R. Schneider

9. Putting it all Together

The Alberta Forest Conservation Strategy (AFCS), representing several years of deliberation among a full spectrum of forest stakeholders, provides the foundation for a new approach to forest management in Alberta (AFCSSC, 1997:1):

> *The Alberta Forest Conservation Strategy calls for significant change in how activities are planned and carried out in forest ecosystems at the legislative, commercial and personal level. The change has to do with giving forest ecosystems first consideration in all that we do, to ensure that the forest and forested lands of Alberta will continue to provide a sustainable flow of goods and services for many generations to come.*

According to the AFCS the implementation of this new system of forest management is to be based on the paradigm of Ecological Forest Management (EFM) (AFCSSC, 1997:11). In the previous three chapters I have reviewed the basic concepts of EFM, as described in the scientific literature. Here I pull the pieces together to illustrate what a workable system might look like in Alberta.

Integrated Management Plans

The objectives of the AFCS cannot be achieved without long-term integrated planning. This entails developing a comprehensive integrated management plan that governs resource allocation, coordinates the activities of all operators on the landscape, and guides regulatory decision-making. Regional differences in land use patterns and forest characteristics dictate that a set of regional plans will be required, not just a single plan. The number of regional management plans for northern Alberta should be limited to four or five to ensure that planning areas are large enough to achieve large-scale ecological objectives.

The plans should not be overly prescriptive, but instead should focus on defining a set of measurable ecological and socio-economic objectives that are relevant across a long planning horizon (e.g., 100 years). Together, these objectives should effectively define a desired future forest that is consistent with the AFCS and bounded by realistic expectations of what can actually be achieved (AFMSC, 1997: 4).

Benefits of Regional Planning

A shift to fully integrated forest-based planning is a prerequisite for managing cumulative impacts and maintaining the ecological integrity of the forest. But regional planning has many additional benefits that make it highly desirable. These benefits include:

1. Cost savings. Cumming and Armstrong (1999) have shown that major savings in the cost of hauling timber and constructing roads could be achieved through a system of regional harvest planning. Harmonizing the construction of roads among industrial sectors would result in additional savings. It is also simpler and more cost effective to develop a single harvest plan for a region than it is to develop several overlapping plans independently .
2. Reduced inter-sectoral conflicts. The number of operators from different industrial sectors is now so high that land use conflicts have become commonplace (Ross, 2001). Regional planning provides a way of dealing with these problems proactively and systematically.
3. Increased productivity. A transition to regional management would enable the widespread implementation of mixedwood management. By harnessing natural processes instead of working against them, this approach increases the overall productivity of the forest relative to monoculture plantations (Lieffers et al., 1996).
4. Stable softwood harvest. Under the existing management regime the current volume of softwood harvest cannot be sustained (see Chapter 5). Cumming and Armstrong (1999) demonstrated that regional harvest planning could alleviate the looming shortage of softwood timber by making better use of the available wood. Regional management that incorporates floating old-growth reserves would also maintain the supply of large logs required by mills that produce dimensional lumber.
5. Effective monitoring and reporting. The current jumble of forest management plans and limited requirements for compliance monitoring make it exceedingly difficult for the public to ascertain how well forestry companies are managing the forest. The impacts of the petroleum sector are even harder to assess, given that literally hun-

dreds of companies are operative in any given region and there is no comprehensive system for tracking their activities. The adoption of a regional approach to management would greatly facilitate monitoring and regular reporting to the public on the overall state of the forest.

6. Protected areas. Under the current system forestry companies with cutting rights in a proposed protected area bear the brunt of the lost harvest volume, while others are unaffected. Regional planning, involving reform of the tenure system, removes this barrier to the establishment of new protected areas by distributing any reduction in harvest volume among all companies. Protected areas can, therefore, be located where they are most needed to fulfill their role as representative benchmarks, not relegated to areas that are otherwise undesirable.
7. Access to markets. Regional management plans designed to maintain ecological integrity of the forest should meet the environmental criteria for the highest standards of forest certification. Therefore, all companies operating under the regional plan should be certifiable and thereby maintain their access to markets in the future.

Plan Development

The primary role of the regional planning process is to define clear and measurable management objectives that will achieve the vision and goal of the AFCS. This entails finding a balance between ecological and economic objectives, in the context of the desired future forest.

The first step is to assign all responsibility for regional planning to a single government agency. The plans developed by this agency must constrain and guide decision-making by other government agencies that handle the mechanics of project approvals and operational planning. This implies a shift to hierarchical decision-making, which would entail significant organizational restructuring within government. The Division of Integrated Resource Management could fulfill the role of regional planner; however, it currently lacks the resources and political backing required to do so. The extent to which additional support is provided to this Division in the future will serve as a measure of the government's commitment to the reform of forest management.

The entire planning process must be bounded by the finite ability of the forest to meet the demands placed on it, as not all desired futures are possible (AFMSC, 1997: 4). To do this the plan must demonstrate that a workable management approach exists for achieving all of the objectives. This latter requirement enormously complicates matters because there is no direct way to work backward from the desired outcome to the process of getting there. Instead, management regimes must be developed and assessed in a process of iterative refinement.

The process of exploring and assessing alternative management regimes is facilitated by computer models serving as decision-support tools. Given the inherent complexity of forest ecosystems and human land uses, these models must in fact be considered a necessity. The tools that are currently available include *ALCES* (see Chapter 5) and *TARDIS* (Cumming and Armstrong, 1999), both of which were developed in Alberta. These models project the state of the forest into the future under alternative management regimes, providing a variety of ecological and economic measures as output.

