

# **The Hwy40 North Demonstration Project**

## ***Using Natural Patterns as the Foundation for Operational Planning***

### ***Part 1: How We Did It***

*Alberta Foothills Disturbance Ecology Demonstration Series  
Report No. 1*

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The Foothills Model Forest mission: We are a unique partnership dedicated to providing practical solutions for stewardship and sustainability on Alberta forestlands. What we learn will be:

- reflected in on-the-ground practice throughout Alberta and elsewhere in Canada, where applicable;
- incorporated in forest and environmental policy and changes;
- widely disseminated to and understood by a broad spectrum of society.

This will be the result of a solid, credible, recognized program of science, technology, demonstration and outreach.

## **ACKNOWLEDGEMENTS**

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## **THE DISTURBANCE ECOLOGY DEMONSTRATION SERIES**

This research report is the first in a series published by the Foothills Model Forest on the management application of natural disturbance research on foothills and mountain landscapes in Alberta. For more information on the FMF Natural Disturbance Program, or the Foothills Model Forest, please contact the Foothills Model Forest in Hinton, Alberta at (780) 865-8330, or visit their website at: <http://www.fmf.ab.ca>

## EXECUTIVE SUMMARY

The Foothills Model Forest (FMF) Natural Disturbance (ND) Program has been studying natural disturbance patterns in the foothills of Alberta since 1996. Although the research is far from finished, we have already gained considerable insight with respect to how natural disturbances shape our landscapes. While there have been many isolated efforts to integrate natural patterns into forest land management across Canada, none have tried to adopt a planning strategy that involves using natural patterns as the conceptual framework for *all* decision-making. The difference is that the former strategy uses natural patterns as a new set of decision-making filters, while the latter uses natural patterns as a default starting point through which all other objectives are filtered. This represents a fundamental shift in terms of process, but also a shift in philosophy since it imposes holistic, biological benchmarks as the underpinning of the planning process.

The ultimate deliverable of the Hwy40 North Demonstration project is to try to create a “*disturbance plan*” that includes all of the planned cultural disturbance activities (including harvesting, road building, seismic line and well-site installation) for a 10-year period. The disturbance plan will use natural patterns as the foundation for the location, sizes, shapes and numbers of disturbed patches, as well as the area, type and spatial distribution of undisturbed residuals. The design will integrate specific requirements of other management objectives as overlays or *filters*. One of our hypotheses is that by approaching operational planning in this manner, the needs of most if not all other planning objectives can be achieved.

The goal of the Hwy40 North Demonstration Project is thus ***to demonstrate the effectiveness of using natural disturbance pattern knowledge as the foundation for effective operational-scale forest management planning.*** The associated objectives are to:

- 1) Evaluate the robustness of a natural pattern strategy as a foundation for operational planning,
- 2) Identify and explore potential convergences and conflicts of adopting a holistic natural pattern strategy with existing policies, practices and other economic, social and ecological values, and
- 3) Build a common understanding of the concept and practice of adopting a natural disturbance based plan. The project will produce not only a disturbance plan, but also a series of reports that document the process and the lessons learned along the way.

A 70,000 ha study area was chosen along Hwy40 between Hinton and Grande Cache that includes parts of the Hinton Wood Products (HWP) and Alberta Newsprint Company

(ANC) Forest Management Agreement (FMA) areas, the Foothills Forest Products quota area, and the Willmore Wilderness Area. The study area forms a logical unit ecologically and functionally, and serves to test the capacity within Alberta to plan across jurisdictional boundaries – which is one of the fundamental requirements of adopting a natural pattern strategy.

The Hwy40 study area is one of the largest remaining areas of (largely) intact old foothills forest, includes part of the current habitat for the A la Pêche woodland caribou herd, represents an extreme risk to both wildfire movement and mountain pine beetle attack, and is rich in both timber and natural gas. It is also an area in which the three forest management companies involved will be planning harvesting operations over the next 10 years. In other words, harvest planning for this area by each partner would occur in the absence of the Hwy40 project.

After creating both an organizational hierarchy and a terms-of-reference, the responsibility for the actual planning was handed over to a multi-disciplinary team of 10 people representing Hinton Wood Products, ANC, Foothills Forest Products (replacing Weyerhaeuser Canada), Alberta Sustainable Resource Development (ASRD) forest management, ASRD fish and wildlife, ASRD forest protection, Alberta Energy, the Canadian Association of Petroleum Producers (CAPP), Alberta Tourism Parks, Recreation and Culture (formerly Community Development), and the Foothills Model Forest (FMF). Over the next two and a half years, the Hwy40 planning team met 16 times. The first few meetings were spent sharing an understanding of natural patterns, woodland caribou, wildfire threat, mountain pine beetle threat, timber planning and tenure systems, natural gas and oil planning and tenure systems, agency goals and objectives, and any other relevant practices and policies affecting any disturbance activities within the Hwy40 study area.

The team then agreed to adopt a rough outline of a planning process representing a blend of components from existing planning systems and some new elements. The existing planning elements were those required by existing policy and higher-level plans. The new elements included:

- 1) *A Terms Of Reference (TOR) that defines scope and responsibilities.* All planning exercises have an implicit TOR, but in most cases it is defined under the auspices of an appropriate regulatory guideline. In the case of Hwy40, there existed a unique set of circumstances that required a unique TOR. For example, the Hwy40 TOR specifically identifies the development of a 10-year *disturbance plan* that includes the total land base (and not just merchantable forest), advocates prescribed burning as a tool, and commits to investing in adaptive management.

- 2) *A sequence of questions for each planning decision designed to focus the planning process on natural patterns as the decision-making foundation.* Other planning filters (representing other objectives – see point 4 below) are passed then through this foundation. Despite vast improvements in technology, data quality, data quantity, prediction models, and knowledge, the essence how we make decisions about where and when to disturb forest, and the roles of those involved has remained largely unchanged for several decades. Change requires guidance.
- 3) *The use of spatially explicit natural pattern scenario planning models.* Access to scenario models provides two benefits. First, it addresses the need to express planning objectives in space - one of the by-products of moving to a natural pattern foundation. Second, it a practical way of representing natural variability. One of the greatest challenges of using a natural pattern strategy is potentially one of its greatest strengths; *it does not offer a single best solution, but rather a large number of equally good solutions.* Spatial simulation model output may well be a required element of future natural pattern strategies.
- 4) *A set of fine filter planning indicators representing critical local values.* These were used both as fine filters to ensure other values are considered (as above), but also to help when NRV was not specific enough. Indicators for eight key fine filter objectives were identified; industrial footprint, timber quality, MPB threat mitigation, caribou habitat impact, wildfire threat mitigation, opportunity for learning, opportunity for public viewing, and grizzly bear habitat.

