# ENVIRONMENTAL PLANNING FOR RIGHTS-OF-WAY IN A RAPIDLY DEVELOPING MULTIPLE RESOURCE SETTING THE ALBERTA DEEP BASIN

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# ENVIRONMENTAL PLANNING FOR RIGHTS-OF-WAY IN A RAPIDLY DEVELOPING MULTIPLE RESOURCE SETTING - THE ALBERTA DEEP BASIN

## INTRODUCTION

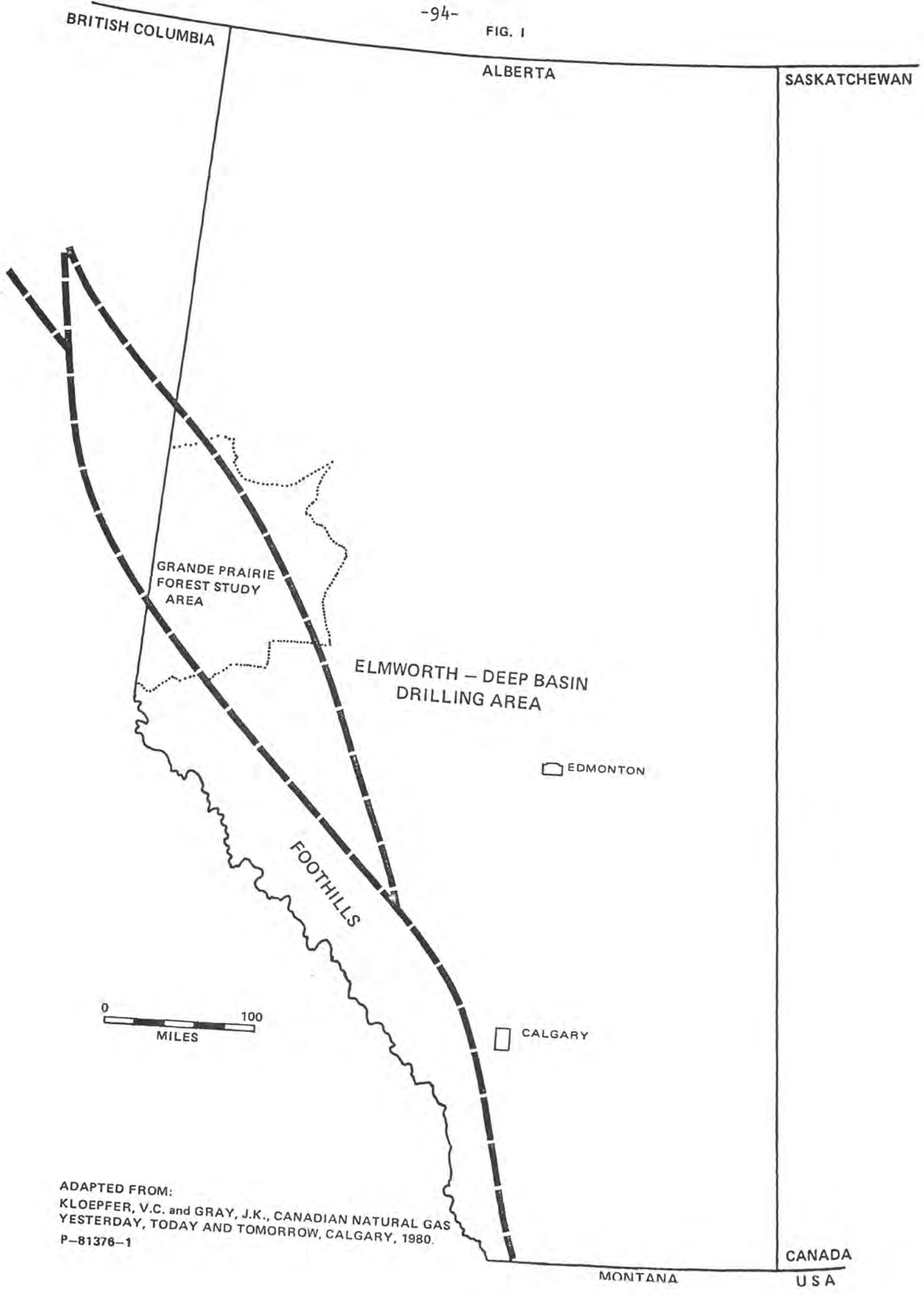
Western Canada is one of the greatest hydrocarbon areas of the world. Many of the reserves underlie extensive forested lands in the Province of Alberta. The rapidly escalating world price for petroleum caused a nine-fold increase in the price of natural gas to producers in the period 1973 to 1977 and touched off a large scale search for gas, which previously had not been economical to recover. The Deep Basin, one of these reserves, is a large recently discovered natural gas deposit in a 26,000 sq. mi (67,600 $km^2$) area straddling the British Columbia - Alberta border (Fig. 1). Initial estimates suggest recoverable deposits may be as much as 440 TCF ($12.5 \times 10^{12}$ cubic metres), compared to the San Juan Basin, second largest in North America at 25 TCF ($0.7 \times 10^{12}$ cubic metres).

