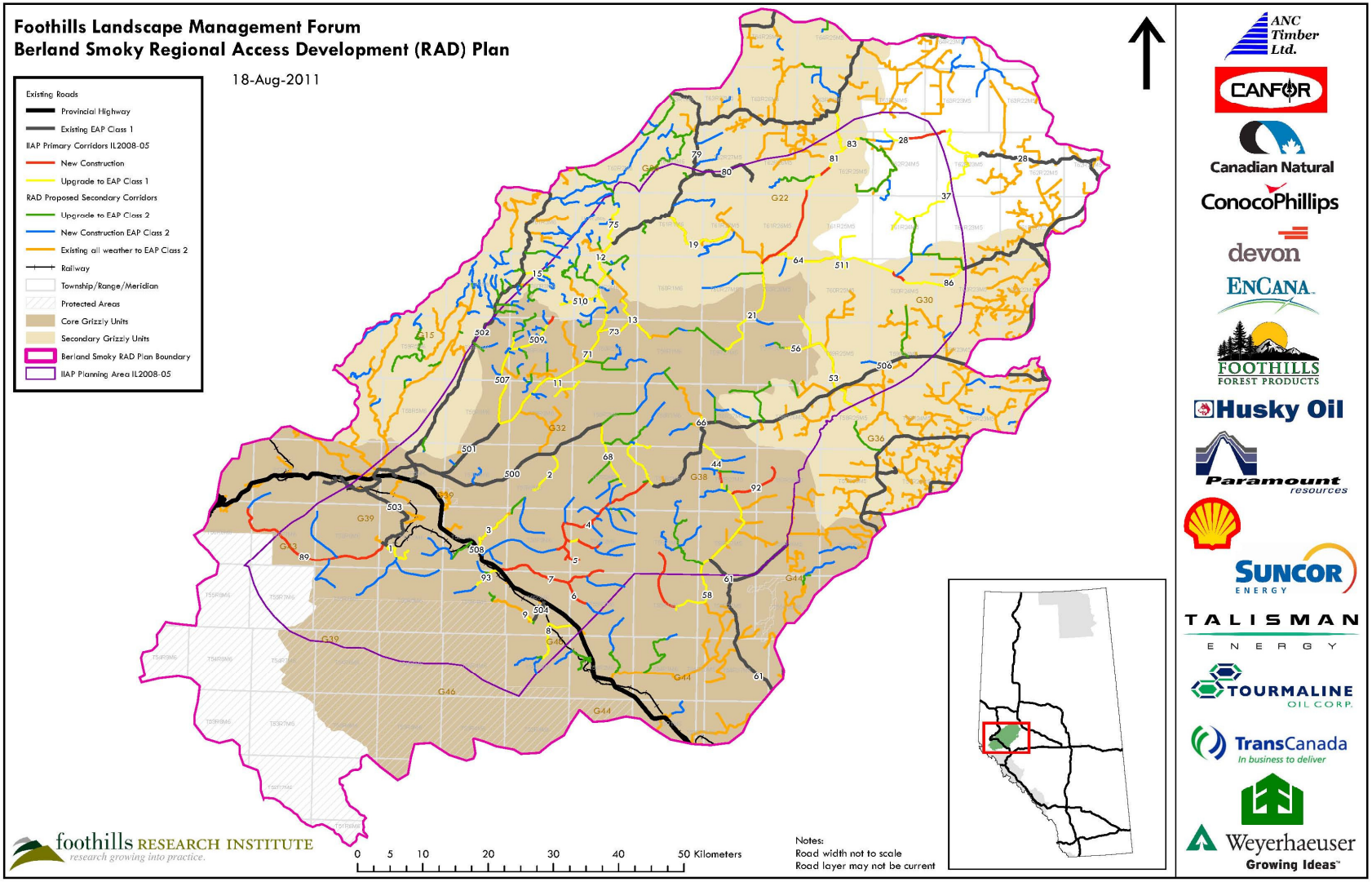
b) When a proponent proposes to build a new RAD road, and that road results in the creation of a redundant road that is NOT owned by the proponent, the proponent will work with the existing owner of the redundant road to factor its restoration into the landscape level restoration plan.

c) A Landscape Level Restoration Plan task team will assess, prioritize, resource and restore historical industrial footprint, and address future redundancies in the RAD Plan area.

Through the FLMF, restoration and deactivation will be tracked, monitored, and reported annually against the following footprint metrics:

- change in open route density
- density expressed in km/km2 for core and secondary grizzly bear watershed units
- change in anthropogenic footprint, buffered and unbuffered by 250m on either side

Figure 1: Berland Smoky Corridor Plan



3. PLAN RESULTS

3.1 Open Route Density Target

In the Terms of Reference, specific land disturbance targets for grizzly bear were identified:

- maintain the open route[9] density targets for grizzly bear management including within ±10% of current values

For the analysis, all EAP Class I-IV roads were included. May, 2010 was determined the baseline from which to measure existing open route density. The baseline open route densities were grouped by habitat type (i.e., core or secondary Grizzly Bear Watershed Unit[10] (GBWU)).

Densities were recalculated in May, 2011 adding the proposed new RAD plan routes (EAP Class I and II roads) and any other variances in the data during the year. Calculations did not include the density reduction effect of existing physical barriers. Studies completed as part of the planning process demonstrated that about 40% of such barriers were ineffective (i.e. gates, creek crossing removed etc.) at controlling human access. Inclusion of effective barriers would result in a reduction of the open route density calculations projected here.

Results are presented in Tables 1 and 2. Assuming all existing routes remain in place, all proposed routes are constructed, and all routes are open (e.g., have no barriers), the target would be exceeded in four of six core GBWUs and four of five secondary GBWU.

Table 1. Comparison of Baseline Open Route Density to Proposed RAD Corridors by Core GBWU

Core GBWU	Open Route Density (km/km2)		% Change	Meets SRD target (yes/no)	Meets Grizzly Bear Recovery Thresholds (0.6 km/km2)
	Baseline	Baseline + New Corridors			
G32	0.29	0.41	+29%	no	yes
G38	0.21	0.41	+95%	no	yes
G39	0.43	0.40	-7%	yes	yes
G43	0.02	0.32	+1500%	no	yes
G44	0.47	0.49	+4%	yes	yes
G46	0.13	0.16	+23%	no	yes

[9] An open route is an access route (ROW, trail or existing road) that is accessible to a motorized vehicle (vehicles with an overall width of 1.65 m (65") or greater) during summer driving conditions.

[10] A Grizzly Bear Watershed Unit is a management unit based on major watersheds subdivided along heights of land and occasionally along watercourses, to approximate the size of an adult female GB home range (~700 km2).

The proposed target provided limited value to route planning since the existing state of access development in each GBWU was not uniform. GBWUs with high existing access had less need for more access, yet had more room within the target for additional access. Conversely, GBWUs with low existing access were the areas where more additional infrastructure was needed to support resource access; yet, the proposed target enabled only limited new development in these areas.

Table 2. Comparison of Baseline Open Route Density to Proposed RAD Corridors by Secondary GBWU

Secondary GBWU	Open Route Density (km/km2)		% Change	Meets SRD target (yes/no)	Meets Grizzly Bear Recovery Thresholds (1.2 km/km2)
	Baseline	Baseline + New Corridors			
G15	0.55	0.66	+20%	no	yes
G20	0.35	0.56	+60%	no	yes
G22	0.33	0.40	+21%	no	yes
G30	0.46	0.52	+13%	no	yes
G36	0.73	0.77	+5%	yes	yes

3.2 Anthropogenic Disturbance Target

In the Terms of Reference, specific land disturbance targets for caribou were identified:

- reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values.

Proposed new construction and/or upgraded access identified in the RAD plan created 52,009 hectares of disturbance when buffered by 250m each side of the disturbance (see Table 3). This represented a 50% increase in the footprint for the plan area. However, the overall anthropogenic buffered footprint actually decreased by 14% when natural recovery of seismic lines greater than 5m was considered. Any new seismic lines were not counted as new anthropogenic footprint since, at less than 3m in width, they were considered low impact. With seismic line recovery alone, the overall proposed disturbance reduction target is close to being met.

The buffering proposed in the anthropogenic disturbance target created challenges:

- The buffered area essentially blanketed the entire landscape, resulting in no net increase in the buffered area affected, regardless of how much new footprint was added.
- The buffered area was subject to double/triple counting requiring complex modelling and analysis.
- The buffered area did not recognize that different intensities of disturbance (i.e., an active road versus an old seismic line; a producing well versus drilling and completion activities)

may have different effects on wildlife.