Using these tools, the team proceeded through a series of four key planning questions; 1) How much disturbance?, 2) How big are the disturbance events?, 3) Where to locate the disturbance event(s)?, and 4) How to design the undisturbed, residual areas within the disturbance event(s)?

In the end, the planning team designed a single disturbance event just over 8,100 ha in size that includes about 44% by area in undisturbed residual, which includes a significant portion of merchantable forest. The event is oriented roughly parallel to Hwy40 which minimizes the amount of new roads required, provides an west-east barrier to both wildfire and mountain pine beetle movement, maximizes the opportunity for public viewing, and overlays much of the existing natural gas development. Although prediction models suggested that the design would not negatively affect woodland caribou, there are concerns that the design will impede animal migration.

The challenges faced varied in form and impact. The project timing coincided not only with the closure of the Weyerhaeuser Grande Cache mill (which meant that Foothills Forest Products eventually replaced Weyerhaeuser on the Hwy40 project), but also a



provincial election, which restricted our ability to communicate at a critical time in the planning process. Our original plan to use a “charrette” to solicit public input was abandoned because it was perceived as an unnecessary layer of complexity. No guidance in the form of strategic or operational plans was available for the Willmore Wilderness Area (beyond the Willmore Wilderness Act). The planning team also had to deal with unsolicited input and advice from individuals from Hwy40 partner agencies not involved in the project, the most serious of which compromised the integrity of both the process and the plan. And finally, the rapid advance of mountain pine beetle has recently created uncertainty over the extent and location of harvesting operations throughout the Alberta foothills.

The challenges are important to identify and discuss not as caveats to the final disturbance plan, but rather as learning experiences. The ultimate success of this project hinges not as much on whether, or to what degree the team was able to follow a natural pattern planning foundation, but rather on clearly and openly talking about the successes and failures of our ability to do so. This report marks the beginning of our efforts to focus on communicating the Hwy40 lessons to a wide range of audiences. The second report on the Hwy40 project will objectively evaluate the process, and provide specific recommendations to help advance the use of natural pattern strategies in the future.

## THE FMF NATURAL DISTURBANCE PROGRAM

Late in 1995, the Foothills Model Forest in Hinton, Alberta initiated a program to study and describe natural and cultural disturbance patterns across 2.75 million ha of foothills and mountain landscapes (Figure 1), and to develop materials, techniques, and tools to help integrate those patterns into forest management and planning. The geographic range of that work has now expanded to include most of Alberta, and beyond.

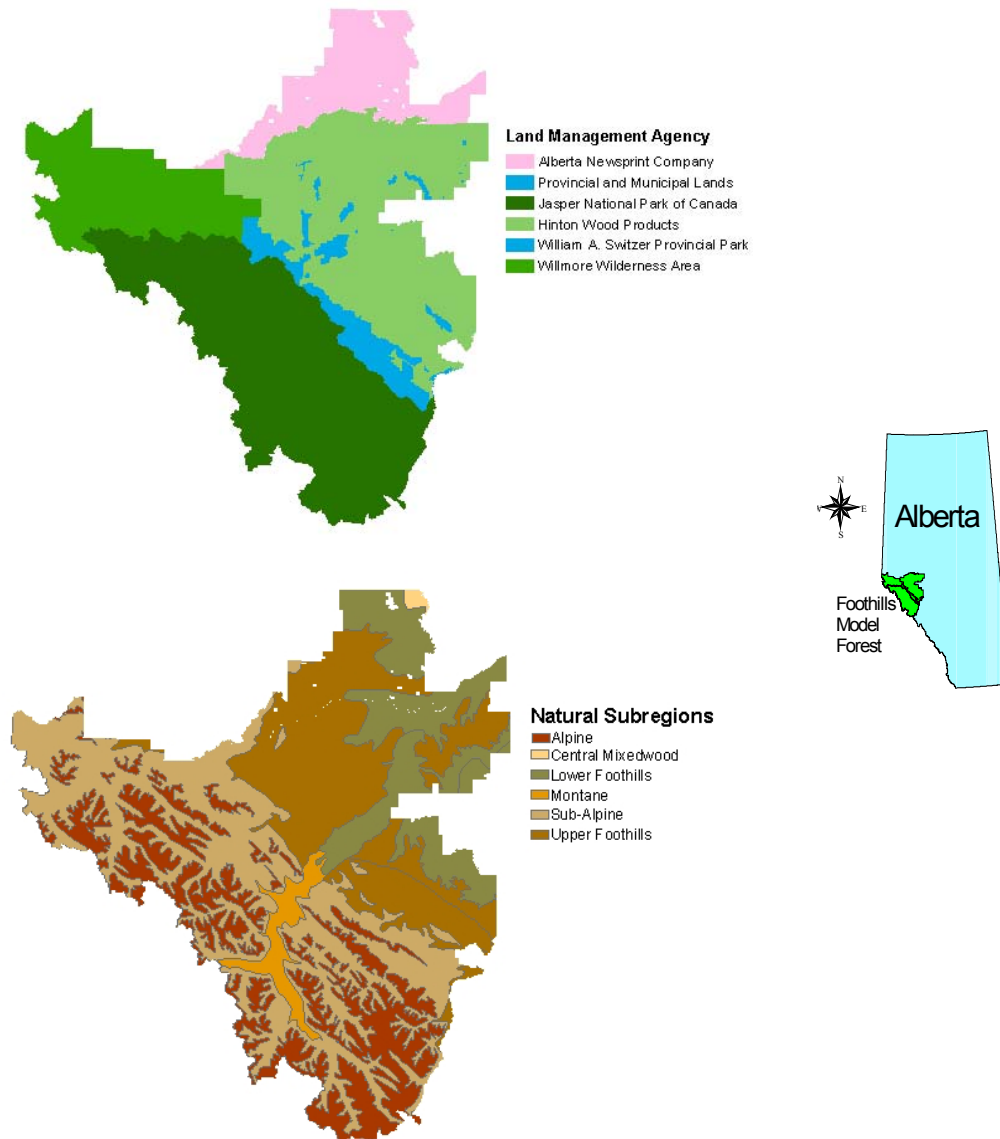


Figure 1. Foothills Model Forest Administrative Areas (above) Ecological Zones (below)

The FMF Natural Disturbance Program is a co-operative venture led by a team of representatives from the Foothills Model Forest, Hinton Wood Products (HWP), Alberta Sustainable Resource Development (SRD), Jasper National Park (JNP), and Alberta Newsprint Company (ANC). The comprehensive research program is partitioned into over 50 inter-related projects. All projects are linked through a long-term plan (Anderson 2006a), which includes details of the purpose and methods for each project, and how they link together. It also defines a series of ground-rules for conducting the research to maintain focus, assess progress, respond to new information, and effect the timely completion of the work. From Anderson (2006a):