Approximately 50% of land in Alberta is provincially owned, and to a large extent forested. The development of non-renewable petroleum resources has a considerable impact on the land surface and the management of its renewable resources. This fact has considerable bearing on the planning approach of the resource management agencies. This paper details an example of environmental and resource management issues that arise in a resource rich area undergoing heavy development in both renewable and non-renewable sectors. Particular emphasis is placed on linear facilities associated with non-renewable resource developments, these being responsible for the majority of land disturbance on the renewable resource sector.

## THE ENVIRONMENTAL SETTING OF THE ALBERTA DEEP BASIN

The Deep Basin lies on the western portion of the province abutting the Rocky

FIG. 1

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Mountains, in the resource rich foothills. The area is relatively remote with only a few populated centres (Figure 2), largely forested with conifers (mainly white spruce, lodgepole pine, black spruce and balsam fir) but with a significant deciduous component (primarily aspen and balsam poplar). This same forest supports a large and important timber industry. The watershed is very important as the area feeds many of the large rivers, which cross the Canadian prairies and the Northwest Territories. The terrain has significant relief and where soil and overburden are unstable, terrain sensitivity is a very important issue. The fish and wildlife resources are very rich and include moose, deer, elk, bighorn sheep, the rare woodland caribou, grizzly and a wide variety of furbearers.