In practice, development of regional plans will likely require an iterative process, facilitated and led by the Division of Integrated Resource Management (with scientific and technical support). The government's role would be to lead stakeholders through a process of defining alternative management scenarios and assessing their relative merits in the context of the desired future forest (AFMSC, 1997: 4). The basic elements of such a process have been incorporated into a pilot project involving the northern East Slopes (AE, 2002). Because the pilot is still underway as of this writing it is too soon to determine how well it will achieve the objectives I have outlined here.

Because the development of management plans will likely involve regional stakeholder groups, the potential exists for local economic interests to be overrepresented. Local economic interests may be directly impacted by the management plan; therefore, it is certainly appropriate that their input is included in the process. However, economic objectives cannot be permitted to override the ecological objectives expressed in the AFCS. If insufficient input regarding ecological objectives is provided through a regional stakeholder process, then steps must be taken to obtain it through alternative means. One solution is to establish a provincial advisory board charged with ensuring that ecological objectives are adequately and consistently incorporated into the regional plans. Ultimately, it is the duty of the government, as manager and primary steward of the forest on behalf of the public owners, to make management decisions that reflect the broad public interest.

In its final form each regional management plan must provide a set of well-defined and measurable management objectives applicable to the entire planning region. The following is a list of the key elements that should be included:

1. Zonation. The plan needs to define the boundaries of protected areas within the planning region. Selection of sites should follow the design principles described in Chapter 7. The location of areas where intensive forest management is permitted, if any, also needs to be defined. All remaining forest should be managed according to the principles of EFM.
2. Ecological objectives. The ultimate ecological objective, as specified in the AFCS, is the maintenance of the ecological integrity of the forest, including the maintenance of biodiversity. However, this objective is difficult to apply in practice. Therefore, the management plan needs to include a series of sub-objectives that collectively ensure that critical ecological processes and the habitat needs of most species are maintained. Examples of these "coarse filter" objectives include the proportion of forest to be retained in the old-growth stage, the maximum density of roads and other linear features, and targets related to the emulation of natural disturbances (see Chapters 6 and 8 for more detail). Additional "fine filter" objectives will need to be specified for species that have unique habitat requirements or are at risk of extinction.
3. Socio-economic objectives. The management plan should define the maximum volume of timber harvest consistent with the maintenance of ecological integrity (as determined through modelling exercises). Given that sustained-yield management has maximized harvest rates at the expense of long-term ecological objectives, a rebalanc-

ing of objectives under the new system implies a reduction in the rate of harvest. Socio-economic objectives should also include measures of long-term sustainability of economic benefits, and cultural benefits that cannot be defined in economic terms (e.g., traditional land-use practices).

Implementation — Forestry Sector

A major overhaul of harvest planning will be required to implement the regional management plans as described. The current hodgepodge system divides responsibility for harvest planning among multiple overlapping tenure holders and the government, making it all but impossible to achieve regional ecological objectives. For example, maintaining large-scale spatial patterns through aggregated harvest or implementing a system of floating old-growth reserves cannot be accomplished under the current system.

The solution is to place all responsibility for harvest planning back with the Land and Forest Service (under the direction of the Division of Integrated Resource Management), reversing the recent trend towards devolution of management responsibility. I make this recommendation with some trepidation because it has been industry, not government, that has shown leadership in implementing EFM over the past several years. However, from a longer-term perspective government control of the process is a necessity. The problem is that only a few forestry companies have demonstrated meaningful progress. Furthermore, companies that have embraced EFM, such as Al-Pac and Daishowa-Marubeni, may be sold tomorrow. In fact, this is exactly what has happened to Daishowa's northern operations, which are now reverting back to sustained-yield management under Tolko. There is also a serious problem in accountability. Expecting forestry companies that are in the business of cutting down trees to maintain the ecological integrity of forests as their top priority presents too great a conflict of interest. Finally, too many factors affecting the forest are beyond the ability of forestry companies to control.

The Land and Forest Service currently does not have the staff or resources required for the complex and technically intensive process of long-term harvest planning. Consequently, the Service has to be substantially expanded or, alternatively, the technical aspects of planning have to be contracted out. Either option is workable. Organizations that currently have the capacity to undertake harvest planning at the regional scale include forest management companies such as Timberline and the planning departments of larger FMA holders. To maintain stability and continuity, outsourcing would have to be done on the basis of exclusive long-term contracts (e.g., five years). To maintain innovation and efficiency the renewal of contracts should be opened to tender.

The final step required for implementing the regional plans is a reallocation of the timber supply. Current allocations, based on sustained-yield management, need to be aligned with the harvest volume defined in the regional management plans. In addition, area-based Forest Management Agreements need to be converted to volume-based tenure agreements to facilitate zonal planning and the implementation of aggregated harvest protocols (see below). The reallocation of timber supply could be done by direct government assignment, as has been done in the past. Alternatively, it could be accomplished through a free-market system whereby companies bid for long-term (e.g., 20-year) volume rights. A benefit of the free-market approach is that it may help resolve the softwood lumber dispute with the United States. During a transition phase of perhaps five years, current harvest volumes of all existing forestry companies would be maintained. After the phase-in period the total harvest volume would be limited to the maximum rate defined in the regional management plan.

Implementation — Petroleum Sector

Although the petroleum industry cuts almost the same area of forest as the forestry industry, the two sectors are fundamentally different. Trees are the commodity on which the forest industry is based, whereas for the petroleum sector trees are just something that gets in the way. The lack of a vested interest in the forest explains why the petroleum sector has never engaged in reforestation or landscape planning (though one wonders why the government has never compelled it to do so). As a result, the gulf between the current system of management and EFM is much wider for the petroleum sector than for the forestry sector. On the positive side, there is no intrinsic reason for the petroleum sector to oppose a reduction in rate of cutting, as long as access to underground reserves remains possible.