Table 3. Hectares of buffered corridor footprint, Baseline and Proposed RAD Corridors

EAP Road Class	Description	250m Buffer				
		Baseline (ha)	New roads (ha)	Total (ha)	% Change	Rehabilitated Area (ha)
I	All weather road - Paved	5,135	0	5,135	0.0%	
I	Gravel road – 30-40 meter ROW all weather	22,482	8,151	30,633	+36.3%	
II	Gravel road – 20-30 meter ROW lane, all weather	75,979	47,171	123,150	+62.1%	
Sub-total EAP Class I and II roads		**103,596**	**55,322**	**158,918**	**+53.4%**	
III	All weather or dry 15-20 meter ROW	44,744				
IV	Low grade 15m ROW frozen or dry	7,951				
V	Winter Road	54,393				
n/a	Reclaimed Trail					**1,496**
n/a	Deactivated Road					**3,278**
n/a	Rehabilitated Road					**4,451**
Sub-total Other Roads		**107,088**				
n/a	Unclassified ROW	292				
n/a	Pipeline ROW	154,018				
n/a	Transmission Line ROW	3,624				
n/a	Reclaimed historic ROW					**842**
n/a	Railway ROW	5,690				
Sub-total Other ROW		**163,624**				
n/a	Historic > 5m wide seismic	653,338				
n/a	Rehabilitated > 5m wide seismic lines				**-28%**	[11]**182,934**
Sub-total Historic Seismic lines > 5m wide		**653,338**				
Total		**1,027,646**	**Total Area Considered Rehabilitated**			**193,001**
			A) Baseline/ Existing	**B) Existing + new**	**C) Existing + new - reclaimed**	**C/A=Net change %**
Total net change			**1,027,646**	**1,082,968**	**888,967**	**13.4%**

- The buffering did not address the predator/prey relationship. The RAD plan did not study predator route selection dynamics to understand which type of route would create more predation on caribou or other wildlife. This was outside of the project's scope.

To remove some of the challenges created by buffering all disturbances the RAD plan also reported on actual (un-buffered hectares) as shown in table 4. In future reporting the FLMF will continue to report on both buffered and non-buffered.

Table 4. Hectares of unbuffered corridor footprint, Baseline and Proposed RAD Corridors

[11] Extrapolated from the Little Smoky lineal inventory results Oct 2010: A line was considered "restored" once there was sufficient coniferous vegetation re-established on the line to: 1) prohibit access by ATV's and 2) discourage any deciduous browse species from growing in the understory. Source Kirby Smith Fish and Wildlife, Edson.

EAP Road Class	Description	Baseline (ha)	New Road (ha)	Total (ha)	% Change	Rehabilitated Area (ha)
I	All weather road - Paved	580	0	580	0.0%	
I	Gravel road – 30-40 meter ROW, all weather	1,361	485	1,846	+36%	
II	Gravel road – 20-30 meter ROW lane, all weather	3,051	1,917	4,968	*+62.0%	
Sub-total EAP Class I and II roads		**4,992**	**2,402**	**7,394**	**+48%**	
III	All weather or dry 15-20 meter ROW	1,544				
IV	Low grade 15m ROW frozen or dry	202				
V	Winter Road	1,245				
Sub-total Other Roads		**2,991**				
n/a	Unclassified ROW	292				
n/a	Pipeline ROW	13,447				
n/a	Transmission Line ROW	218				
n/a	Reclaimed historic ROW					**842**
n/a	Railway ROW	228				
Sub-total Other ROW		**14,185**				
n/a	Historic > 5m wide seismic	29,515				
n/a	Rehabilitated > 5m wide seismic lines				**-28%	[12]**8264**
Sub-total Historic Seismic lines > 5m wide		**29,515**				
Total		**51,683**	**2,261**	**54,483**		
			Total Area Considered Rehabilitated			**9,106**
			A) Baseline existing	**B) Existing + new**	**C) B - reclaimed = Net**	**C/A =Net change %**
Total net change			**51,683**	**54,085**	**44,979**	**13%*****-

* Shows that in EAP road classes I &II there is a net increase in roads by 45%
**28% reclaimed (extrapolated from the Little Smoky lineal inventory)
*** 13 % reduction in footprint if you applied the results of the inventory above

[12] Extrapolated from the Little Smoky lineal inventory results Oct 2010: A line was considered "restored" once there was sufficient coniferous vegetation re-established on the line to: 1) prohibit access by ATV's and 2) discourage any deciduous browse species from growing in the understory. Source Kirby Smith Fish and Wildlife, Edson.

4. RAD PLAN IMPLEMENTATION

4.1 Approval

Approval of the Berland Smoky RAD Plan means that all industry operating in the plan area are subject to the RAD Plan.

When considering application through the Enhanced Approval Process (EAP), this RAD plan is a "higher order (ILM) plan" as referred to in the EAP Integrated Standards and Guidelines. SRD approval of the RAD Plan allows for the following:

- The 20 metre right of way (ROW) of a Class III road is not restricted to 20% of the length of the road. The ROW for Class III roads can be built in the RAD area as required to address safety and engineering standards, but will be the minimum required to support operations, and shall not exceed the 20m ROW.
- Loop roads can be created by the completion of Class I and II roads. (Reference: Approval Standards, EAP 100.9.2.3; 100.9.3.2. – May 30, 2011)
- Parallel roads within 250 meters can be created by the Class I and II roads. (Reference: Approval Standards, EAP 100.1.1.b. – May 30, 2011)
- Arterial roads as referenced in Approval Standard 100.9.2.1.d. are considered Class I, II and III all-weather roads.
- Industrial activity referenced in Approval Standard 100.9.2.1 includes site and road building preparation and construction.

4.2 Communications

Industrial access route planning at an operational scale, as demonstrated through the RAD Plan, has been recognized by industry and government as a significant contribution to integrated land management. In support of future RAD planning, partner companies will work with SRD to develop and implement a communications and education outreach strategy aimed at industry and government.

4.3 Periodic Review

The corridor routes identified in the RAD Plan will meet the needs of industry for the resources allocated at the time of the plan's development. As new resources are allocated, or technologies for resource extraction change, the RAD plan will need to be responsive to changing times and land-user needs. As such, the plan will undergo a joint review every two years from the time of approval.

The review should:

- Re-validate the need for any un-built access routes,
- Identify access routes suitability for retrieval of energy resources given new energy sources (e.g., shale gas) or new technologies,
- Identify changes to environmental or social values as result of land use planning efforts, monitoring and reporting results, new research, and additional area land users.

4.4 RAD Plan Amendment

Primary Road Corridor Amendments

When any company determines that a primary corridor (EAP Class I) is required that is not identified in the RAD plan, the following procedures should be followed:

- The company's representative should convene a technical meeting to examine alternatives to meet their access needs from an ILM perspective. If the company pursuing the amendment is not an FLMF member, they should contact the FLMF coordinator to start the process.
- If alternative routes are available, the FLMF will conduct a ranking process with the company proposing the plan amendment and seek input from other RAD plan member companies to determine if any issues or conflicts exist. The purpose of this review and ranking is to maintain the integrity of the RAD plan and its objectives of meeting ILM goals and reducing impacts on other values. Once this review is complete, a letter will be offered to the company from the FLMF outlining the findings and assessment of meeting objectives.
- This letter should be provided by the company representative to the Executive Director, Land Management Branch, SRD, Edmonton, along with a request to update the RAD Plan.
- If the amendment is accepted by SRD, the RAD Plan will be updated and approval documents prepared by SRD in time for the next scheduled EAP update (which occurs in March and October).
- The regular application process through the EAP would then be required.

Secondary Road Corridor Amendments

Amendments to secondary corridors in the plan should be only required if the ROW clearing of a Class III is insufficient to adequately construct the road (i.e. terrain, safety, etc). If the business need dictates that a higher standard of access is required (i.e., upgrading from an EAP Class III to an EAP Class II) then the following process will apply:

- The company representative proposing the change should contact FLMF and advise them of the need for an amendment.
- The FLMF will coordinate dialogue, assessment and a timely meeting with FLMF

partners accordingly.

- The FLMF will conduct a brief review to determine if the new route is in the proximity of a "planned secondary corridor" to see if the new route can replace the planned one.
- If so, a letter will be written from the FLMF recommending approval of the revision. This will not require any formal review or ranking on behalf of the FLMF as outlined in the primary corridor amendment.
- If the amendment is accepted by SRD, the RAD Plan will be updated and approval documents prepared by SRD in time for the next scheduled EAP update (which occurs in March and October).

ATTACHMENT 1: RAD PLAN TERMS OF REFERENCE

TERMS OF REFERENCE
REGIONAL ACCESS DEVELOPMENT PLAN
BERLAND-SMOKY AREA

Approved: (June 19, 2009)

PURPOSE

This Terms of Reference (ToR) details project deliverables, scope, objectives, governance and general timeframes for completion of a Regional Access Development (RAD) Plan for the Berland-Smoky area. Background context for this work is found in Appendix 1.

DELIVERABLES

The primary deliverable of this project is the development of a RAD Plan. The plan will:

- validate the original primary access corridors identified in the 2008 approved IIAP,
- rationalize the need for secondary roads in the future (those coming off of primary corridors),
- identify whether the planned roads are required as permanent or temporary access,
- align pipeline routing.

The plan will not consider seasonal roads, those in use for less than 2 years, or in-block roads and access to well-heads.

As part of the planning process, the project will identify, evaluate and make recommendations on:

- integrated access management and mitigation strategies (e.g., gates, restoration) that can be used across a variety of planning processes and time horizons (i.e., DFMP, AOA, individual dispositions, etc.),
- risk assessment models,
- parameters required for computer modelling, simulation and scenario testing,
- data needed to support this planning, along with data security, compilation, maintenance, and storage needs,
- information and communication strategies for government, industry and other audiences,

- opportunities to improve/enhance the current SRD approval system for such plans,
- misalignments, operational conflicts (such as FMA vs IL 2003-23 road standards), and barriers to planning (e.g., other departments),
- monitoring and evaluation processes to assess plan implementation against targets for all new (as built) footprint.