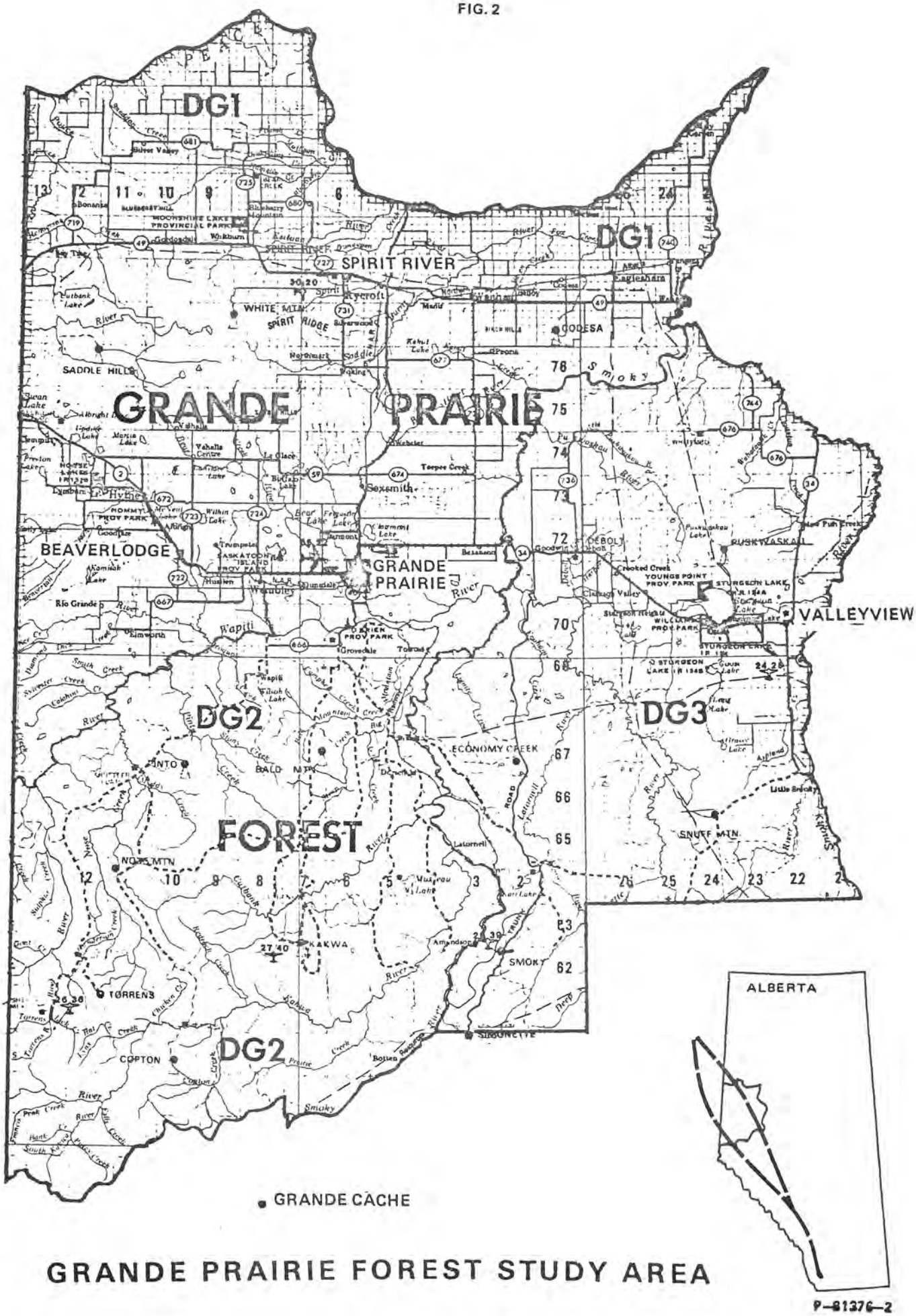
Due to limited access in many areas until recently, the wildlife populations have not been heavily exploited. This however is changing rapidly. The area has many aesthetic characteristics with deeply incised rivers, waterfalls, and large wilderness areas. A limited amount of grazing occurs in some areas.

Recreation potential within the area is excellent. However, prior to the development of road networks by the timber and petroleum and natural gas industries, much of it was inaccessible. In fact, to this point in time there is still no continuous permanent access through the heart of the area.

## RIGHTS-OF-WAY AND ASSOCIATED DEVELOPMENTS IN THE STUDY AREA

A recent study (using a 10% stratified random sample) estimated the amount of area physically disturbed by energy related activity, to be 66,576 acres (26,963 ha) for a selective study area encompassing the Grande Prairie Forest an administrative unit of the Alberta Forest Service (Figure 2). Table 1 shows the breakdown of land use disturbance by area for oil and gas related activities. Surface activity is not spread evenly throughout the Forest. Thus the amount of land disturbed by area does not reflect the relative

FIG. 2




GRANDE PRAIRIE FOREST STUDY AREA

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TABLE 1 EXTENT OF LINEAR DEVELOPMENT ESTIMATED FOR STUDY AREA TO DEC. 1979 *
(TOTAL ACRES) (ALBERTA ENERGY & NATURAL RESOURCES 1981 UNPUBLISHED)

| AREA CLEARED IN ACRES (HECTARES) DISTURBANCE TYPE | PRODUCTIVE FOREST | POTENTIALLY PRODUCTIVE | NON-PRODUCTIVE | TOTAL | MILEAGE EQUIVALENT | % OF TOTAL DISTURBANCE |
|---|---|---|---|---|---|---|
| SEISMIC | 34615 (14019) | 2803 (1135) | 10196 (4129) | 47614 (19283) | 15713 ** (25140 km) | 72% |
| ROADS AND WELLSITES | 2053 (831) | 379 (153) | 1250 (506) | 3683 (1491) | 460 (740km***) | 6% |
| POWERLINES PIPELINE | 2889 (1170) | 500 (203) | 1536 (622) | 4925 (1995) | 616 (991km***) | 7% |
| GAS PLANTS | 93 (38) | 0 | 0 | 93 (38) | - | 0% |
| MULTI-PURPOSE RIGHT-OF-WAY | 8001 (3240) | 808 (327) | 1252 (507) | 10062 (4075) | 1258 (2024km***) | 15% |
| MISCELLANEOUS OIL AND GAS | 156 (63) | 40 (16) | 0 0 | 197 (80) | - | 0% |
| TOTAL | 47809 (19363) | 4532 (1835) | 14234 (5765) | 66576 (26963) | 18047 (28875km) | 100% |

* THESE VALUES IN TOTAL REPRESENT 1.3% OF THE TOTAL STUDY AREA.
** SEISMIC LINES ARE STANDARD 25 FT WIDTH
*** AVERAGE WIDTH IS 66'

activities, nor the indirect effects on other resources. It merely reflects the direct losses to forest cover.