Ideally, regional harvest plans developed for the forestry sector should be fully integrated with long-term operational plans that define the spatial layout and timing of future petroleum developments. This approach would minimize the additive impact of the two sectors. Unfortunately, the petroleum sector in Alberta is not at all amenable to centralized operational planning. Whereas there are only 11 companies with area-based tenures in the forestry sector, there are several hundred companies with area-based tenures in the petroleum sector. Moreover, subsurface mineral leases are typically only a few hundred ha in size; therefore, regional management plans would impinge upon literally thousands of existing leases worth hundreds of millions of dollars. An even more fundamental problem is that finding and developing underground petroleum reserves involves a fair degree of chance. Therefore, it is not possible for a centralized operating plan to assign a specific volume of oil to a petroleum company in the same way that a specific volume of wood can be assigned to a forestry company. Finally, the pace of activity in the petroleum sector is influenced primarily by economic factors, which introduces substantial variability into the timing of petroleum developments.

If centralized operational planning of the petroleum industry is not possible, then integration of activities must occur at the level of the regional management plan. This could be accomplished by setting limits on the amount of cumulative disturbance, using such measures as total area in a non-forest state and density of linear features. Under this system petroleum companies would retain their existing subsurface tenure rights, but the right to disturb the forest would be subject to a competitive bidding process. The cost of these disturbance rights would provide an incentive for petroleum companies to implement practices that minimize the amount of disturbance. Restoration would be another option, and in fact would be a requirement in areas where the disturbance threshold had already been reached.

If the right to conduct surface disturbance became a tradable commodity, then the future of the forest industry might come into question. This is because the petroleum sector, generating 100 times the revenue of the forestry sector, may find it expedient to simply buy out forestry companies to garner their disturbance rights. If such a scenario was not felt to be in the public interest then the regional plan could reserve a fixed proportion of the disturbance allocation for the forest industry. The petroleum industry would have to work with what is left.

Legislative Reform

The Division of Integrated Resource Management has initiated a process of regional planning that could realize the changes in forest management I have described. But experience with similar initiatives in the past suggests that success will not be forthcoming unless changes in policy are supported by changes in legislation. In his review of the current Integrated Resource Management initiative, Kennett (2002) drew the following conclusions:

> *The reliance on policy instruments without detailed legal underpinnings would have three implications for regional strategies. First, interested parties would not be able to rely on specific legal requirements in the event that the proposed process for developing and implementing regional strategies is not completed, or the manner in which it is carried out is contested. Second, regional strategies as integrative mechanisms would be subordinate to other legal mandates and requirements that may not fully reflect principles of Integrated Resource Management. There would be no legal accountability mechanism should decision makers fail to comply with them. Finally, the failure to entrench the regional strategy process and its products in legislation would increase their vulnerability to shifts in political direction and funding priorities, such as those that undercut the [earlier] Integrated Resource Plan process.*

It seems clear that reform of forest management must be accompanied by legislative reform. In fact, the AFCS includes a formal recommendation to this effect (AFCSSC, 1997: 6). Given that most legislation pertaining to forest management dates back to the 1950s, such reform is long overdue. The updated *Forests Act* should enshrine the concept of EFM and the key elements of the AFCS as the basis for forest management in Alberta. In addition, the statutory basis for land-use planning needs to be streamlined and should provide the mandate and procedural requirements for developing integrated regional plans and controlling cumulative industrial impacts.

Lessons from Ontario

The notion that reforms as described here might actually be implemented may, to some, seem farfetched. In fact, reforms of a similar nature and magnitude have already been realized in British Columbia, Ontario, and the Pacific Northwest of the United States.

The changes in forest management that have taken place in Ontario over the last decade are particularly illustrative of what might be accomplished in Alberta, given that both provinces share vast expanses of boreal forest and a Conservative government. Reforms in Ontario began with a class environmental assessment of Ontario's system of forest management, lasting from 1987 until 1992 (Euler and Epp, 2000: 278). The outcome of this assessment was a set of recommendations that share a remarkable similarity to the recommendations of the AFCS. Notably, both processes recommend that sustained-yield management be superseded by EFM (Euler and Epp, 2000: 280).

The major difference between the two review processes is that in Ontario the recommendations were actually implemented. To start, the concept of placing the integrity of the forest first was enshrined in the *Crown Forest Sustainability Act* (GOO, 1994: sec. 1):

> *The purposes of this Act are to provide for the sustainability of Crown forests and, in accordance with that objective, to manage Crown forests to meet social, economic and environmental needs of present and future generations. In this Act, "sustainability" means long term Crown forest health.*

The *Act* also defines two principles by which sustainability is to be determined (GOO, 1994: sec. 3):

> *1. Large, healthy, diverse and productive Crown forests and their associated ecological processes and biological diversity should be conserved.*
>
> *2. The long term health and vigour of Crown forests should be provided for by using forest practices that, within the limits of silvicultural requirements, emulate natural disturbances and landscape patterns while minimizing adverse effects on plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values.*

In addition to defining the general objectives of forest management the *Crown Forest Sustainability Act* also establishes requirements for planning. In particular, managers must prepare an explicit analysis of how forest management will affect the landscape, including measures of diversity (Euler and Epp, 2000: 286). There are also requirements pertaining to adaptive management and public input.