For all of the above, the opportunities and challenges of the approaches selected will be documented to capture key learnings for future RAD planning efforts.

SCOPE

Footprint Definition

The reference anthropogenic footprint is c2009 (e.g. roads, pipelines, transmission lines, recreation corridors, seismic lines >5m) and human development (e.g. well sites, cutblocks).

Planning Area

The planning area (Appendix 2) includes the Berland-Smoky IIAP area and extends beyond that to include entire adjacent grizzly bear watershed units[13]. It also includes the Little Smoky and A La Peche Caribou Ranges.

Givens

The following will further direct this work:

- Resource development will continue to occur in the area.
- The Berland-Smoky Integrated Industrial Access Plan will guide industrial access to the area approved through IL2008-05.
- Resource tenure is not within the project scope.
- Most current data available will be used. Data collection is not within the scope of this project and completion of the work will not be delayed from expectations for imminent new information. However, new information will be addressed as it becomes available and plan reviews occur.
- The RAD Plan may require amendment to conform to the Upper Peace and Upper Athabasca Regional Plans.

[13] **Grizzly Bear Watershed Unit (GBWU)**: a management unit based on major watersheds subdivided along heights of land and occasionally along watercourses, the size of an adult female GB home range (~700 km^2).

- The RAD Plan, once approved, does not grant access to the area; current review and approval processes will be used.
- Integrated land management principles will be applied.
- The full scope of adaptive management (i.e., plan-do-check-adjust) is expected.

OBJECTIVES

The specific objectives of this work are to:

2. Use and assess the feasibility of the disturbance targets recommended by SRD in its "Action Plan Recommendations for West-Central Alberta Caribou Recovery" (March 2009). That is:
    - maintain the open route density targets for grizzly bear management including within +/-10% of current values, and
        - reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values, and
        - show demonstrable progress toward targets within 5 years, and project progress over 20 year intervals.

2. Identify the opportunities, challenges, risks and benefits to industry and government of a target-based management approach.
3. Inform and provide input into the LUF processes.

GOVERNANCE

The following structures are established to manage this project.

- *Department Project Steering Committee*, consisting of:
    - Glenn Selland, Executive Director, Lands Branch
    - Ron Bjorge, Executive Director, Wildlife Branch
    - Robert Stokes, Acting Executive Director, Forest Management Branch

    This committee is accountable for:
    - approving the overall project work plan
    - approving products/tools to be used for the RAD Plan development

- liaising with Area Managers for staff resources and local operational expertise
- resolving issues brought forward by the project co-managers
- reviewing and recommending the RAD Plan to SRD's Executive Committee.

- *Project Co-managers* have been identified as:
  - Aniko Parnell, ILM Program Director
  - Wayne Thorp, Foothills Landscape Management Forum

  They are accountable for the project deliverables, and specifically for:
  - providing management oversight for all project elements;
  - creating a feasible and efficient work plan and keeping it current;
  - creating task-groups and assigning tasks, approving work schedules, and monitoring progress of assignments;
  - chairing the Project Management Team,
  - identifying and resolving operational issues;
  - assessing outcomes against the work plan and deliverables;
  - ensuring productive and meaningful dialogue and liaison occurs with appropriate industry groups and associations;
  - referring strategic issues with proposed resolution to the Project Steering Committee;
  - allocating shared resources as agreed by government and industry (FLMF); and
  - monthly status reporting to the department and others as required.

- Area Advisors
  - Brent Schleppe – Area Manager, Foothills
  - Stuart Taylor – Lands Manager, Foothills

  The Area Manager will designate an advisor to participate on the "Project Management Team", provide management oversight to the advisors, and rule on strategic direction necessary to guide area representatives.

The Area Advisors will coordinate the selection of program (Wildlife, Lands, Forests) specialists from the Department's three administrative areas to represent the Department's interests during RAD Plan development. Area advisors shall ensure timely and pertinent information is delivered to and received from the three Areas covered by this project.

- Task Groups

Task groups may be created by project co-managers for deliverables identified in this ToR. The project co-managers may lead some task groups. Membership to task groups will be by invitation of the project co-managers, and may include representatives from industry, other sectors, SRD, or other government departments as deemed appropriate.

The task groups will prepare detailed work schedules, and identify resource needs and timelines to complete their task within the general timeframes established by this ToR. Project co-managers will approve work schedules prior to work commencing.

Task group leads are responsible for identifying and promptly resolving operational issues. Task group leads shall keep the project co-managers apprised of all impediments to progress.

Task group leads will be part of the "Project Management Team."

- Project Management Team

The project management team chaired by the project co-managers, will meet regularly to discuss progress, timelines, issues and opportunities related to task completion, and address them as appropriate.

The governance structure described above is illustrated in Appendix 3.

TIMEFRAMES

Key timeframes for the project are outlined below. More details will be developed by project task groups.

Phase 1: Project Preparation (April – June 2009)

Project terms of reference will be completed, the governance structure determined, resource needs identified, and resources deployed.

Phase 2: Regional Access Development (RAD) Plan and Tool Development (June 2009 – June 2010)

Key partners in the planning exercise will be identified and invited to participate in this work.
On-going communication avenues will be identified.
Industry will identify their access requirements and needs.

Existing tools (databases, computer models, risk assessment frameworks, mitigation measures, etc) will be identified, evaluated and enhanced/modified jointly by industry and government to support this project.

A RAD plan and process recommendations (as defined above) will be developed and completed jointly by industry and government using an iterative process (Appendix 4).

Phase 3: Plan Approval (July 2010 – September 2010)

The plan will be submitted for approval.

Learnings that emerged throughout this process will be documented, and a manual for Regional Access Development planning will be produced by the project co-managers.

Phase 4: Plan Implementation/Evaluation (2010+)

The plan will be used as the template for future access development.

A monitoring, evaluation and reporting system will be put into place.

The plan will be reviewed and modified as required upon approval of the regional plans designated for this area.

APPENDIX 1: BACKGROUND CONTEXT

The Berland-Smoky area is recognized as a busy landscape with multiple economic (timber, energy, minerals), social (aesthetic, recreational) and environmental (grizzly bear, caribou, water) values. To address the demand for primary access into the area to access economic opportunities, the Berland Smoky Integrated Industrial Access Plan (IIAP) was developed between 2006 and 2007. Plan development involved timber and energy companies active in the area, the Foothills Research Institute, and advice and local expertise from Alberta Government staff from SRD and Energy.

An outcome of the plan was agreement around the primary corridors that would be developed consistent with continuing economic activity in the area. The plan was endorsed by SRD and Energy in July 2008 through an Information Letter (IL 2008-05). The Information Letter outlines procedures and expectations for primary access development and management, and directs that all future access into the area use the primary access corridors. If primary access not previously identified in the plan were to be required, then companies active in the area would have to reconvene to renegotiate their access into the region.

Several developments in 2007 and 2008 reinforce the approach that *footprint development* needs to consider more than economic values, and more than primary access (roads).

- The Alberta Grizzly Bear Recovery Plan (October 2007) identified the need to manage open route densities in core and secondary areas to reduce risk of human caused bear mortality.
- The ILM Program (December 2007) identified operational principles that support engagement of stakeholders in efforts to reduce and better manage footprint.
- The Land-use Framework (December 2008) recognized the need to manage cumulative socio-economic and environment effects.
- The Action Plan for West Central Caribou Recovery (May[14] 2009) calls for management and planning of the industrial footprint.