- 1) The main assumption driving this research program is: ***In the absence of information on alternatives, using natural disturbance patterns to guide management is one of the best possible means of achieving ecological sustainability.*** Therefore, our main research focus is on patterns and the disturbance processes responsible for those patterns. This is not to say that the ecological responses to those patterns are not important, but they are a second stage of issues for which more basic knowledge and extensive research is required.
- 2) Since both natural and cultural disturbance affect pattern, the program implicitly considers all types of disturbances. The danger of the deliberate isolation and study of different types of disturbance agents is the assumption of pre-conceived, and possibly incorrect, relationships between pattern and process.
- 3) The research is driven by operational needs, and the results designed to be readily interpreted. This means that the research must consider translations of results to management practices. This can be accomplished in two ways. First, direct linkages have been sought to monitoring programs through the description of pattern(s). Although the output of this research is non-species specific, it is highly quantitative, and it is possible in many cases to define “natural baselines”, and thus ideally suited to monitoring. The second means of developing operational translations is through experimentation and demonstration. This allows for the evaluation of operational changes in terms of a) the success of creating the desired pattern(s), b) the biological responses of species and processes not part of the original research, c) practicality, and d) socio-economic impacts.
- 4) Internalising the research is to be avoided. High-quality research must be conducted by professionals, openly peer-reviewed, presented at public meetings, conferences and tours, and published in FMF NDP Quicknotes, Integration Notes, internal reports, news updates, posters, and refereed journals. A

communications plan has been developed for the FMF Natural Disturbance Program to address these issues to help guide the dissemination and integration of the research.

## DEFINITIONS

The terms "landscape", "disturbance" and "residual" have many meanings at many different scales. It is less important to be correct than to be consistent and concise. The FMF ND Program has created a series of spatial definitions that are used throughout all projects and communications.

### 1. Biome

*A major division of climate, flora, fauna, and soil on earth.* A biome is the largest recognizable subdivision of land area within continents. The FMF spans two major biomes; the Boreal Forest and the Mountain. (Note that Natural Resources Canada claims their "eco-zones" also represent major subdivisions of land based on climate, flora, fauna, and soil. However, they are technically subclasses of the original biomes.)

### 2. Region

*One or more spatially related landscapes.* Within biomes there can be sub-categories based on differences in soil, vegetation, and/or climate. The ecological classification systems of each province sub-divide the biomes (or ecozones as the case may be) into subcategories based on moderate changes in climate, soil, and vegetation. For example, within the Boreal Forest biome, Alberta includes the Boreal Plains, Boreal Shield, and Foothills "Natural Regions" within its provincial classification system.

### 3. Landscape

*An ecosystem large enough to allow observation and understanding of the interaction of disturbance, geomorphic, and topographic dynamics with the biota.* Landscape definitions vary tremendously in the literature, but in this case it is tied specifically to a "disturbance regime". A disturbance regime is characterized in terms of the type, areal extent, severity, timing, frequency, and predictability of the resident disturbance vectors (White 1979, Heinselman 1980, Sousa 1984). Variations of the Alberta ecological Natural Subregions have proven useful in defining landscapes (Beckingham *et al.* 1996), although in some cases one or more Forest Management Agreement (FMA) areas are sufficient.

### 4. Sub-landscape

*Sub-sections of one or more landscapes defined by a combination of ecological, social, and economic characteristics.* Quite often the size and location of sub-

landscapes is a function of management, scientific, or social needs. Our ability to study or manage entire landscapes is limited. The Hwy40 study area is an example of a (scientific) sub-landscape, and watersheds are (biological) sub-landscapes. “Management units” are (management) sub-landscapes that forest management companies identify for strategic planning. Ideally, sub-landscapes would always include parts of only a single landscape, but in reality that does not always happen.

## **5. Event**

*Areas within or between landscapes that at some point in time are commonly affected by a single disturbance such as a forest fire, a flood, or harvesting activities.* Events include one or more disturbance patches, and often cross landscape and sub-landscape boundaries. They may also include both forested and non-forested patches. For a more specific description of a disturbance event, see Andison (2006b).

## **6. Patch**

*Contiguous area of land that share common physical and/or biological characteristics.* There are many different types of patches. *Age patches* share year or year-range of origin (such as Old Forest), *forest type patches* depict areas of common tree species combinations, and *forest inventory patches* define complex combinations of age, tree species, density and height, other vegetation, and other site factors. A disturbance event may also have multiple, spatially distinct *disturbance patches*.

## **7. Matrix**

*All undisturbed land outside the boundaries of disturbance events.* Thus, any part of a landscape or sub-landscape that is not within a disturbance event is matrix.

## **8. Matrix Remnant**

*Undisturbed residual land that lies within an event, but is still physically attached to the surrounding matrix* (Andison 2006b). For example, forest fires can leave corridors of entirely undisturbed forest between two disturbed patches. If these areas are within an event (as per Andison 2006b), they are matrix remnants.

## **9. Island Remnant**

*Any partially disturbed or undisturbed area that lies within disturbed patches of a disturbance event* (Andison 2006b). Thus, any physically isolated patch of forest in the middle of a disturbed patch, whether partially or entirely intact, is an island remnant. In addition, any partially disturbed edges of disturbed patches (often referred to as “feathered edges”) are island remnants.

The geographical terminology used in this document is as follows. The FMF consists of two major land areas divided by the Rocky Mountains (see Figure 1). To the west of the continental divide lies approximately 1.1 million hectares of Jasper National Park (JNP). To the east of the mountains is an area of approximately the same size, which covers the Hinton Wood Products Forest Management Agreement (FMA) area but also includes William A. Switzer Provincial Park, the town site of Hinton, a large coal mine, and a strip of land under the management of Alberta SRD. Outside the boundary of the FMF, but still in our study area is approximately 370,000 hectares representing the ANC FMA (Figure 1). The area to the west of the divide is JNP, and will be referred to as such. Since the area to the east of the mountains is a mixture of tenure, it will simply be referred to as the "Foothills East".

Within JNP, three Natural Subregions exist: the Montane, Subalpine, and the Alpine. In the Foothills East there are three main Natural Subregions: Lower Foothills, Upper Foothills, and Subalpine (Figure 1). To avoid confusing the two Subalpine areas, they will be referred to as the "Subalpine JNP" and "Subalpine East".