SEISMOGRAPHIC EXPLORATION LINES (SEISMIC)

Seismic lines are the predominant fraction of the disturbance in the study area contributing 72% of the area disturbed for a total of 47,614 acre (19,283 ha). This translates to 15,713 miles (25,140 km) of lines 25ft (7.6m). Seismic activity is the predominant activity in the initial exploration stage. The forest cover is removed and the ground graded clear. The line may be used only once or it may be used several times (in similar terrain further south, 1 seismic line was shot over two dozen times). Little deviation from a straight line occurs except to by pass difficult obstacles such as a lake. In sensitive areas such as steep slopes of valleys, regulations typically call for hand cut lines which use no surface machinery. Seismic line construction does not preclude subsequent land uses but does have indirect effects on timber rotation, watershed protection and access into significant habitats etc.

OIL AND GAS ROADS AND WELLSITES

7% of the surface activity in the study area was attributable to oil and gas roads and wellsites for a total of 3,683 acres (1,491 ha). Roads are an average of 66 ft (20 m) wide and wellsites are 4 acres (1.6 ha). Limited road infrastructure existed prior to oil and gas exploration, due to forest harvesting activity and forest management activity. This provided a framework for new road development in a portion of the area. From a road use perspective, it created some very serious problems of overuse viz-a-viz grade destruction and locational difficulties in road network expansion. Several energy companies and major forest products companies wanted access to the same general areas. However, their locational timing and capitalization requirements were vastly different. From the government perspective, this led to some very difficult negotiations in the name of coordination of road development.

Currently the government is attempting to put a new major roadway in place across the heart of the study area, that will provide the core for road network establishment. As the study area has not advanced far into the development stage, roads and wellsites will increase in proportion to other disturbances. Those roads and wellsites involved with producing wells eventually form the basis of a network which will exist at least for the life of the field. Wellsites have fairly rigid location requirements and determine the end point of access roads. Such roads are typically route planned during exploration on the basis of the nearest interconnection point and the proposed drill site, not on the basis of what a final developed landscape might look like. In much of the rugged topography of the study area the environmental need to "fit" the roads into the landscape will lead to some later very difficult decisions for prevention of landscape dissection by different types of rights-of-way yet to be constructed. During exploration one does not know which wells will be producers. The common management strategy for access locational analysis is to look at each well road on its own merits.

POWERLINES AND PIPELINES

Powerlines and pipelines account for 7% of the disturbed area for a total of 4,925 acres (1,995 ha) which translates to 616 miles (991 km) of r-o-w 66 ft. (20 m) wide. Land occupied by such facilities are not typically available for other activity uses such as timber production during the life of the facility. For the timber operater the impact on the operating unit can be serious. If the oil and gas developer attempts to follow existing road rights-of-way with production facilities, this may avoid timber operation problems. However existing rights-of-way many times fail to meet the majority of locational requirements for pipelines and powerlines. In these cases the indirect effects of the oil and gas right-of-way are very disturbing to the timber operator, because the landscape gets heavily dissected, isolating timer stands and making haulage road development very difficult.

From a fish and wildlife perspective, the new rights of way bring good and bad. The former by creating edge and browse for wildlife, the latter by opening up hunter access and through the direct effects on fisheries habitat. Pipelines in particular are notorious for stream damage.

Two new major pipelines have already been built to service the expected transportation needs of energy development. Both of these pipelines are located on the basis of "probable" locations of collection and processing facilities. However, they do not reflect a great deal of locational consideration for the indirect effects they will create viz-a-viz secondary interconnection facilities. As of the time of construction the complete development picture wasn't known. In light of this uncertainty, the pipelines are located in a way that economically minimizes future secondary system development. This approach makes little allowance for future effects on renewable resources.