The reform of forest management in Ontario also included a process for establishing additional protected areas in the commercial forest zone. Through this process 378 new parks totaling 24,000 km^2 were established in 1999 (OFAAB, 2001). Discussions concerning the designation of additional areas are currently underway.

The Natural Disturbance Model

Under EFM, harvest planning and operational practices are to be based on the emulation of natural disturbances. Operating guidelines for implementing this approach at the stand-level are now becoming available in the scientific literature (e.g., Song, 2002; see Chapter 6). An important unresolved issue is how to adequately emulate the structural legacy left after fire in the form of standing dead trees and fire skips. Leaving clumps of live trees on cutblocks and limiting the salvage logging of fire-killed trees are both useful approaches. The question is, how much is enough?

In this instance ecological and economic objectives are diametrically opposed; therefore, the issue is not only a scientific one. Stakeholders need to evaluate the inherent tradeoffs through the exploration of alternative management scenarios and the final decision needs to reflect the broad public interest. Researchers should structure their studies and present their results in a way that facilitates this process. Studies that demonstrate the change in ecological response across multiple levels of a management intervention are of particular value. Once the decisions have been made they should be incorporated in an updated version of the provincial *Operating Ground Rules*.

At the landscape-scale the emulation of natural disturbances involves the application of harvest planning protocols that maintain landscape patterns similar to those produced by fire and natural regeneration (see Chapter 6). The pre-industrial forest provides the appropriate target landscape, when characterized at the scale of the regional management plans. Other approaches for defining the target landscape are theoretically possible, but are impractical to implement.

The full benefit of the natural disturbance approach can be realized only if it includes the emulation of very large fires, because these fires have the greatest ecological effect and account for most of the cumulative area burned. Emulating large fires requires that most forest harvesting be concentrated in a small number of sites. The size of these aggregated harvest areas would likely be in the range of 1-3 townships (100-300 km^2). Harvesting would take place over a relatively short period (e.g., 10-20 years), resulting in a reasonable approximation of a large even-aged patch. Further emulation of fire patterns could be achieved by leaving some stands unharvested, to represent fire skips, and by leaving residual structure within cutblocks, as previously described. Recent research by the Alberta Research Council recommends that up to 30% of merchantable trees should be retained in cutblock residuals, unharvested stands, and riparian buffers (Schieck and Song, 2002).

Intensive regeneration techniques, such as ground scarification, genetically selected stock, and herbicides, should not be used except on sites where natural regeneration is likely to fail and in intensive management zones defined in the regional plan. In mixedwood forests great care must be taken to preserve understory spruce and clumps of seed trees at the time of harvest because these trees are vital to the regeneration of softwoods under a low intervention approach. After harvesting has been completed all roads would be reclaimed and the site left undisturbed for an extended period (e.g., 100 years).

To many in the conservation community the thought of implementing large harvest blocks is anathema. But this approach is actually far superior to the existing system of dispersed harvest for maintaining ecological integrity of the forest. The main reason is that the dispersed system of harvest requires the construction and maintenance of an extensive road network to provide continual accessibility to the entire management area. The existence of a permanent road network that permeates the forest to such a degree presents an unacceptable risk to the integrity of the forest. Secondly, aggregated harvest is necessary for achieving large-scale landscape patterns similar to those produced by fire. Maintaining large patches of old-growth could be accomplished by delaying the subsequent harvest of selected harvest sites for an extended period (i.e., floating old-growth reserves). Finally, by concentrating the harvest in a few areas, the majority of the management area would remain undisturbed. This is particularly significant when one considers that many management techniques designed to speed the regeneration of conifers involve multiple entries to the stand. It also means that only a small part of the forest will be exposed to early management trials, which carry the greatest uncertainty and highest risk of failure.

If the total area of harvest is held constant, then the implementation of an aggregated system of harvest will likely result in a reduction in harvest volume. This is because stands are selected for harvest on the basis of location, not volume, which is opposite to the current system. Moreover, many of the high-volume stands that might have been immediately harvested will lose volume due to aging before they are eventually scheduled for harvest. Older stands may also face a higher risk of fire. Finally, the removal of roads after harvest precludes the use of multiple-entry management techniques designed to maximize the rate of regeneration of conifers. This includes some of the techniques that have been proposed for mixedwood management. A further reduction in harvest volume will likely result from the implementation of measures to maintain old-growth.

Because implementing the natural disturbance approach at the landscape-scale is likely to result in a reduction in harvest volume it is again necessary to weigh tradeoffs between ecological and economic objectives. The evaluation is particularly challenging in this instance because many interacting variables need to be considered. For example, the number and size of aggregated harvest sites and the duration of harvest are all open to adjustment. Similarly, the number of old-growth reserves, their total area, and duration of existence are open variables. Cost savings through reduced road maintenance (which are likely to be considerable) and the additional cost of rebuilding roads after being reclaimed also need to be considered, along with the impact of wildfire. The "best" combination of variables will be that which stakeholders feel presents the correct balance between ecological and economic objectives, within the bounds of the AFCS. Making this decision will require an iterative approach involving computer models, as described in the section on regional plan development.