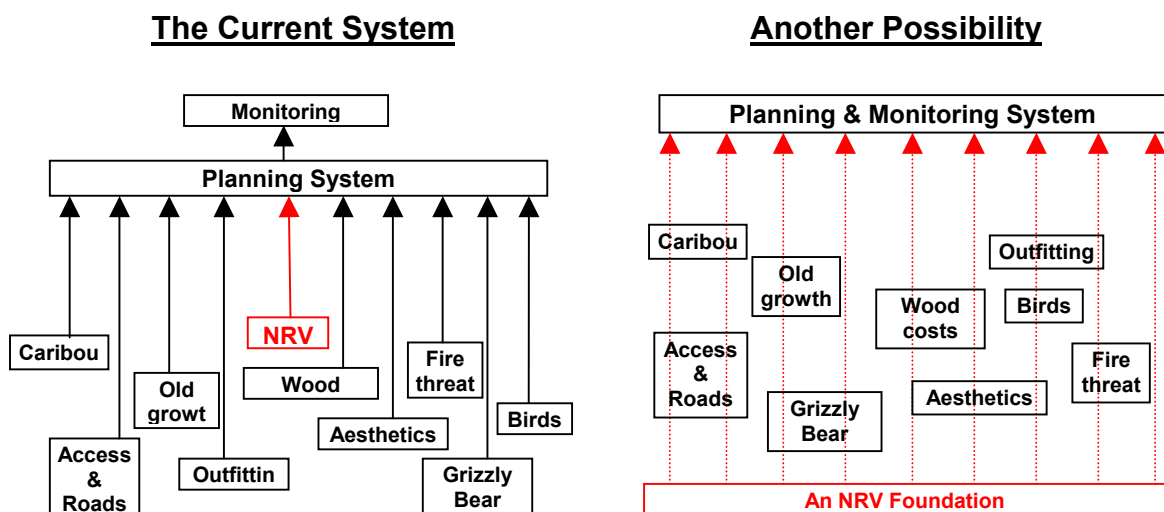
## BACKGROUND

The Foothills Model Forest (FMF) Natural Disturbance (ND) Program has been studying natural disturbance patterns in the foothills of Alberta since 1996. Although the research is far from finished, we have gained considerable insight into how natural disturbances shape our landscapes. Natural patterns are present at virtually all scales, and are tremendously variable in both breadth and depth. The challenge is shifting now to more practical questions of implementation guidelines, operational realities, ecological impacts, and social and economic limitations. Exactly how, to what degree, and when can natural pattern knowledge be used to plan, manage, and monitor?

There have been several integration efforts across Alberta and elsewhere. Many forest management companies are now leaving residual stems and islands, and disturbances are becoming more variable in size and shape, all of which are consistent with more natural patterns. In addition, natural range of variation (NRV) targets for metrics such as residual material, block size, and seral-stage distributions are now being included in planning guideline and monitoring systems.

This form of natural pattern integration amounts to the addition of some new coarse-filter objectives (based on natural patterns) to the list of values we manage for (Figure 2 on the left). Policy, planning and monitoring frameworks need not change to accommodate this type of integration. However, there is a danger of either deliberately or inadvertently high-grading the most obvious or economically viable natural patterns. The list of natural disturbance patterns extends far beyond seral-stage representation, patch sizes, and area in island remnants, yet these are often the only metrics used in provincial natural pattern guidelines.

**Figure 2. Conceptual Models of How Forest Management Planning Occurs Today (left), Compared to How it Might Occur Within a NRV Strategy (right).**



Adopting a few natural patterns as practical guides for individual (coarse-filter) planning attributes is only one of many possible natural pattern *strategies*. Natural disturbance patterns may also be used as a conceptual framework through which other biological, social, and economic filters are passed. This involves using NRV metrics as a complete package on a given landscape as a biologically neutral starting point (as opposed to a requirement) for planning activities. Other values such as caribou habitat, outfitting or aesthetics are now *filtered through* an NRV baseline (as in the right-hand diagram in Figure 2). Deviating beyond NRV is acceptable to satisfy the need for roads, safety, cultural preferences, or specific ecological issues, but at least there is a recognition that some type of natural limit has been exceeded, which perhaps triggers monitoring activities.

What advantages could this proposed alternative planning system offer? What little we have seen so far suggests that many other ecological, social, and economic values are consistent with an NRV strategy. This should not necessarily be surprising. By definition, the natural disturbance model is consistent with the habitat requirements of many species, access issues, aesthetics, and even mitigating the threat of natural disturbance. The use of an NRV foundation is also theoretically attractive. Consider that it offers the potential to 1) integrate (and potentially simplify) management and monitoring systems, 2) ensure that management decisions have a scientific and ecological foundation (consistent with ecosystem management ideals), 3) integrate the planning needs of several institutions across jurisdictional boundaries, and 4) streamline the planning process.

The potential to provide these benefits has gone untested to this point. Thus the goal of the Hwy40 Demo project is to ***demonstrate the effectiveness of using natural disturbance pattern knowledge as the foundation for operational-scale forest management planning***. The right side of Figure 2 shows a conceptual model of how operational planning might occur using natural patterns as the foundation.

## OBJECTIVES

The FMF Natural Disturbance Program partners agreed to take the next logical step and test the potential for NRV to be used as a planning foundation across a substantial area. To be clear, the intent is not to develop a plan only using NRV knowledge. Rather, what is known about local natural patterns at various scales will be used as the *foundation* for planning. The three main objectives of the project are as follows:

- 1) *Evaluate the robustness of an NRV strategy as a foundation for operational planning.* The success or failure of integrating individual elements of NRV (such as retention as islands) has little to do with the ability of a holistic NRV strategy to advance sustainable forest management.



- 2) *Identify and explore potential convergences and conflicts of adopting a holistic NRV strategy with existing policies, practices, objectives, and other economic, social, and ecological values.* The best way to learn about these issues is from an adaptive, practical application.
- 3) *Build a common understanding of the concept and practice of adopting a natural disturbance based plan.* A myriad of opinions exist today on how, to what degree, and where NRV information could be integrated into forest management planning, and to what degree it is possible or desirable. Regardless of the outcome, a large demonstration area will be a powerful communication tool with which to help develop and focus debates, and ultimately inform new opinions, strategies, and policies.