GAS PLANTS AND BATTERIES

As development increases, gas plants,oil batteries and similar facilities become more prevalent. Physically they do not take up much space in themselves. However the location of these nodal features is important because it dictates the overall configuration of field development for flow lines, roadspower lines, product transmission lines and railways to and from the plant. From a land use perspective, the location of the plant is critical. In this study area an estimated 93 acres (38 ha) have been directly removed by gas plants to date. The indirect land use effects have yet to be assessed.

MULTIPLE-FACILITY RIGHTS-OF-WAY

These facilities contributed to 10,062 acres (4,075 ha) of clearing and accounted for 15% of the total disturbance. These features are quite permanent. Planning for such facilities often take the form of second and third party developers taking advantage of or being regulated to locate in an existing

common right-of-way. Rarely will one find a multiple facility right-of-way that has not developed in an ad hoc fashion. As noted previously, use of existing rights-of-way is the most common form of multiple use right-of-way. Thinking and planning of idealized multiple use rights-of-way prior to any development was impossible in the Deep Basin because of the existence of a limited forestry industry road network in place, and because of the scale and rate of new right-of-way requirements. Thus planning and development of multiple use rights-of-way has taken place case by case as proposals for roads and pipelines were received from developers. A number of successes have been achieved for facilities of a similar type to date in the case of roads and separately the case of pipelines. However, as the area develops a much more extensive network of secondary facilities in the future, the amount of landscape dissection is bound to increase. Multiple facility rights-of-way are not always the best solution for reasons of land sterilization etc. However it is a major issue requiring careful consideration in cases such as the Deep Basin where many linear facilities are required.

MISCELLANEOUS AREAS BY OTHERS

These areas which include industrial campsites and airstrips accounted for only 197 acres (80 ha). While the physical area they occupy is small, the extent of activity has consequences beyond the immediate area of the facility. For instance, the numbers and locations of campsites has an effect on road use and wildlife disturbance. Major campsites in the study area are owned and operated by the two major forest products companies. These campsites are used repeatedly, and consequently form significant nodal features for road development.

RESOURCE MANAGEMENT AND LINEAR DEVELOPMENTS

The problem facing the resource manager is how to plan for heavy initially rapid development in the absence of complete knowledge. At a constant level of petroleum development activity, the resource agency can staff managers to work

with companies to plan routes for individual activities with an eye toward overall comprehensive land use and good environmental design. However, when a large and rapidly developing "play" occurs, this sytem becomes overloaded, time frames for planning become extremely tight and planning "from the hip" takes place. This is the time when maximum conflict with other resources and resource users takes place. The situation becomes overheated. How can the resource agency handle this overload on the system?

EXISTING MEASURES

a) Legislation:

Legislation works on a permit system, a somewhat reactive approach. Field staff review plans and offer advice, supervise and inspect and approve project development. Companies are encouraged to carry out preliminary planning with resource managers prior to permit application submissions. In low activity modes this works well but as activity increases the experienced field staff get overloaded. As well, as play "heats up", more companies enter the scene, competition shortens planning times further, and co-ordination by resource managers of short term developments within the framework of long term goals becomes very difficult. In fact it is often impossible to develop a framework in time to focus on individual activities.

b) Field Level Co-operation & Expectations:

Company engineers, landmen and environmentalists work individually with the field officers of the management agency to plan their projects. This works best when the level of activity is low. Companies however vary in the extent to which they plan their projects with the agencies in advance of permit application. They also vary in the way they do their business and live up to expectations. In an overheated situation as was the case in the Deep Basin, development results on the ground in a number of cases were a far cry from the commitments made by individual operators.

DEEP BASIN RESEARCH PROGRAM

With the above limitations in mind, the Deep Basin Research Program has been established to consider the overall and cumulative effects of rapid oil and gas development, in order that a proactive management approach can be taken. This approach will address the two main problems facing resource managers.

1. A large area of land where detailed biophysical information and information about the sensitivity of the area to disturbance is not available
2. Components and timing of exploration and development critical to determination of an end use landscape require careful definition.