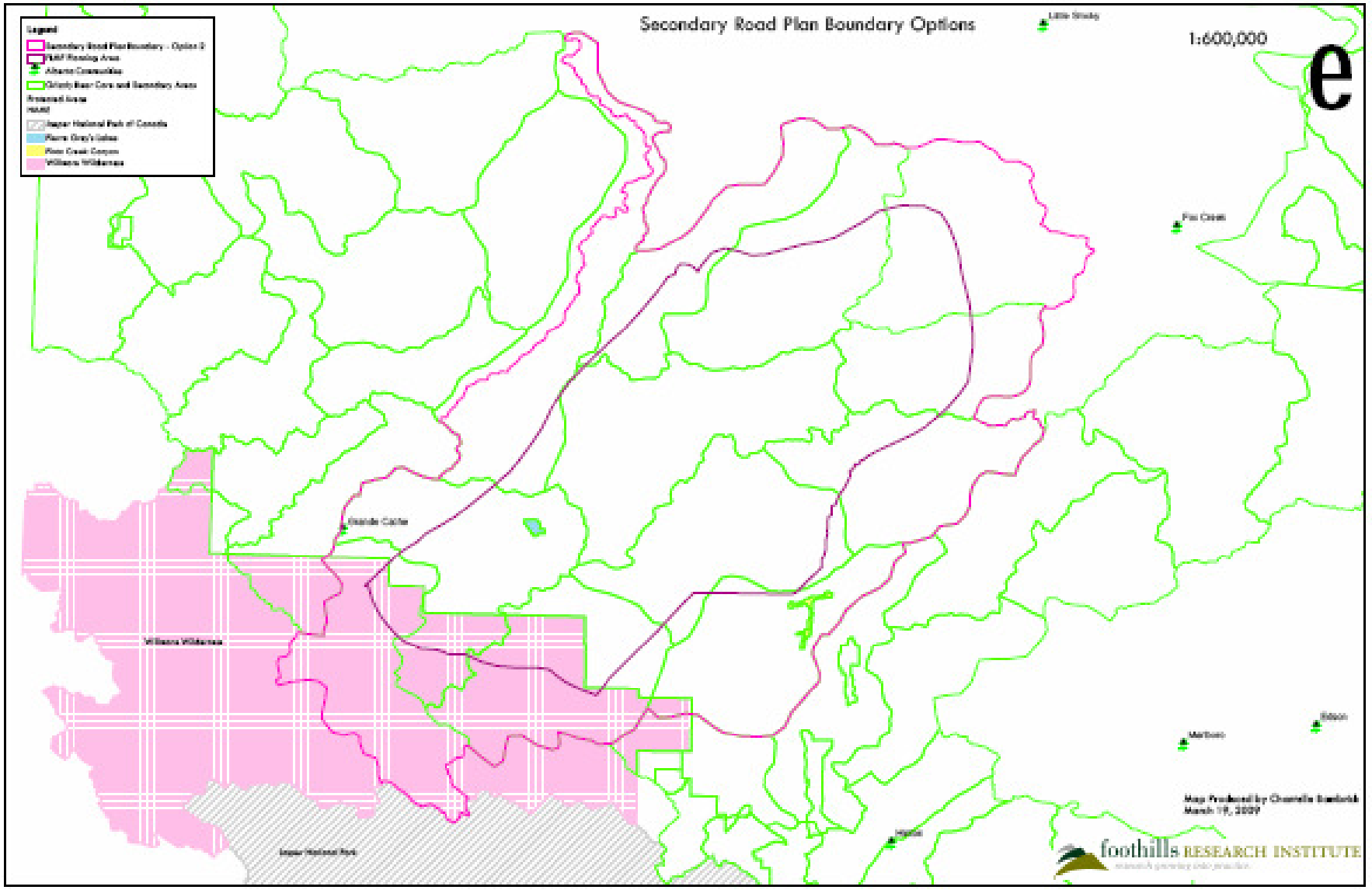
In addition, existing government legislation, policy, guidelines, directives and other plans also provide context for resource management and development, such as:

- *Public Lands Act* (surface access to public land; land disposition approval process)
- Federal *Fisheries Act, Navigable Waters Act*
- *Water Act* and Codes of Practice (road and pipeline watercourse crossings)
- Detailed Forest Management Plans

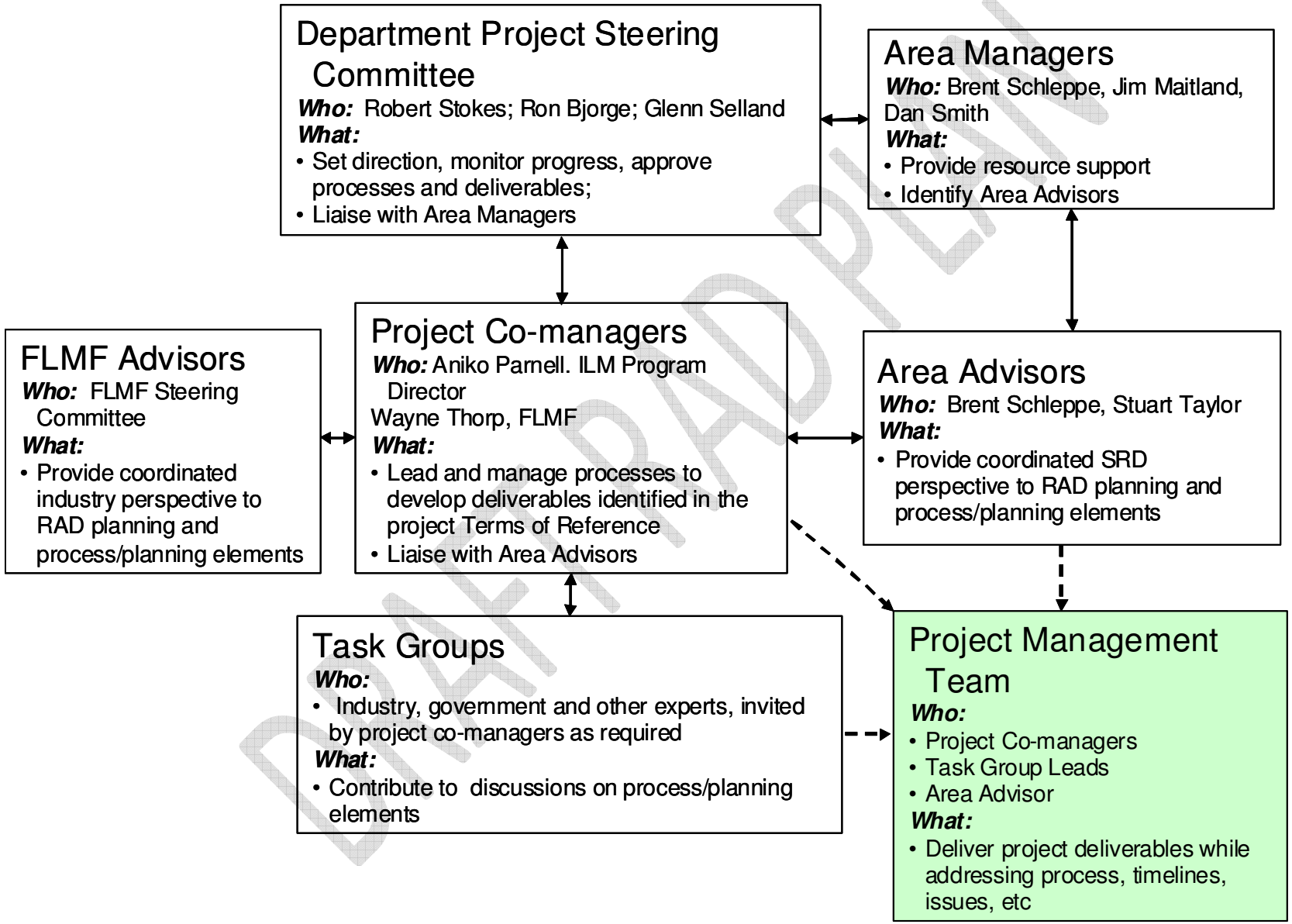
[14] Release date to be confirmed.

- West Central Alberta Caribou Steering Committee: 1996 Operating Guidelines; and Habitat Supply Subcommittee initiatives
- Oil and Gas Access – Best Practices Within the West Central Caribou Range IL 2003-23
- Landscape fire management initiatives
- Mountain Pine Beetle – Healthy Pine Forest Strategy
- Interim strategies (November 2006) west central caribou zones
- Alberta Woodland Caribou Recovery Plan 2004/05-2013-14, 2005.