To this point I have avoided mention of the petroleum industry in the context of the natural disturbance model. This is because there is no natural disturbance analogue for most petroleum activities and because it is very difficult to incorporate petroleum activities into long-term plans. One solution is to locate aggregated harvest sites in areas that have the highest potential for petroleum development. But this is only a partial solution because few harvest sites will be active at any time. In parts of the management area where the forest industry is not active disturbances by the petroleum industry should be reduced to the point that their ecological effects are negligible. Such "best" practices are already being implemented in areas of native prairie (Sinton, 2001). Similar practices applicable to forested areas have been developed, but are not yet in widespread use. Some examples of "best" practices include:

- minimizing road infrastructure by using existing roads or temporary winter access as much as possible, coordinating the construction of new roads with other industrial users, and removing well site access roads after drilling has been completed;
- minimizing cumulative linear disturbance by maximizing the spatial overlap of roads, seismic lines, pipelines, and power lines;
- limiting the width of seismic lines to 1.0 m on average and reforesting lines immediately after use;
- utilizing a meandering course when cutting seismic lines as well as intermittent blockage to preclude a linear corridor effect;
- well sites limited to 0.25 ha in size or less and multiple wells drilled from common pad;
- well sites immediately reforested after decommissioning;
- use of alternatives to fresh water for enhanced oil recovery; and
- reduction in flaring, spreading of oil wastes, and other forms of pollution.

Implementing even this preliminary list of best practices would be of enormous benefit in managing cumulative industrial impacts. To demonstrate this I incorporated a set of best practices into a new run of the *ALCES* simulation from Chapter 5 (Fig. 9.1). Using *ALCES* in this way also illustrates how models can be used to evaluate alternative management scenarios (though in practice additional output measures would be requested).

Adaptive Management and Protected Areas

The approach to planning presented in the previous sections presumes that the information required to make informed decisions is available. In reality, there are many gaps in our knowledge.

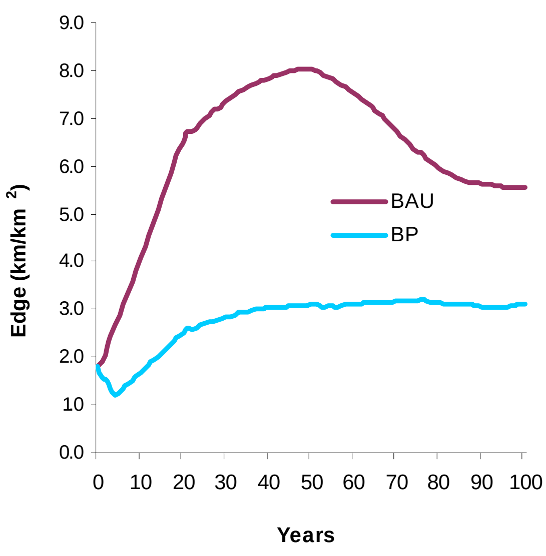

Fig. 9.1. Total density of linear disturbance edge in the Al-Pac FMA, predicted by ALCES simulation. BAU = Business as usual (see Chapter 5). BP = Best practices: 50% overlap in linear features; 50% road harmonization; seismic lines = 1.0 m and immediately reforested.

These gaps are most evident with respect to our understanding of ecological responses to human disturbances, especially at larger spatial scales and over longer periods of time. This is largely because large-scale long-term studies are difficult and costly to plan and implement and because natural systems are tremendously complex.

Because our knowledge base is incomplete it is important that decision-making be conducted in the context of the adaptive management approach, together with a healthy dose of the precautionary principle. Under adaptive management, management scenarios are treated as hypotheses, not fixed expectations (Walters, 1997). Careful monitoring is conducted to determine whether the system is in fact responding as expected. If not, adjustments are made to assumptions, models, and management practices in an effort to rectify the observed deviations. By implication, regional management plans and long-term harvest plans must be considered living documents that require continual updating and revision.

Two types of monitoring are required to support the adaptive management process. The first is compliance monitoring, designed to verify that the management plan is being carried out as planned and that operational targets are being achieved. The second is biodiversity monitoring, designed to evaluate whether the plan is fulfilling its ultimate mandate of maintaining biodiversity in the face of industrial activity. The provincial biodiversity monitoring program (www.fmf.ab.ca/bm.html), now in the pilot phase, is ideally suited for meeting the biodiversity monitoring needs of adaptive management. This program should be implemented as soon as possible.

In addition to the *reactive* use of adaptive management, as described above, this approach can and should be used in a *proactive* manner (also known as passive vs. active adaptive management). With proactive adaptive management an effort is made to identify key uncertainties inherent in the management scenarios while they are being developed. Experimental management trials are then implemented on the landscape in an effort to resolve these key uncertainties, leading to more robust predictions and better management decisions.

Our limited understanding of natural systems and the inherent limitations of the natural disturbance model dictate that an expanded system of protected areas be established to help manage the risk of species loss on the industrial landscape. Protected areas also function as ecological benchmarks, providing appropriate control sites for monitoring under adaptive management and sites for future research into natural systems. Design criteria for selecting new protected areas and the optimal location for a set of new large areas designed to fill existing gaps in ecosystem representation were described in Chapter 7.

Economic Realities

Forestry Sector

The factor most responsible for impeding the implementation of EFM is concern over diminished economic returns. Within the forestry sector, new requirements for maintaining oldgrowth, leaving residual live trees in cutblocks, establishing new protected areas, and implementing an aggregated harvest system will collectively reduce the volume of timber harvest from current levels. Some of the loss in timber flow will be offset by gains in efficiency and productivity under the new system (Cumming and Armstrong, 1999), but not all of it.

Scientific research and computer-based decision-support tools will help clarify and quantify the exact nature of trade-offs between ecological and economic objectives. However, the final decision is not a scientific one — it ultimately hinges on societal values (given that the forests in question are publicly owned). In this context, industrial claims that EFM is too "costly" to implement amount to an assertion that societal benefits from the forest industry are so great that they justify precedence over ecological objectives.