## LOCATION

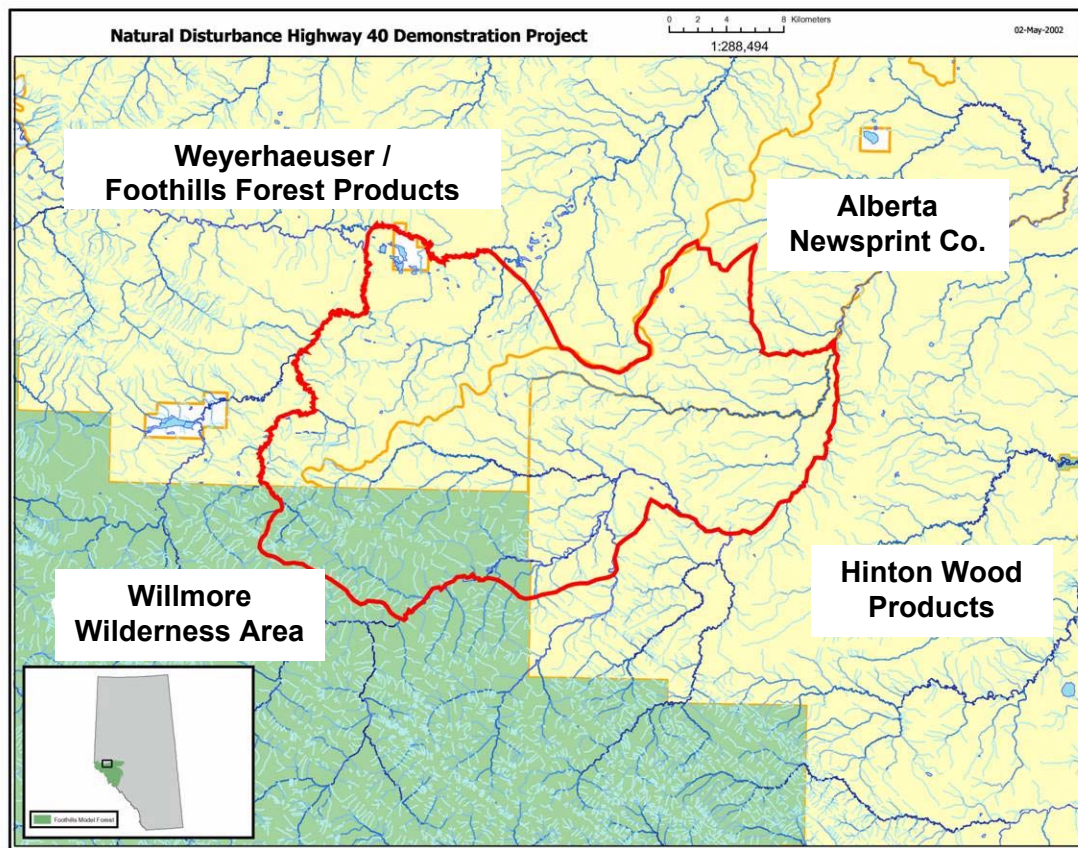
The criteria for the choice of the location and size of the demonstration project are as follows:

- Operational plans must be pending – the plan must be real.
- Include multiple jurisdictions.
- An area with multiple values that poses a planning challenge.
- Consideration of a range of known NRV patterns.
- Include opportunities for public viewing.
- Provide scientific opportunities towards the ecological impacts of using NRV.

After considering a number of possibilities, the site chosen for this demonstration project is an area approximately 70,000 hectares in size including 20,000 each from Hinton Wood Products and Alberta Newsprint Company (ANC) Forest Management Areas (FMA) and the Foothills Forest Products quote area, and 10,000 ha of the Willmore Wilderness Area. The study area is bisected by Highway 40 and runs from the Berland River in the south to Pierre Greys Lakes in the north. It also roughly corresponds to the foothills winter range of a portion of the A la Pêche caribou herd (Figure 3). This location and size were chosen deliberately for several reasons:

- It is highly visible and accessible. Part of the reason for doing this project is to raise awareness about NRV integration and forest management issues. The Hwy 40 corridor offers excellent access for the public, scientists, and professionals.

**Figure 3. Location of the Hwy40 North Demonstration Study Area (in Red).**



- There are unique and high values and risks in the area already. Caribou, old growth, and bull trout are of particular concern, and it is also one of the most likely entry points for Mountain Pine Beetle. The composition, structure, and age of the forest in the area also pose a significant forest fire risk. Despite these unique biological values and risks, the management of the area falls under many jurisdictions, including three forest management areas, a protected area under the auspices of Alberta Tourism, Parks, Recreation and Culture (TPRC), oil and gas companies, trappers, and many different types of public use.
- The three forest management areas have plans and approvals for harvesting in the vicinity due within the next few years. If this area were not chosen for the project, operational plan development and approvals would occur anyways.

- Having three forest management companies and several different branches of ASRD involved provides an opportunity to test the potential of streamlining not only planning, but also the approval process.
- Its proximity to protected areas offers the potential for some alternative management solutions not as readily available elsewhere – prescribed burning in particular.

## **METHODS**

The following list of steps includes those elements that were part of the original project vision, plus others that were developed along the way.

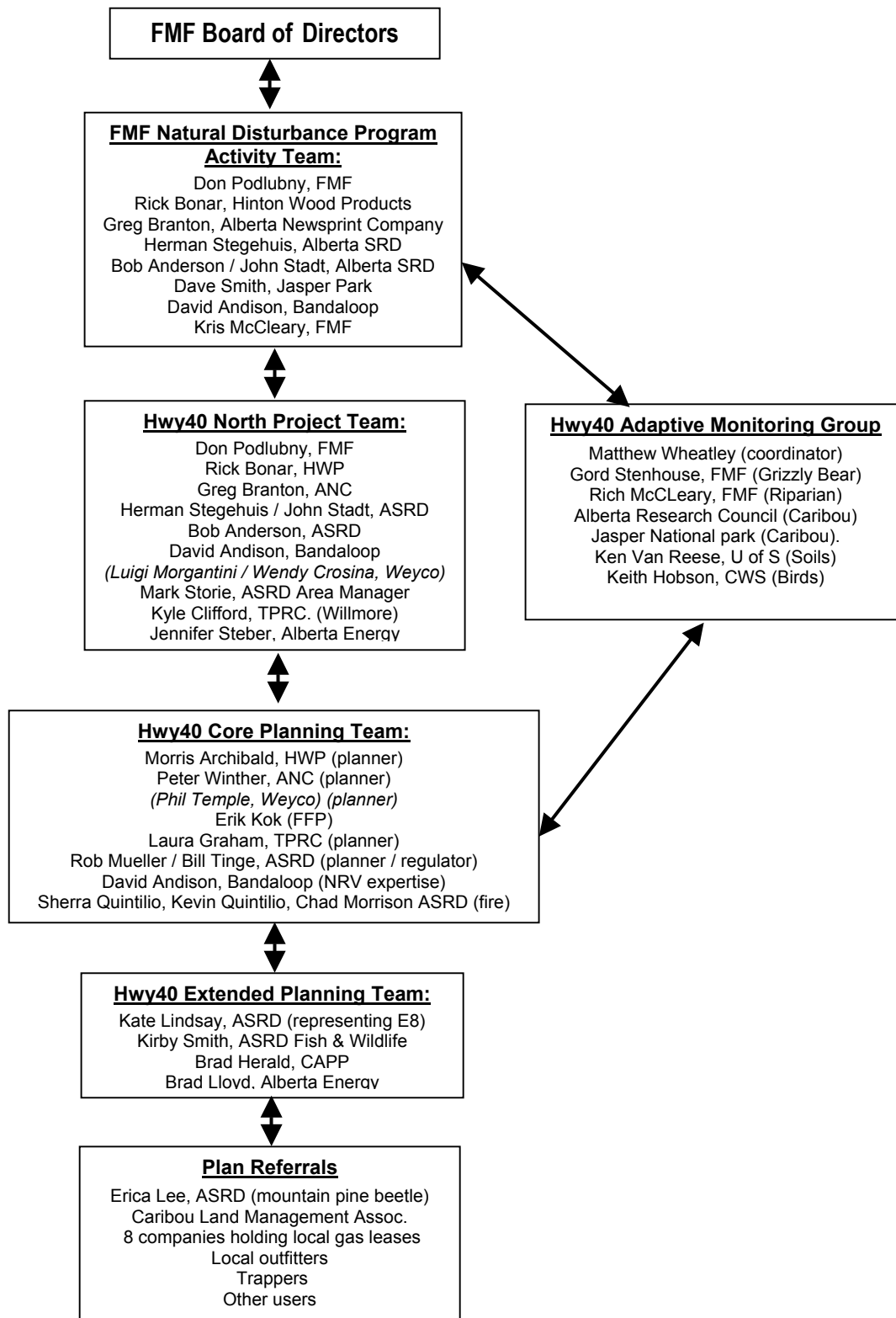
### **1) Develop an Organizational Structure**