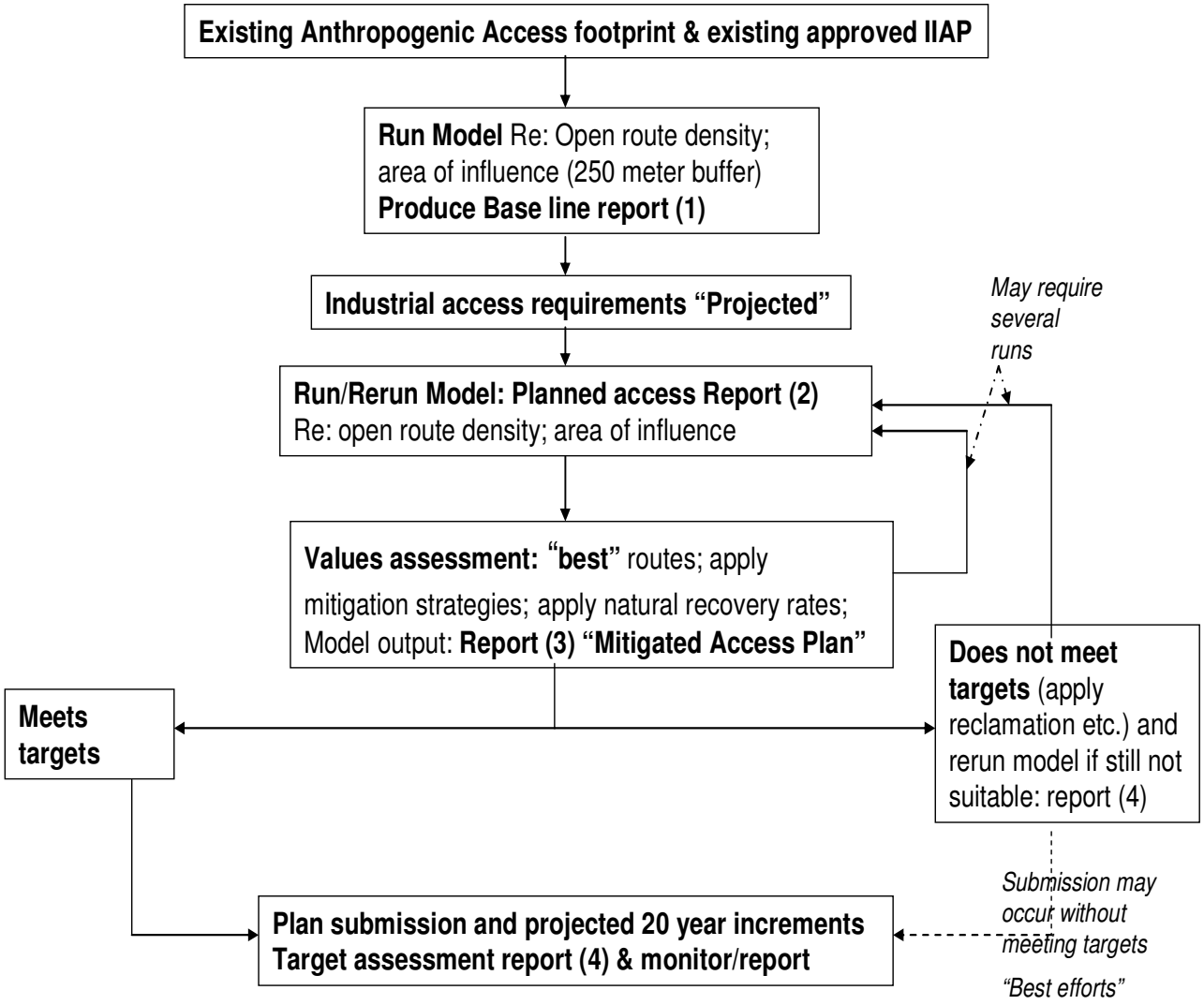
APPENDIX 2: BERLAND SMOKY RAD PLAN AREA



APPENDIX 3: PROJECT GOVERNANCE



APPENDIX 4: RAD PLAN ITERATIVE PLANNING PROCESS



APPENDIX 2 – DATA CHAPTER 2 GLOSSARY

The following is an initial list of acronyms and terms relevant to understanding the Berland-Smoky RAD Data Chapter. Descriptions have been obtained from materials supplied and other documents listed in Appendix B.

TERM	DESCRIPTION
#	
A	
Access Road	This refers to all-weather roads and other linear disturbances natural or man-made that can accommodate motorized vehicles. Linear disturbances includes seismic lines, pipeline ROW's, transmission lines, seasonal roads.
ANC	Alberta Newsprint Company
Anthropogenic disturbance	Disturbances in the environment caused by man. For the purposes of the Berland-Smoky project, 2009 will be used to determine the "baseline" and anthropogenic disturbance will include: roads, pipelines, transmission lines, recreation corridors, seismic lines > 5m, well sites, and cutblocks.
Anthropogenic linear disturbance	Any man-made linear feature that provides access for wolves and primary prey into caribou range.
AOA	Area Operating Agreement.
AOP	Annual Operating Plan. Plan prepared and submitted by the timber operator each year.
ASRD	Alberta Ministry of Sustainable Resource Development.
AVI	Alberta Vegetation Inventory (AVI) is a photo-based digital inventory. It identifies: • the type, extent and conditions of vegetation; • where vegetation exists; and • what changes are occurring with the vegetation. [www.srd.alberta.ca]
B	
C	
CLMA	Caribou Landscape Management Association.
Core Areas	Are areas of high habitat value (as indicated by the Resource Selection Function) and low mortality risk. These are of high priority when coordinating access.
D	
DFMP	Detailed Forest Management Plan.

TERM	DESCRIPTION
DIDS	Digital Integrated Dispositions. Mapping initiative to provide spatial inventory of activities on public land.
E	
Enhanced Approvals Project	Project is to aid the Integrated Operational Guidelines task team with project management support, and to assess and consolidate current guidelines, identify gaps, develop land use standards where required, and assemble a Consolidated Standards and Guidelines document to become a part of the development of a enhanced AOA.
F	
F&W	Fish and Wildlife.
FLMF	Foothills Landscape Management Forum.
FLUZ	Forest Land Use Zone. Area of land to which legislative controls are applied under the authority of the Forests Act. Each FLUZ is specific to the land area it refers to. Can be used to limit access.
FMA	Forest Management Agreement; Forest Management Area.
FO	Forest Officer employed by ASRD
FRI	Foothills Research Institute.
G	
GBPU	Grizzly Bear Population Unit.
GBWU	Grizzly Bear Watershed Unit. A management unit based on major watersheds subdivided along heights of land and occasionally along watercourses to approximate the home range of an adult female grizzly bear. This is approximately 700 square kilometers.
GIS	Geographic Information Systems
GPS	Global Positioning System
Grizzly Bear Population Unit	A management unit based on genetic distinctions occurring within a grizzly bear population. Population units tend to be separated by major highway corridors.
H	
I	
IIAP	Integrated Industrial Access Plan.
ILM	Integrated Landscape Management. Integrated Land Management.
Intact areas	Refers to the concept of habitat intactness. For Caribou, intactness areas were determined using a nine step process referred to as the Intact Area Determination Process. The Alberta Caribou Committee (ACC) defined an area (habitat) as being intact if there is little or not anthropogenic disturbance. The West Central Caribou Landscape Planning Team further defined a habitat as being intact if there existed areas of 80+ year old coniferous forest equal to or greater than 1000 ha and

TERM	DESCRIPTION
	not bisected by roads, pipelines, power lines, rail lines, or major waterways.
IRM	Integrated Resource Management. Management of forest resources in an area to meet the objectives of an integrated resource plan.
IRP	Integrated Resource Plan. Regional plan developed by provincial government agencies in consultation with the public and local government bodies. Provides strategic policy direction for the use of public land and its resources within the prescribed planning area. It is used as a guide for resource planners, industry and the public with responsibilities or interests in the area.
J	
K	
L	
lineal inventory	Primarily a detailed inventory of vegetation along seismic lines.
LOC	Licence of Occupation. A disposition issued by the Alberta government authorizing occupation of a linear corridor (normally for an access road).
Low-Impact Seismic	Low-impact seismic is refers to an approach that reduces the loss of merchantable forest. Seismic lines are an average of 5 meters wide. Valuable stands of merchantable forest are avoided through the use of meandering lines. Disturbance of the soil and groundcover are minimized through the use of vehicles with low ground pressure. (Fact Sheet by the Alberta Centre for Boreal Studies; Nov 2001).
LSAS	Land Status Automated System
LUF	Land Use Framework.
M	
MSL	Mineral Surface Lease
N	
O	
Open Route	Is an access route that is usable by a motorized vehicle with overall width of 1.65 metres (65 inches) or greater.
P	
PIEOPs	Public Information, Education and Outreach Programs (PIEOP). This is a unit within Alberta Sustainable Resource Development.
Q	
R	
RAD	Regional Access Development.
Resource Selection	Is the relative probability of the occurrence of a grizzly bear on the landscape.

TERM	DESCRIPTION
Function	
Restricted Route	Is an Open Route which is restricted in terms of time, space, or activity.
Road - deactivated	A road that has been temporarily closed but will be used again. Road grade is maintained but changes may be made to reduce maintenance costs or to prevent vehicle use.
Road – Permanent	Roads that will be in use for more than two years.
Road - reclaimed	A deactivated road that has been returned to use.
Road – Seasonal	A lineal area cleared of vegetation and which can be driven in Winter by a four-wheel drive vehicle.
Road – Secondary	Road is considered secondary if: • it comes off a primary road • it is considered a main artery • it does not end at a well site • it is permanent with the exception of those within intact areas
Road Access Density	Total length of all the roads in the Project Region divided by the area of the Project Region.
RSF	Resource Selection Function.
S	
Secondary Areas	Are areas of good habitat. These are secondary priority areas when planning access.
seral - early	Usually shrubs and trees which start growing in natural succession soon after a disturbance.
SPOT	Satellite Pour l'Observation de la Terre
SRD	Alberta Ministry of Sustainable Resource Development.
sufficient regeneration	Is defined as the existence native woody vegetation that is not considered browse for moose or deer. It is desirable that this be coniferous trees (alder has also been identified as acceptable in certain cases).
T	
U	
V	
W	
WCCP	West Central Caribou Plan.
X	
Y	
Z	

APPENDIX 3– PROJECT REFERENCES

References to documents and web pages reviewed in the course of work for the Berland-Smoky RAD Data Chapter Project Plan.