One way to evaluate the importance of the forest industry to society is to tally the revenue it generates for the province. In fiscal year 2001, revenue to the Government of Alberta, in the form of timber royalties and fees, was $72.9 million (AE, 2001: 47). An additional $303 million was received in the form of corporate income tax and property tax, for a total return of $376 million (AFPA, 2001). This amounts to 1.8% of the total provincial revenue in 2001 of $21.2 billion (GOA, 2002). But the province also incurs costs in maintaining the forest industry. These costs relate to harvest planning for quota holders, regulatory approvals, compliance monitoring, policy development, fire protection, fish and wildlife management, construction and maintenance of highways and grid roads, and a range of other items. At various times the province has also absorbed millions of dollars in loan defaults by forestry companies. A breakdown of the cost of these various activities is unavailable, but total expenditures for Alberta Environment in 2001 (which also had partial administrative responsibility for the petroleum sector) were $361 million (AE, 2001: 47). The implication is that the forestry sector's impact on the provincial economy is minor, and possibly negligible once all costs are figured in.

Another measure of the societal benefit of the forest industry is employment. According to Pratt and Urquhart (1994: 15) employment, not rent collection, may in fact have been the government's primary policy objective in its expansion of the forest industry. However, the decision to expand the industry through large, technologically advanced pulp and paper mills, at the expense of labour-intensive local mills, meant that only about 4100 jobs were added as result of the expansion in the late 1980s (Pratt and Urquhart, 1994: 7). In 2000, total direct employment in the primary forestry sector (including logging, lumber mills, pulp and paper, and panelboard) was 11,352 (AFPA, 2001). This amounts to 0.7% of the 1,627,300 Albertans employed in 2002 (AHRE, 2002). The implication is that the forestry sector is of very minor importance as a source of employment. In fact, more individuals are directly employed in the operation of parks than in the forestry sector, despite the large disparity in the land base of the two sectors (Dobson and Thompson, 1996) (Fig. 9.2).

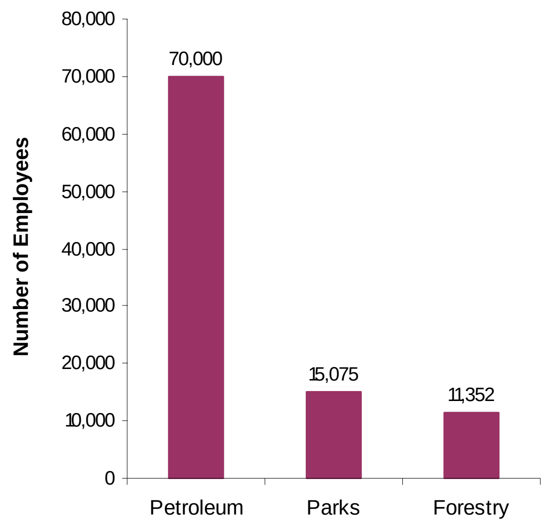

Fig. 9.2. Direct employment in major industrial sectors in Alberta. Sources: Petroleum (2001) = SC, 2002; Parks (1994) = Dobson and Thompson, 1996; Forestry (2000) = AFPA, 2001.

In conclusion, societal benefits from the forest industry are relatively minor in Alberta. It should be possible to implement EFM without any noticeable economic repercussions at the provincial level. Certainly, reform of the tenure system, reallocation of timber, and implementation of new operating practices will be disruptive for many forestry companies in the short-term, to a greater or lesser degree. But in the long-term the new system promises increased stability. In particular, by maintaining old-growth on the landscape and reducing the rate of softwood harvest to a level that is sustainable over the long term, the new system will prevent a serious shortfall in softwood timber and a reduction in log size in future decades. Given that the wood manufacturing sector (cabinets, furniture, flooring, etc.) accounts for even more jobs than the primary forest sector (AFPA, 2001), stability in the supply of high-quality softwood logs is especially important. A transition to EFM will also mean that companies in Alberta will not be denied access to markets once forest certification becomes prevalent.

Petroleum Sector

In contrast to the forest industry, there can be no doubt that the petroleum industry is vital to Alberta's economy (Fig. 9.3). However, this does not imply that the existing system is the best one, or that controls on landscape-level impacts of the petroleum sector are inappropriate. Again, it is a matter of balancing economic and ecological objectives.

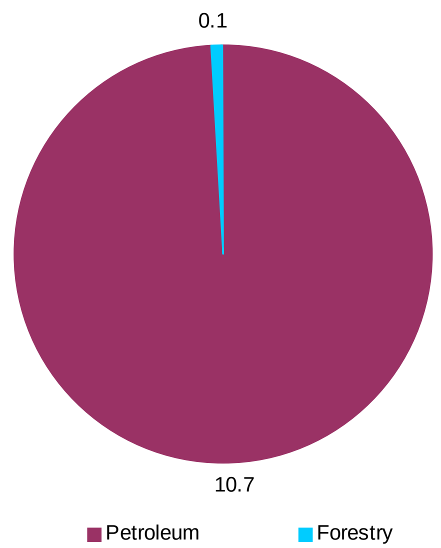

Fig. 9.3. Revenue ($ billions) of the petroleum sector and forestry sector in Alberta in 2001. Sources: Petroleum = ARD, 2001; Forestry = AE, 2001.