Technically, the Hwy40 Demo Project is part of the Natural Disturbance (ND) Program, which is one of eleven program areas at the Foothills Model Forest. The project is part of the ND work plan for 2003/04, 2004/05, 2005/06, 2006/07, and 2007/08, all of which were approved by both the FMF Board of Directors and the ND Activity Team.

However, the Highway 40 North Demonstration project is also an operational plan. Considerable thought went into designing teams and assigning responsibilities such that the project objectives for the FMF could be met with minimal interference to the planning requirements for the partners involved. A hierarchical but inclusive structure was devised that reflected the desire for joint planning activities (Figure 4).

To initiate the project, the ND Activity Team formed a project team, who established the location and size of the study area, the partner base, the overall project guidelines, the composition of the core planning team, and a set of rules for the planning team (see below). The Hwy40 project team included most of the ND Activity Team, the Alberta Sustainable Resource Development (SRD) Area Manager for Foothills (responsible for approving the operational plans), and representatives from Weyerhaeuser / Foothills Forest Products (FFP), Alberta Community Development / TPRC (for the Willmore Wilderness Area), and Alberta Energy. Representatives on the project team also served as conduits back to their respective organizations in terms of planning decisions, information, and communication.

**Figure 4. The Hwy40 North Demonstration Project Organizational Structure.**



The planning team's responsibilities were to develop and deliver an operational-scale disturbance plan for the area. The core planning team included planners from each of the four land management agencies involved, a representative from the Hinton Area ASRD, an ASRD specialist in prescribed fire planning, and a scientist specializing in natural patterns. Before meeting for the first time, this group expanded to include individuals that could provide input on key local issues such as caribou and energy sector development. The planning team also began the process of contacting other experts and agencies through the "referral" process as input to the final plan (Figure 4).

The last part of the organizational chart for the Hwy40 project is a group involved in adaptive monitoring and research opportunities that the disturbance activities would potentially create (Figure 4). A coordinator was hired, and funding secured to allow these activities to occur.

### ***A CHANGE IN PARTNERSHIP***

The original partnership of the Hwy40 Demo Project included Weyerhaeuser Company in the north. Early in 2004, the Weyerhaeuser Grande Cache sawmill was closed, and the responsibility for managing the forest for that FMA ceded to the Alberta government. Over the short term, representatives from the Alberta Sustainable Resource Development (ASRD) acted on behalf of that part of the Hwy40 area until Foothills Forest Products (FFP) took over responsibility for the area several months later. A representative from FFP became a member of the Hwy40 planning team soon thereafter.

## **2) Establish the Rules (Terms of Reference)**

The project team developed several rules for the planning team:

- 1) *This is an operational plan that must respect all goals and objectives from higher-level plans.* The planning team must work within the bounds of all decisions made at higher levels of planning. The planning team does not have the power to change decisions made within either the long-term Forest Management Plan (FMP) or the five-year Development Plan (DP). This does not include any higher-level plans that may be in draft or otherwise pending approval (such as the provincial caribou recovery plan or forest land use zones). However, the planning team did agree that if any such higher-level plans became available during the Hwy40 planning process, every effort would be made to include them. (*n.b.* as it turned out, none did).
- 2) *A single disturbance plan will be developed.* A "disturbance plan" is the sum total of all cultural disturbance activities for a given area. Ideally, this includes all harvesting, road building, prescribed burning, well-site development, and seismic

line or pipeline installation. Cultural disturbance activities are thus no longer merely ends in and of themselves, but now also the means with which to achieve a disturbance design objective. Granted, the disturbance tools involved are often highly prominent, and in some cases even dictatorial in nature. However, by starting to focus more on designing the cumulative impact of our disturbance activities on the landscape (relative to those of Mother Nature), one is far more likely to identify biological threats to the integrity of the long-term health of natural systems.

- 3) *Planning will take into account the management of the total land base.* The total land base includes forested, non-forested, and non-vegetated areas. This represents a fundamental departure from any traditional forms of forest land management. It is highly unlikely that biological integrity can be sustained without a planning system that considers the whole land base.
- 4) *Each land partner involved will submit to their respective agency their operational plans through normal approval channels.* The existence of a single disturbance plan can serve as an overarching reference document, it but does not replace the requirements of the individual agencies involved. Rather than try to redefine policy, the idea was to include individual requirements within a single plan.
- 5) *Disturbance activities will be designed in detail for ten years, and disturbance scenarios will be identified generally for 40 years.* Imposing longer time frames means operational planning must become more deliberate and collaborative, although less responsive.
- 6) *Local knowledge of natural patterns is used to establish starting points for disturbance design decisions.* Thus, the first question for any planning decision is, “What would Mother Nature do?” Once the range of natural pattern options has been quantified and understood, only then are other (fine-filter) values identified and their needs considered within the context of NRV. There is no requirement to stay within NRV for each planning decision, only to use it as a starting point. So while the natural range helps to define a *defacto* coarse-filter ecological safe zone, it may not always provide the necessary solution space to satisfy all fine-filter objectives.
- 7) *Disturbance designs will adapt to facilitate adaptive management learning opportunities where possible.* The project introduces a new way of designing cultural disturbance activities, and the ecological impacts of that design are well worth monitoring. Considerable effort will be spent to develop financial and academic support for adaptive monitoring programs prior to, during, and after disturbance activities have occurred.