Documents

Reference ID	Title/Description
ASRD-AF	"Map" [AnthroprogenicFootprint_0700_Oct13_36x47.pdf]
ASRD-BS-CHA5	Appendix 5: Caribou Habitat Assessment
ASRD-BS-PN-20090716	Berland-Smoky Regional Access Development Plan PROCESS NOTES Date: July 15, 2009 [Berland Smoky PROCESS NOTES 2009_07_16.doc]
ASRD-BS-PN-20090810	Berland-Smoky Regional Access Development Plan PROCESS NOTES Date: August 7, 2009 [Berland Smoky PROCESS NOTES 2009_08_10.doc]
ASRD-BS-PN-20090813	Berland-Smoky Regional Access Development Plan PROCESS NOTES Date: August 13, 2009 [Berland Smoky PROCESS NOTES 2009_08_13 (2).doc]
ASRD-BS-PN-20090910	Berland-Smoky Regional Access Development Plan PROCESS NOTES Date: September 10, 2009 [Berland-Smoky_Foothills_meeting_mintutes_2009_09_10.doc]
ASRD-BS-PN-20091023	Berland-Smoky Regional Access Development Plan PROCESS NOTES October 23, 2009 [Berland-Smoky_Foothills_meeting_mintutes_2009_10_23.doc]
ASRD-BS-PN-20091120	Berland-Smoky Regional Access Development Plan PROCESS NOTES Date: Nov 20, 2009 [Berland Smoky PROCESS NOTES 2009_11_20.doc]
ASRD-BS-Timelines	Regional Access Development Plan -- Berland-Smoky Area Task Timelines.
ASRD-BS-TOR	Terms of Reference, Regional Access Development Plan, Berland-Smoky Area, 19 June 2009. [Terms of Reference Final (June 19).doc]
ASRD-GB-CPT	Integrated Access Management for Grizzly Bear Conservation

Reference ID	Title/Description
	Project Team, Terms of Reference
ASRD-GB-MAP	"Map" [GrizzlyBear_OpenRouteDensity_1700Oct9_36x47.pdf]
ASRD-LUF	Land Use Framework [LanduseFramework-FINAL-Dec3-2008.pdf]
ASRD-RD	"Map" [AllExistingRoadsByClass_FLMFGB_solid.pdf]
ASRD-SRP	Secondary Road Plan -- Access and Footprint Criteria; Draft for Discussion; December 16, 2009.
ASRD-TT	Regional Access Development Plan – Berland Smoky Area Task Timelines [task timelines.doc]
CLMA-CD	[http://www.albertacaribouCommittee.ca/caribouData/Caribou-Data-Summary.pdf]
CLMA-DT-RAD	CLMA Database [Data Table for RAD Plan.doc]
FLMF-BSAP	Foothills Landscape Management Forum Berland Smoky Access Plan [Foothills_Landscape_Management_Forum_Berland_Smoky_Access_Plan.doc]
FLMF-RADSUP3	RAD Plan Supplement #3 ATHROPOGENIC (sic) FOOTPRINT REPORTING. Draft: August 26, 2009.
FRI-CMC	Caribou Metadata Catalog, Foothills Research Institute Detailed Metadata Report.
FRI-GS	How To: Generate Stats Found in the September 2009 IIAP Report Tables, September 29, 2009.
FRI-IDT	Incoming Data Tracking XLS table.
FRI-MOU-ADM	Memorandum of Understanding (MOU) for Access Data Management between Forest Research Institute (FRI) and Alberta Sustainable Resource Development (ASRD) for Caribou and Grizzly Bear Project Data May 8/08- Draft Version [DataManagementMOU ConsolidatedModel (June draft).doc]
FRI-PIIAP	How to prepare the FLMF Integrated Industry Access Plan (IIAP), September 2009.
FRI-RGC	Road and Gates Capture/Updates Process Document.
FRI-UNA	Foothills Research Institute Regional Online Sustainable Land Management Atlas User Needs Assessment (UNA), September 2008.
FRI-WP	Foothills Research Institute Annual Work Plan 2010-2011 [Final 2010-2011 FLMF Work Plan Nov 15 09.doc]
MSC-FOR-01	ALBERTA TIMBER HARVEST PLANNING AND OPERATING GROUND RULES, 1994

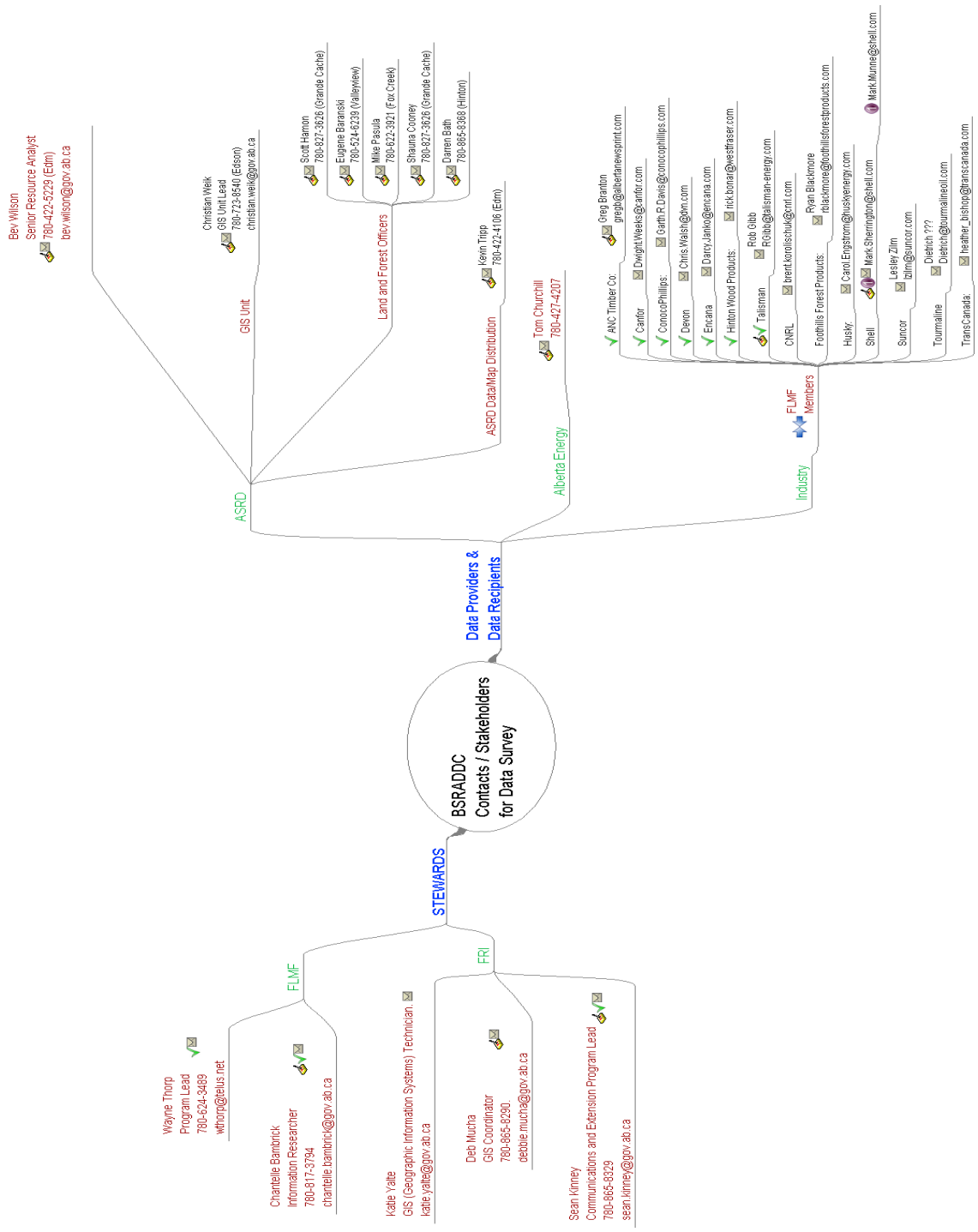
Reference ID	Title/Description
	Pub. No. Ref. 71, ISBN: 0-86499-919-4
RDC-AP	Resource Directors' Action Plan Recommendations for West-Central Alberta Caribou Recovery, March 2009 [RDC_Action Plan_Final_Draft Mar5_09_Final.pdf]

URL's [current as of the date of this document]

Web-Site URL's Related to Berland-Smoky RAD Data Chapter Project
Alberta Caribou Committee <http://www.albertacariboucommittee.ca>
Alberta Land Use Framework <http://landuse.alberta.ca/>
Alberta Sustainable Resource Development <http://www.srd.alberta.ca/>
Alberta Sustainable Resource Development, Forest Management Unit E8 http://www.srd.alberta.ca/ManagingPrograms/ForestManagement/ForestTenure/ForestManagementPlans/ForestManagementUnitE8.aspx
Foothills Landscape Management Forum <http://foothillsresearchinstitute.ca/pages/ProgramsFLMF/default.aspx>
Foothills Research Institute <http://foothillsresearchinstitute.ca/pages/home/>
Foothills Research Institute, ArcIMS website <http://24.65.224.214>

C APPENDIX 4– STAKEHOLDERS / CONTACTS

C1) Contacts



C2) Current FLMF Members

Member Name	Comments
ANC Timber Company Limited (ANC)	
Aseniwuche Winewak Nation of Canada (Grande Cache)	
Canadian Forest Products Limited (Canfor)	
Canadian Natural Resources Limited (CNRL)	
ConocoPhillips Canada Resources Limited (ConocoPhillips)	
Devon Canada Corporation (Devon)	
Encana Corporation (Encana)	
Foothills Forest Products Incorporated (FFP)	
Hinton Wood Products, a division of West Fraser Mills Limited (HWP)	
Husky Oil Operations Limited (Husky)	
Shell Canada Limited (Shell)	
Suncor Energy Incorporated (Suncor)	Divesting interests in the Berland-Smoky region and may no longer be involved with data issues in the region.
Talisman Energy Incorporated (Talisman)	
Tourmaline	

Appendix 5 Outline Reference/Check List for Access Planning

Quick Reference for Access Planning

Step 1: Initial set up

1) Create access planning team

2) Create structure for governance

a) Identify the following

i) Criteria for membership

ii) Administration

(1) Who chairs meetings

(2) Who records minutes of meeting

(3) Record keeping

(4) Who is the manager of the project and accountable for:

- Providing management oversight for all project elements
- Creating a feasible and efficient work plan and keeping it current
- Creating task groups and assigning tasks, approving work schedules, and monitoring progress of assignments
- Chairing the Project Management Team
- Identifying and resolving operational issues
- Assessing outcomes against the work plan and deliverables
- Ensuring productive and meaningful dialogue and liaison occurs with appropriate industry groups and associations
- Referring strategic issues with proposed resolution to the Project Steering Committee

iii) Mechanisms to fund/support planning

(1) Shared costs by members

(2) Member dues

(3) Government grants

(4) Combination of the above

3) Gather data

a) To describe management area

i) To set boundaries

ii) To select baseline date

b) Describe existing access

i) Roads, trails, pipelines, well sites, railways, structures, etc

c) Describe environmentally sensitive areas

i) Rivers, streams, critical wildlife habitat, unstable soils/slopes

d) Non industrial uses of the land base

4) Define objectives and goals for access management

a) Adopt the Life Cycle Approach for all surface footprint?

i) Plan, Construct, Maintain, Deactivate, Reclaim

ii) Identify the footprint life cycle as part of the plan, and implement life cycle events according to the plan or agreed practices (e.g., deactivate when a road will not be used for a set period of time, reclaim within a specified time after road use is completed)

iii) Timely deactivation and reclamation. Identify footprint that is not needed on a temporary or permanent basis and deactivate or reclaim as appropriate

b) Scope of planning
   i) Reduce industrial footprint?
   ii) Set thresholds to limit industrial footprint?
   iii) Control/regulate traffic?
   iv) Design/selection of corridors?
   v) Control human use?
   vi) Mitigation to reduce footprint?
   vii) Monitoring?

Sept 2: Outreach and Communication

1) Outside groups
   a) Inform them of formation of access planning
   b) Communicate goals/objectives of proposed access planning
   c) Invite other interested groups/parties to join
   d) Build relationships with outside groups
   e) Identify mechanisms for continued communication with outside groups
      i) Newsletter
      ii) Web site
      iii) Workshops
      iv) Brochures or news releases
2) Structure, skill sets and communication within planning group
   a) Representative from all industrial participants in the planning group
   b) Members of planning group should be familiar or knowledgeable with:
      i) Opportunities, constraints, policies, working environment of their own company/agency
      ii) Members should be familiar with government regulations and legislation as opportunities or barriers for success
      iii) Members should be aware/familiar with scientific knowledge with respect to access development and its environmental impacts
      iv) Members should have some appreciation and understanding of data management
         (1) Database manager and GIS expertise should be a member of the group or be easily accessed by the group as needs arise. Live interactive workshops are the best approach for this.

Step 3: Design and Assessment of Access Planning.

Planning is often initiated by a group member with access needs that are characterized by longer tenure on the landscape and higher standards for road construction (e.g., energy, forestry). This plan is then shared with others group members to see if it meets their needs. Discussions between members and adjustments to the proposed plan are made until the access needs of all are satisfied.

1) Planning for new access or removal of existing redundant access should be based on some or all of the following depending upon the scope of the plan
    a) Existing access
        i) Ownership of access
        ii) Non-industrial use of access (e.g., trapping, traditional use, recreation)
    b) New access for short- and long-term business needs
        i) Forestry
        ii) Oil and gas
        iii) Other
    c) Identification of scope of the planning exercise (e.g., which lineal disturbances are in or out of scope?)
    d) Identification of access (road) standards required (e.g., all weather, frozen only, with of right of way)
    e) Identification of sensitive ecological, hydrological and topographical sites
        i) Rivers, streams, lakes
        ii) Unstable soils and slopes
        iii) Stream crossings
        iv) Spawning species and locations
        v) Critical/endangered wildlife and habitat
        vi) Others (recreational, scenic, habitations)
2) Develop locations for proposed access in office
    a) Consider more than one route for new access and develop ranking process to select
        (1) More than one route allows comparisons as a basis
        (2) Develop an objective ranking system to choose best option for trade-offs to minimize disturbance and to control costs
    b) Confirm:
        i) Provincial and federal guidelines and legislation satisfied
        ii) Sensitive sites avoided
        iii) Destinations for resource extraction identified
3) Identify new access on maps or by GIS analysis
    a) Ensure all rules, guidelines, legislation are satisfied
4) Conduct field reconnaissance to confirm office work
    a) To confirm objectives to minimize/prevent disturbance were satisfied
5) Make final selection for new access
6) Share plan with other industrial members of the planning group
    a) Adjustments are made to the plan until access needs of all group members are satisfied

Step 4 Plan Assessment

1) Assess plan to confirm that measures employed in the design phase to minimize/reduce industrial disturbance were effective
    a) This will usually be done by a GIS analysis
        i) Threshold values most often used to assess the extent and change in industrial disturbance at the landscape level and for specific habitats
        ii) Two common thresholds used are:

(1) Road buffers that are assumed to capture the effects of industrial disturbance
(a) In the BSRAD Plan, a road buffer of 250 m on both sides of roads was used
(2) Road density km/km^2 for open route access was used in the BSRAD Plan
(a) 0.6 and 1.2 km/km^2 for core and secondary grizzly bear habitat

2) Consult with external stakeholders for input and acceptance of the plan
   a) Municipalities
   b) Public
   c) User Groups (ATC, Conservation, Fish and Game Clubs)
   d) First Nations
3) Submit to Government for approval
   a) Define what approval means

Step 5 Risk Assessments.

Risk assessment predicts future outcomes of management decisions in the face of uncertainty.

1) Risk can be used in access management to test the effectiveness of road design and location on wildlife behaviour and populations.
   a) Risk assessments can be qualitative or quantitative.
      i) Quantitative assessments are based on parameters that can be measured
      ii) Qualitative assessments are subjective based on expert knowledge
   b) In both cases the assessments are based on before and after disturbance or the absence or presence of wildlife data sets.
   c) Assessments are easier to implement and interpret when more than one road design is evaluated.
2) Resource selection functions (RSF) are considered most promising to describe habitat selection and numbers by wildlife
   a) RSF methods are statistical models that quantitatively assess the risk of habitat change on habitat selection and wildlife populations.
   b) RSF have the advantage that they are proportional to probability of habitat selection
      i) The density of animals using a given habitat can be estimated
      ii) A probability of use can also be calculated

Step 6 Data Management

1) Data management is important and essential in any endeavour where large data sets are involved
   a) A good data management system should be based on:
      i) Adequate data storage capacity
      ii) Data should be readily available to users
         (1) Easy to retrieve and use
      iii) Data are protected by database security
      iv) Redundant data are minimized
      v) Logs of data access

(1) Who logged on
(2) Dates of changes to data base

vi) Consistent methods for naming objects (e.g., files/tables) that will identify their purpose to future programmers and users

2) Database should include:
   i) Baseline data
      (1) Existing access and infrastructure
      (2) Stream crossings
      (3) Land use zones/categories
      (4) Vegetation
      (5) Wildlife habitat
      (6) Aquatic habitats
      (7) Sensitive sites
   ii) Modeled Data
      (1) Proposed new access
      (2) Watersheds
      (3) Stream channel networks
      (4) Industrial footprint
      (5) Open route access
      (6) GIS generated images
         (a) Access network (existing and new)
3) Data Sources may include:
   i) Commercially available data sources
   ii) Downloadable government data
   iii) Member of access planning group
      (1) Some of these data may be proprietary
      (2) Data sharing agreements may be required
   iv) Data sources for wildlife and aquatic habitats may be limiting
      (1) Description or modeling based on expert opinion may be required
      (2) Possible sources may be:
         (a) Research reports
         (b) Resource/inventories
         (c) Monitoring by government agencies
         (d) Member companies in the access management group
4) Confirmation of by whom and how data will be stored and provided (pros and cons). A key consideration is the need for confidentiality of some data sets that can be used for planning but not shared with others (e.g., traditional use, specific company plans).
5) Confirmation of who owns the data (where is the "official copy" stored)
6) Confirmation of data maintenance is an ongoing activity that involves:
   i) Development of new access
   ii) Monitoring and mitigation programs
   iii) Annual updating of access databases
   iv) Creating data sharing agreements with external sources
      (1) Items to consider in data sharing agreements include:
         (a) All access constructed in past year
         (b) All proposed access for the upcoming year

(c) All mitigated/decommissioned roads in past year
(d) All new infrastructure in upcoming year
(e) Proposed new infrastructure
(2) Shared data should have
(a) Common or compatible software for storing and processing
(b) Common spatial and numeric formats for data
(3) Deadlines for reporting data
(4) Identify
(a) Central location for data storage
(b) Assignment of responsibility for:
(i) Database management
(ii) Data analysis
(iii) Reporting of results

7) Create cost sharing agreements for database management, data analysis and reporting of results among members in the access planning group

Step 7 Mitigation.

Mitigation includes the strategies and practices used to limit and/or reduce the industrial footprint on the landscape and its associated environmental effects.