The first point to be made is that many practices designed to reduce the ecological footprint of the petroleum sector will actually result in cost savings for the industry. A case in point is the integration of road construction between the petroleum industry and the forest industry. A pilot study involving the 500 km^2 Gulf Surmont project southeast of Fort McMurray demonstrated that integrated planning with Al-Pac would result in a 50% decrease in road construction, relative to conventional planning, and a cost saving of approximately $1.1 million (Pope, 2001). Seismic programs are another area where ecological and economic benefits could both be realized. Once new enviro-drills become widely available it should be possible to cut narrow seismic lines with less effort, and cost, than the 5-7m wide lines that are cut today using bulldozers. Moreover, petroleum companies will save millions of dollars per year in reduced timber damage fees paid to forestry companies and may gain additional millions in the form of carbon credits.

Another point of consideration is that the rapid pace of petroleum development in Alberta is largely predicated on a system of low economic rents. According to a recent study by the Parkland Institute, this system is costing Albertans billions of dollars a year in foregone royalties and taxes (Macnab et al., 1999: 9). Meanwhile, excessive growth of the petroleum industry is causing social disruption in northeast Alberta (Parkinson, 2001) and enormous environmental degradation. By raising royalty rates, the pace of petroleum development could be moderated to a more appropriate level, without a significant decline in revenue flow. Furthermore, this approach would maximize the value of non-renewable petroleum resources to Albertans. Other comparable jurisdictions, such as Alaska and Norway, have successfully employed a strategy of high rents while maintaining a prosperous petroleum industry and building petroleum savings funds substantially larger than Alberta's (Fig. 9.4).

A Time for Change

Although the boreal forest presents a seemingly endless expanse, it does in fact have limits, and they are now being reached. The days of the open frontier are over, and the attitude that the forest can be all things to all interests is no longer tenable, if indeed it ever was. The time for change has come.

Many of the prerequisites for changing course are already in hand. The AFCS supplies the consensus vision and goals and a set of fundamental principles that are to guide forest management in

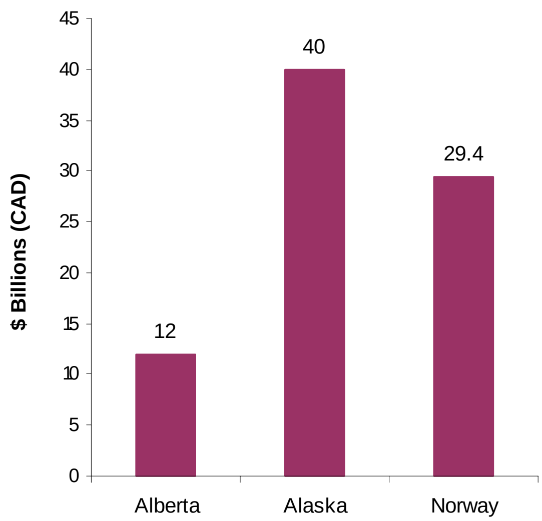

Fig. 9.4. Size of petroleum savings fund in Alberta (Heritage Fund), Alaska (Permanent Fund), and Norway (Petroleum Fund) in 1997. Source: Macnab et al., 1999.

the future. EFM provides the conceptual framework for achieving these new goals. Finally, the scientific and legal communities in Alberta, together with a few progressive forestry companies, have been working to develop policies and practices for putting the concepts of EFM into practice. The next step is wide-scale implementation.

Implementation involves organizational restructuring, the development of integrated management plans, and reform of legislation, regulations, and practices. The government's establishment of the Division of Integration Resource Management and its initiation of an integrated management planning process represent important steps in this direction. The next and most crucial step is to undertake the fundamental legal and regulatory reforms required to bring the process to a successful conclusion.

Unfortunately, there is no indication that the government is prepared to undertake anything but incremental change. In the five years since the AFCS was released it has been industry (i.e., a few progressive forestry companies), not government, that has shown leadership and made demonstrable progress in implementing EFM. Government action has been largely limited to policy pronouncements and the initiation of additional consultative exercises. Most troubling is the fact that the new consultative processes fail to include the AFCS as a starting point! On the ground, forests continue to be allocated on the basis of sustained-yield management; antiquated operating ground rules remain in effect; cumulative industrial impacts remain unregulated; companies continue to plan their operations independently; and the entire process is still governed by 1950s-era legislation. Furthermore, the political power base continues to reside in the departments of Energy and Sustainable Resource Management, not in the Division of Integrated Resource Management, suggesting that the political will to effect major reforms is lacking.

The government's reluctance to engage in meaningful and timely reform is remarkable on several counts. First, the AFCS represents a consensus that included the Alberta Forest Products Association and the Canadian Association of Petroleum Producers as signatories. Second, a large majority of Albertans, the ultimate owners of the resource, desire protection of the forest over development (Fig. 9.5). Finally, EFM is recognized by the scientific and management community as the state-of-the-art in forest management, while sustained-yield management has effectively been discredited.