8) *This project will ultimately produce two products:*

- a. *A disturbance plan in space, and over time.* Moving from theory to practice requires stepping into the real world. Regardless of the academic value of the exercise, in the end, the plan must be real, and the participants committed for the right reasons.
- b. *A report on the process.* There is no point in trying new things if the lessons learned benefit only a few. As an FMF project, the ultimate measure of success is not the degree to which a plan is created that adheres to the rules, but rather how much we were able to learn and pass on to others.

### **3) Compile Background Data, Materials, and Knowledge**

Considerable effort was necessary to identify, summarize, and explain all relevant data, information, and knowledge of the study area, as well as the relevant planning processes and policies from each partner involved. This built a common understanding of the issues, limitations, state of knowledge, and available data. Although this was originally envisioned as a distinct stage of the planning process, the process of sharing knowledge, data, and information was ongoing and took many forms.

The relevant spatial datasets, including roads, harvesting history and plans, inventories, stand-origin maps, historical fire locations, digital elevation models (DEMs), existing and proposed access layers, and any wildlife data, were gathered from the different sources and merged into seamless layers by a GIS consultant. The single exception was the Weyerhaeuser portion of forest inventory, updates, and access data, which could not be shared with the team after the announcement of the Grand Cache mill closure.

The team also invested considerable time learning about natural disturbance patterns on foothills landscapes in general, and the Hwy40 study area specifically. A full account of what is known about the disturbance history, patterns, and legacy of the area (both natural and cultural) was compiled, presented, and distributed to the planning team over the course of several months. This process also involved using a disturbance dynamics spatially explicit simulation model (LANDMINE) to generate dozens of possible landscape pattern scenarios based on the historical, natural disturbance regime (Andison 1996). At the request of planning team members, parts of the natural pattern research were presented several times as the planning process progressed and its relevance became more obvious.

The Hwy40 planning team also shared the requirements for developing, submitting, and approving operational plans for the various disturbance activities recognized within the study area. The development and approval processes and timelines for harvesting,

salvage harvesting, prescribed fire, well-site development, road building, and seismic line installation are vastly different. Similarly, the policies relating to sanctioning of different disturbance activities on the different parts of the Hwy40 study area varied. For example, the Willmore Wilderness Act forbids any commercial disturbance activities such as commercial harvesting or oil or gas exploration. The team used this information both to help further develop the planning process, but also to support the needs of the various agencies involved.

The planning team spent a substantial amount of time and effort to share and/or solicit the best available information on the various values within the study area. For example, the decision support tools used for “fire-smarting” landscapes to reduce the risk of wildfire were summarized, and a full assessment of fire threat for the Hwy40 area presented to the planning team. The ASRD wildlife expert on the planning team facilitated the team’s education of provincial policies, status, understanding, and ongoing research efforts with respect to woodland caribou in Alberta, as were details of what is known of the dynamics of the resident A la Pêche herd. Similarly, the location and age of gas wells, pipelines, and seismic lines, and a map of existing subsurface leases and leaseholders was presented to the group, along with an explanation of the tenure systems used for the energy sector.

The planning team dealt with mountain pine beetle risk in the study area by inviting one of the provincial MPB experts to a planning team meeting to outline the current status of MPB in the area, including an analysis of output from the state-of-the-art prediction models of MPB spread into the Hwy40 study area. Note that when this information was solicited (in the autumn of 2004), no one was predicting the significant advance of MPB into Alberta that occurred over the next two years.

#### **4) Identify the Goal and the Planning Objectives**

Parallel with the background data and information gathering, the Hwy40 planning team used the terms of reference and project objectives (see above) to (re)define the overall project goal as follows:

***Project Goal:*** *Demonstrate the effectiveness of using natural disturbance pattern knowledge as the foundation for effective operational-scale forest management planning, leading to sustainable forests and the multitude of values provided by the forest for a defined forest area of multiple administrative jurisdictions [sic].*

The team also reworded and expanded on the original list of project objectives as follows. (Adapted from the original list defined by the Hwy40 planning team):

- 1) Develop an operational-scale *disturbance plan* in collaboration with all relevant land management agencies that is consistent with the objectives of



all relevant higher-level plans and the ideals of ecosystem-based management, and follows existing approval processes.

- *Indicator: Plan approvals.*

2) Evaluate the success of adopting natural patterns to achieve other landscape objectives.

- *Indicator: An objective evaluation of the planning choices against other values (see the four main planning questions discussed in Section 5 below).*

3) Identify key convergences and conflicts of creating more “natural” landscapes with existing land use policies, practices, and objectives.

- *Indicator: An inclusive and objective evaluation of the final plan and process.*

4) Increase awareness of natural pattern concepts, terms, and potential integration possibilities.

- *Indicators: The number and variety of Hwy40 presentations, and the number and distribution of final reports and Hwy40 updates.*

5) Develop indicators that measure the success in achieving the objectives of the higher level plans

- *Indicator: List of fine-filter indicators (see next page).*

6) Using the most current information from the energy sector, develop an access plan that meets the needs of all industries while minimizing the industrial footprint and adequately addressing other values

- *Indicator: A process is already in place through the Caribou Land Management Association (CLMA) to ensure that all industries are collaborating on access.*

7) Enable the extraction of the approved timber volume from the HWP and ANC FMAs (and FFP’s quota area).

- *Indicator: Approved volumes of timber for each agency within the respective Final Harvest Plans and Annual Operating Plans (AOPs).*

8) Manipulate the landscape to reduce the threat of Mountain Pine Beetle (MPB) attack (or advancement).

- *Indicator: Available MPB prediction models, although there was agreement that wildfire threat models would be sufficient surrogates for evaluating MPB threat.*

9) Manipulate the landscape to mitigate the impacts of any disturbance activity on existing caribou habitat.

- *Indicator: Available caribou habitat or other models. (at the time, only the ASRD “regression” model available).*

- 10) Manipulate the landscape to mitigate the threat of wildfire to this and other landscapes.
  - *Indicator: Available wildfire threat models.*
- 11) Include prescribed fire as a tool with which to achieve the disturbance plan.
  - *Indicator: The number of areas and ha burnt via prescribed fire.*
- 12) Learn more about the impacts of natural pattern inspired plans on key fine-filter biological values.
  - *Indicators: Total funding levels for adaptive management research, total number of research projects, numbers of caribou collared and /or monitored, and the number of journal articles, reports, and “Quicknotes” including any new knowledge of fine-filter impacts (see Section 7 below).*

Note that the first four “objectives” listed above are similar to the three objectives defined in the Objectives section. However, the eight new objectives listed above are actually relevant to the planning process itself. In other words, points 1-4 above are project objectives, and points 5-12 are planning objectives that roughly relate back to point #5 above. These planning objectives were then translated into eight fine filter planning indicators (note the addition of Grizzly Bear habitat impact);

- 1) Industrial footprint,
- 2) Timber quality,
- 3) MPB threat mitigation,
- 4) Woodland caribou habitat impact,
- 5) Wildfire threat mitigation,
- 6) Opportunity for learning,
- 7) Opportunity for public viewing, and
- 8) Grizzly bear habitat impact.