1) Objectives for mitigation can include some or all of the following:
   a) Protect terrestrial and aquatic wildlife from human disturbance
   b) Reclaim disturbed lands (i.e., access) to a natural condition
   c) Reclaim stream crossings
   d) Prevent and reduce the occurrence of wildfires
2) Mitigation review and assessment:
   a) Review all current practices, assess effectiveness and cost
   b) Include all tools government could bring to the table (regardless of use) and assess effectiveness
   c) Innovations
   d) Measurement criteria
3) Methods for mitigation can be categorized as:
   a) Traffic control
      i) Eliminates or reduces human activity
      ii) Has the potential to increase the quality of wildlife and aquatic habitats
      iii) Methods for traffic control can include
         (1) Gates
         (2) Manned gates
         (3) Check stops
         (4) Berms to impede traffic
         (5) Legislative means
      iv) Additional considerations
         (1) Traffic control can reduce maintenance costs for a road
         (2) Active enforcement of control measures may be required
   b) Road Closure
      i) Another form of traffic control

ii) Temporary storage of a road for future use
iii) Road remains part of the access network
(1) Industrial footprint is not reduced
(2) Benefits from traffic control are obtained
iv) Methods – same as traffic control
v) Additional considerations – same as traffic control

c) Removal of access (i.e., roads)
i) Reduces industrial footprint on the landscape
ii) Two options to consider for removal are:
(1) Option 1 - Access abandonment
(a) Removes access from road network
(b) Recovery/reclamation to a natural condition based on
(i) Ingress by existing nearby vegetation (Leave for Natural)
(ii) A long-term solution (10-20 years for recovery)
(iii) Not acceptable for bare mineral soil conditions
1. High potential for soil erosion
2. Sediment deposition in streams, rivers, lakes
(iv) Additional consideration
1. Traffic control may be necessary to eliminate use
a. Barriers
b. Enforcement
(2) Option - 2 Removal and Reclamation (R&R)
(a) Direct action that removes access (usually roads) and
(b) Reclaims sites by re-vegetation
(i) Agronomic species initially to stabilize bare mineral surfaces
(ii) Native species by planting or natural ingress

4) Mitigation Planning
a) Planning for R&R based on:
i) Creation of a planning/design team
ii) Setting reclamation standards
iii) Identification of appropriate treatments/practices
iv) Access to:
(1) Current and accurate inventories
(2) Resource management plans
(3) Adequate funding
(4) Compliance with existing guidelines and legislation
(5) Resource specialists for planning, design, monitoring during and after reclamation

b) Skills and expertise for planning/design team should include:
i) Forest engineer or equivalent
ii) Agrologist (soils)
iii) Hydrologist (stream crossings)
iv) Plant ecologist (native species)
v) Wildlife manager/biologist
vi) Fisheries manager/biologist
vii) Resource mangers (forestry/oil and gas)
viii) Traditional knowledge

5) Priorities for access removal (R&R)
    a) Selection based on watersheds
        i) Watersheds with maximum disturbance
            (1) A logical first choice for R&R
            (2) Significant reduction in industrial footprint
        ii) Watersheds with low disturbance and core habitat
            (1) Consider giving a higher priority
            (2) Repair may be easier
            (3) Core habitat protected
    b) Selection within watersheds
        i) Consider potential impacts on terrestrial and aquatic species
        ii) Special attention to
            (1) stream crossings that may affect fish and other aquatic organisms
            (2) endangered or threatened species and their habitat
6) Standards for R&R
    a) Usually established by government in guidelines and regulations
    b) Standards can be categorize as engineering and reclamation based
    c) Engineering standards can include some or all of the following:
        i) Remove all stream culverts
            (1) to ensure fish passage
        ii) Remove all bridges
        iii) Restore surface drainage to natural pathways
        iv) Re-contour road right-of-ways to natural slope conditions
        v) Re-work surface soils with natural amendments to create a medium favourable for plant establishment and growth
        vi) Stabilize road right-of-ways with respect to:
            (1) soil erosion and sediment transport into streams
            (2) slope stability
        vii) Establish gate or barrier to prevent motorized traffic
        viii) Ensure compliance with guidelines and legislation
    d) Reclamation standards can include some or all of the following
        i) Plant vegetation to prevent soil erosion
            (1) Minimum of 50% live cover and 10-20% natural litter or organic debris
            (2) Site preparation to create favourable seed bed conditions for germination
            (3) Use of agronomic species initially for erosion control followed by native species
        ii) Long-term strategy for recovery to natural conditions
            (1) Use native species only
            (2) Application of soil+organic layer as a seed source
            (3) Plant shrubs and trees compatible with adjacent undisturbed vegetation
7) Methods for Removal of Access
    a) Methods variable with site conditions
    b) Objectives for road removal are to return ground surface to natural slope conditions for slopes and at stream crossings
    c) R&R will usually involve the following

i) Scarification/ripping to break up and de-compact the road surface/bed into a granular material (with properties of aeration, texture, water retention and transmission)
ii) Re-contouring the right-of-way to resemble natural slope conditions for a site
iii) Replacement/addition of soil and organic material to surface layers to create soil properties favourable for plant growth, water infiltration and storage
iv) Seeding and planting of plant species for erosion control and return of the site to a natural condition

8) Monitoring Programs should be created to evaluate the success of access removal and reclamation and the need for remedial work

Step 8 Monitoring

Monitoring is watching or checking an activity or condition with the objective of detecting change with respect to given criteria or levels of performance. Monitoring usually consists of a series of observations over time to assess the effectiveness of a given activity or program.

1) Monitoring is an essential component of adaptive management, which is:
   a) "The rigorous combination of management, research, and monitoring so that credible information is gained and management activities can be modified by experience."
   b) Adaptive management consist of 6 steps
      i) Problem recognition
      ii) Program design to solve the problem
      iii) Implementation of the program
      iv) Monitor program performance
      v) Evaluate program performance
      vi) Make adjustments and continue monitoring
         (1) To ensure objectives are being satisfied or improve performance
2) What kind of monitoring will be done and who will do it? (Sustainable process?)
   a) Trend monitoring to describe temporal and spatial variability
   b) Baseline monitoring to characterize existing conditions
   c) Implementation monitoring to assess whether management practices were carried out as designed
   d) Effectiveness monitoring to evaluate effectiveness of individual management practices
   e) Project monitoring to assess the cumulative effects of a given activity (e.g. forest harvesting on water, access effects on wildlife)
   f) Compliance monitoring to determine if specified thresholds or criteria are being satisfied
3) Designing a Monitoring Program
   a) Initial steps
      i) Identify general objectives to solve problem/task
      ii) Define personnel and budgetary needs and constraints

iii) Review existing data/experience relevant to problem
iv) Identify specific monitoring objectives
v) Define
    (1) Monitoring parameters to be measured and how they will be measured
    (2) Duration of monitoring
    (3) Sampling frequency
    (4) Where monitoring will be done
    (5) Analytical methods or tests to be applied
        (a) Test should be expressed as a question or hypothesis
vi) Will collected data satisfy monitoring objectives
vii) Can the program be completed with available resources?
    (1) If yes, proceed to implementation stage
    (2) If resources are inadequate return to step 1 to reassess objectives
viii) Initiate program
    (1) If possible use first few cycles of observations to test effectiveness of the program to see if it is working as desired
    (2) Make adjustment if needed
    (3) Resume monitoring and evaluate results
        (a) If program still needs adjustments continue in pilot mode until all needs are satisfied
    (4) Initiate program on a regular monitoring basis and conduct data analysis as required
ix) Prepare reports and recommendations relevant to objectives

Glossary of Terms

TERM	DESCRIPTION
Access Road	All-weather roads and other linear disturbances natural or man-made that can accommodate motorized vehicles. Linear disturbances includes seismic lines, pipeline ROW's, transmission lines, seasonal roads.
ANC	Alberta Newsprint Company.
Anthropogenic	Human caused.
AOA	Area Operating Agreement.
ASRD	Alberta Ministry of Sustainable Resource Development.
DFMP	Detailed Forest Management Plan.
DIDS	Digital Integrated Dispositions. Mapping initiative to provide spatial inventory of activities on public land.
Enhanced Approvals Process	To aid the Integrated Operational Guidelines task team with project management support, and to assess and consolidate current guidelines, identify gaps, develop land use standards where required, and assemble a Consolidated Standards and Guidelines document to become a part of the development of a enhanced AOA.
FLMF	Foothills Landscape Management Forum.
FLUZ	Forest Land Use Zone. Area of land to which legislative controls are applied under the authority of the Forests Act. Each FLUZ is specific to the land area it refers to. Can be used to limit access.
FMA	Forest Management Agreement; Forest Management Area.
FRI	Foothills Research Institute.
GIS	Geographic Information Systems
GPS	Global Positioning System
IIAP	Integrated Industrial Access Plan.
ILM	Integrated Landscape Management. Integrated Land Management.
Intact areas	Refers to the concept of habitat intactness. For Caribou, intactness areas were determined using a nine step process referred to as the Intact Area Determination Process. The Alberta Caribou Committee (ACC) defined an area (habitat) as being intact if there is little or no anthropogenic disturbance. The West Central Caribou Landscape Planning Team further defined a habitat as being intact if there existed areas of 80+ year old coniferous forest equal to or greater than 1000 ha and not bisected by roads, pipelines, power lines, rail lines, or major waterways.
lineal inventory	Primarily a detailed inventory of vegetation along seismic lines.
LUF	Land Use Framework.
Open Route	An access route that is usable by a motorized vehicle with overall width of 1.65 metres (65 inches) or greater.
RAD	Regional Access Development.
Resource Selection Function	The relative probability of the occurrence of a grizzly bear on the landscape.

TERM	DESCRIPTION
Road - deactivated	A road that has been temporarily closed but will be used again. Road grade is maintained but changes may be made to reduce maintenance costs or to prevent vehicle use.
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