The government's aversion to forestry reform can perhaps best be understood through comparison with other jurisdictions. As it turns out, initial reluctance to embrace EFM, or any major

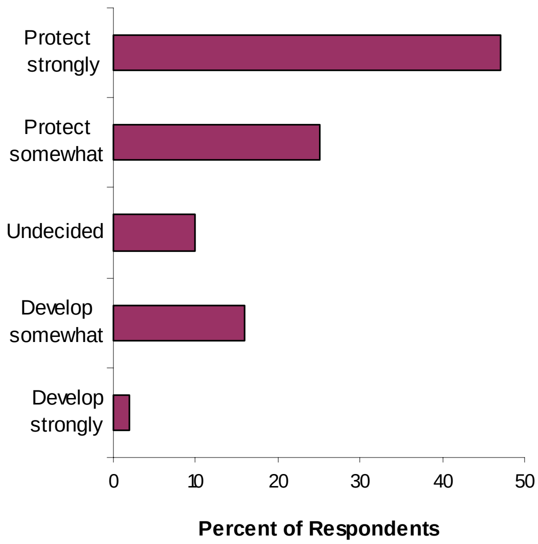

Fig. 9.5. Response of prairie province residents to the question: Is it more important to DEVELOP the boreal forest as an economic resource OR is it more important to PROTECT it in its natural state? Source: MacAllister Opinion Research, Sept. 2001 poll for Canadian Boreal Trust.

change for that matter, is not uncommon. Political scientist Jeremy Wilson, in his analysis of 30 years of forestry policy in British Columbia, provides insight into why this may be so (Wilson, 1998: 334):

Governments the world over muddle through. They try to plan, but mostly they react. They spend a fair bit of time grappling with states of full or partial paralysis brought on by uncertainty, inadequate information and capacity, internal divisions, and conflicting advice or pressures. For the most part they move incrementally. Overwhelmed by the complexity of problems they confront, decision-makers lean heavily on preexisting policy frameworks, adjusting only at the margins to accommodate distinctive features of new situations. Occasionally, when the planets are aligned, governments seize the opportunity to consolidate disparate policy tendencies into a coherent shift in policy direction.

Our government's reluctance to follow through with the reforms dictated by the AFCS may, therefore, amount to simple inertia. After more than 30 years in power, the Progressive Conservative party may simply be an old dog disinclined to learn new tricks. More specifically, having built a party platform rooted in economic development, it may be incapable of recognizing workable solutions that do not involve maximizing the rate of industrial profits. These basic tendencies are undoubtedly influenced and reinforced by strong industrial lobbies.

Despite the government's unwillingness to champion EFM, there is yet hope for our forest. The basis for this hope lies in another of Wilson's observations (Wilson, 1998: 343): "*Policy making is mostly about expediting or delaying the way immutable forces unfold, or about nudging the resultant change trajectories a few degrees to one side or another.*" The public's desire for ecological management is one of these immutable forces, and the ultimate implementation of EFM in Alberta is inevitable. It happened in the Pacific Northwest of the United States. It happened in British Columbia. It happened in Ontario. Eventually, it will happen in Alberta. The question is, how long will it take?

Until now the government has been able to successfully employ delay tactics based on re-labelling old ideas with new terminology and symbol-laden policy statements that are devoid of measurable objectives. But these tactics are effective for only a limited time. By adopting the language of EFM, the government becomes bound by the tests and standards of that model. Moreover, the capacity of external organizations to assess the government's performance against these tests and standards is rapidly increasing. Unless meaningful reforms are undertaken, the government's position will become progressively indefensible and untenable.

In a democratic system such as ours, indefensible policies and indifference to the broad public interest cannot be maintained indefinitely. Eventually, our leaders will be compelled to exert the political will necessary to see through the required reform of forest management. But time is of the essence. Every additional year of delay forecloses options and further diminishes the integrity of the forest. Therefore, it is incumbent on all Albertans who value the forest for the many benefits it provides, who abhor the idea that caribou and other species may become extinct, and who are concerned about the legacy we are leaving for our children, to make their voices heard.

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Glossary

Cohort: A group of trees (or other entities) of similar origin, and hence of the same age.

Ecological integrity: The degree to which all ecosystem components and their interactions are represented and functioning.

Ecosystem: An assemblage of populations of plants, animals, bacteria, and fungi, together with their environment, treated together as a functional unit..

Edge: The transition between two distinct patch types. In the text I primarily focus on the edge between human-caused features and intact forest.

Landscape: I use the term landscape to denote areas of a few hundred to a few thousand hectares (i.e., larger than a stand, but smaller than a region).

Mixedwood forest: Forest stands comprised of both hardwoods and softwoods. Mixedwood stands containing aspen and white spruce typify upland sites in Alberta's boreal forest.

Monoculture: Growth of a single species, such as white spruce, through artificial planting and the suppression of competing vegetation.

Natural Disturbance Model: An approach to forest harvesting that sets targets for forest structures and patterns based on the emulation of natural disturbance and renewal processes.

Patch: A group of contiguous stands that are of similar age and type (e.g., old-growth aspen).

Phase 3 inventory: A non-spatial forest inventory of the province completed in 1984 by the Alberta government. Based on aerial photography.

Region: I use the term region to denote areas of a few hundred square kilometers to many thousands of square kilometers (i.e., larger than landscapes). In most cases in the text I equate the regional scale with Natural Subregions.

Riparian zones: The forest adjacent to natural water courses.

Scale: Refers to the size (or type) of units within which observations are made. In the text I use three spatial scales: forest stands, landscapes, and regions.

Senescence: Deterioration and death associated with advanced age.

Snag: A standing dead tree from which the top has broken off.

Species richness: Refers to the number of species in a study area; one measure of biodiversity.

Stand: A group of trees that share a defined set of attributes (e.g., 80-year old, B-density aspen). Designation of stands is usually done through the interpretation of aerial photographs, focusing on the dominant tree species. Most stands are initiated through disturbance events such as fire.

Succession: Process of stand development over time involving tree maturation and death and changes in species composition. The predictable patterns of change, which are unique for each stand type, are referred to as successional trajectories or paths.

Sustained-yield management: Approach that seeks to achieve a sustained flow of timber from the forest, without explicit requirements for the maintenance of biodiversity or ecological function.

Understory: Plant life that exists beneath the canopy of large mature trees in a forest stand.