Available biophysical data for the study area is being organized in order to determine deficiencies and establish priority areas where new information needs gathering. This is being accomplished using an integrated ecological land classification (ELC) and derivative interpretations as a data base. ELC is an approach which allows the resource manager to consider the landscape as ecological units and to organize complex interrelationships into identified geographical areas with similar properties. ELC units, because of their assessed inherent biological potential allow for extrapolation of known information and management practices to units of similar conditions. Key parameters utilized in ecological classification include physical characteristics (climate, soil, landform, surficial deposits) as well as biological (vegetation) factors. Units will be classified according to their potential to withstand surface disturbance, and the extrapolative capability of this sensitivity rating will then be tested. The units will be assessed also for existing and potential resource capability for timber, recreation, wildlife etc. By categorizing the landscape according to sensitivity and resource value, the resource manager will be able to priorize his level of effort and direct his attention to the sensitive areas.

Initial mapping of the area is being done at 1:100,000 (land section) level. Where sensitive areas or areas where extensive activity occurs, the ELC will be refined to the 1:15,000 (land type) scale. This terrain and resource sensitivity analysis will then form the basis for day to day review and approval of continuing development proposals. Further, it will provide a basis from which to consider how individual access roads, pipelines etc. can be assessed with regard to the "big picture", and long term pattern development.

Mapping and time sequencing of linear developments is forming a monitoring program to assess decision points and issues during oil and gas activity that control long term overall land use. All linear facilities are being continuously assessed for pattern development, and will be superimposed on the ecological data base as available. It is significant to emphasis that our research program is in a catch up situation because development is ongoing.

The second phase of the approach is to tackle the planning aspects of the petroleum development. As mentioned, the exploratory phase was well underway before the area was identified as a major play. Now as the development phase takes place, the actors are becoming well known. The Deep Basin program will bring the actors together with the renewable resource managers to review and assess the development history of the area to the present. The main goal of this group will be to plan for the reduction of future surface disturbance by carefully assessing facility needs, locations and designs for further development. The group will consider road, pipeline and powerline planning requirements specifically from an end land use perspective. Potential and achievable maximization of multiple purpose rights-of-way will be identified, as well as strategic nodal features controlling pattern development. Critical development elements already in place will be assessed for locational significance.

Hopefully this "learn as you go approach" will provide a better landscape once development is complete in the Deep Basin, and will provide a proactive planning framework for future development areas. This is not the first major conventional oil and gas development area in Alberta. It won't be the last.

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# PROCEEDINGS:

# ALBERTA RECLAMATION CONFERENCE

## Edmonton, 1982

CLRA
CANADIAN LAND RECLAMATION ASSOCIATION

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# INTRODUCTION

Last Spring the Provincial Government's Reclamation Research Technical Advisory Committee presented a two day Reclamation Research Seminar at the Chateau Lacombe. We were surprised by the large turnout and an overwhelming majority of those in attendance indicated the desirability of an Annual Reclamation Conference for Alberta which would focus on Policy and Practice as well as Research and which would include industry, academic and government participation.

These were very sensible suggestions though their implementation would exceed the mandate and manpower of the Reclamation Research Technical Advisory Committee. So various groups were contacted to sponsor and help organize the Conference. Positive responses where received from the Canada Land Reclamation Association (CLRA) The Alberta Government's Land Conservation and Reclamation Council, The Coal Association of Canada and The Oil Sands Environmental Study Group (OSESG).

The CLRA authorized formation of an Alberta Chapter to serve as the umbrella organization with a Program Committee consisting of representatives of the Government and the two Industry groups. Through this Conference and perhaps other functions the Alberta Chapter of the CLRA can fulfill two important roles:

1. To provide an opportunity for members of the Reclamation community to meet, exchange experiences or argue and otherwise improve communications among its industry, government and academic factions.

2. To provide a public forum for reclamation activities, capabilities, issues and challenges.

This was the first function of its kind in Alberta. Special thanks are due the Sponsors, Speakers and the other Members of the organizing Committee: Jennifer Hansen, Malcolm Ross and Al Fedkenheuer. Their talents and efforts made the Conference a success.

One final word on the Speakers: they were given very short notice of the Conference and not only responded enthusiastically but prepared presentations which were of remarkable quality and consistency. We are fortunate to have individuals of this caliber working in the Field of Reclamation in Alberta.

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