## **5) Solicit Local Public Input**

The original vision of the Hwy40 Demo project was as an open planning process in which any legitimate land use stakeholders were welcome to participate. In part, this perspective arose from the recognition that this particular operational plan was going to be fundamentally different than anything preceding it. The concept of inclusion with respect to decision-making is also consistent with the idea of the application of natural patterns as the foundation for better decision-making. If an NRV foundation for operational planning is truly a superior system, then that opinion should be universal and the experience shared.

A parallel FMF ND Program proposal early in 2004 provided an opportunity to integrate local public input into the planning process through the development of a “charrette” in

collaboration with University of British Columbia's Sustainable Communities program. A charrette is a process by which different stakeholders who share a common land base are brought together, provided with the necessary background knowledge, and given a formal, intensive procedural structure through which unanimous planning decisions are generated. The marriage of the charrette with a natural pattern foundation is in many ways an ideal one. Both shift the focus away from being forced into conflict over planning decisions based on the perceived needs of individual values in favour of a system that emphasizes an inclusive, big picture perspective.

In the end, the original Hwy40 project team did not unanimously support the application of a charrette initiative to the Hwy40 project. The integration of the two distinct and innovative projects was felt to be an unnecessary complexity in an already complicated project.

At this point, the land management agencies involved on the planning team were directed to initiate the conventional, mandated public involvement procedures required by law, through open houses, notices on the web, newspaper ads, and so on. In addition, the FMF developed a separate communications plan for Hwy40 to talk about the project to a wide range of audiences, including public open houses and town council meetings.

Unfortunately, almost immediately after abandoning the charrette idea, the province imposed a lengthy "black out" period for communications running up to and including a provincial election. During this period, no ASRD representatives were allowed to participate in any public meetings, workshops, or lectures with respect to Hwy40, which significantly restricted the ability to talk about the project in a meaningful way, let alone solicit public input.

## **6) Develop and Implement a Planning Process**

This was easily the most challenging part of the project for the planning team because a) there are no similar planning process templates available, and b) it required everyone involved to function not only as planners, but as a *planning team* – new territory for most. At the suggestion of the project lead, the planning team agreed to a straw-man process template that focused on natural patterns as the foundation. However, many of the details were deliberately left out to force the team to openly evaluate and respond to new information, suggestions, and requirements. In other words, the idea was to provide a very rough planning process outline, but to rely on the collective wisdom of the people involved to test it, fill in the details, and if necessary, adapt.

The planning team was responsible for addressing four main planning decisions: 1) How much disturbance?, 2) How big are the disturbance events?, 3) Where to locate the disturbance event(s)?, and 4) How to design the undisturbed, residual areas within the

disturbance event(s)? For each decision, the planning team agreed to follow a sequence of eight questions designed to represent one possible version of a natural pattern foundation:

1. What is the natural range of variation (NRV)? (What did Mother Nature do?)
2. What is the current range of variation (CRV)?
3. Why is NRV different than CRV?
4. What fine-filter management objectives (of the eight identified at the end of Section 4) would converge with moving towards NRV in this case?
5. What fine-filter management objectives (of the eight identified at the end of Section 4) would conflict with moving towards NRV in this case?
6. (How) can we move towards NRV from CRV?
7. Are there policy or practise implications?
8. What are the new questions / issues?

The team also relied heavily on both research results, and spatial simulation modelling output for the Hwy40 area for each of the four main planning decisions. A significant volume of research was available on natural wildfire patterns in the foothills (Andison 2003a, 2003b, and 2004). Much of this information was already available in a locally calibrated version of a stochastic landscape disturbance simulation model, LANDMINE (Andison 1998). A series of stochastic runs was produced by LANDMINE under a range of disturbance regime assumptions, and the output presented to the planning team. This provided the necessary range of natural design possibilities as the decision-making starting point for attributes such as event size and configuration, patch size distribution and shape, and the size, shape, location and total amount of undisturbed residuals.

### **Planning Decision #1: How Much Disturbance?**

Since the Hwy40 project is an operational plan, the total area to be disturbed is almost entirely dictated by the respective strategic plans of each partner. Neither the Hwy40 project team nor the planning team has any influence over how much area will be disturbed. On the other hand, it is within the bounds of the project mandate to evaluate the area disturbed from a natural range perspective. Most of the eight questions listed above are still valid.

Depending on the location, the disturbed area necessary to meet the collective strategic wood volume objectives of the partners is 3,500-6,000 ha over the next 10 years. It is more difficult to quantify the total area of new roads and seismic lines, plus whatever areas may be burnt via prescribed fire, but it is likely a fraction of the required harvested area. For simplicity, the Hwy40 planning team assumed that *3,500-6,000 ha of disturbance in the study area over the first 10 years is the current range of variation, as established by higher-level plans.*

How does CRV area align with the natural range of variation? There are two ways of answering this question. First, an historical burn probability table was generated for the Hwy40 study area (Table 1). For example, over the next 10 years, there is a 50% chance that at least 4,500 of the 70,000 ha would burn (in bold blue in Table 1) under the historic fire regime scenario. This number falls comfortably within the proposed decadal disturbance level of 3,500-6,000 ha, suggesting that CRV is not inconsistent with NRV in this case.

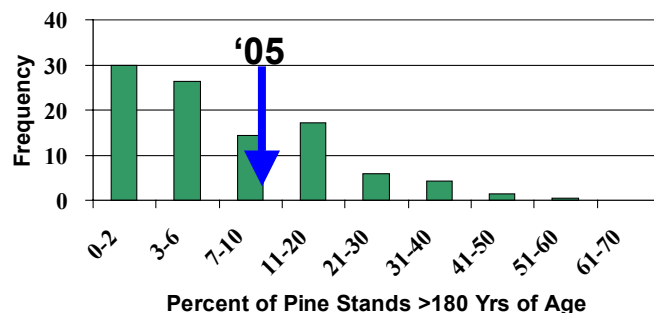
**Table 1. Historical Probabilities of Burning in the Hwy40 Area**

Probability	Minimum Number of Hectares Burnt		
	<i>In 10 Years</i>	<i>In 20 Years</i>	<i>In 40 Years</i>
90% chance	>180	>2,800	>10,800
75% chance	>1,100	>6,900	>19,900
50% chance	<b>&gt;4,500</b>	>13,800	>29,600
25% chance	>10,100	>20,700	>37,700
10% chance	>14,500	>24,900	>46,900

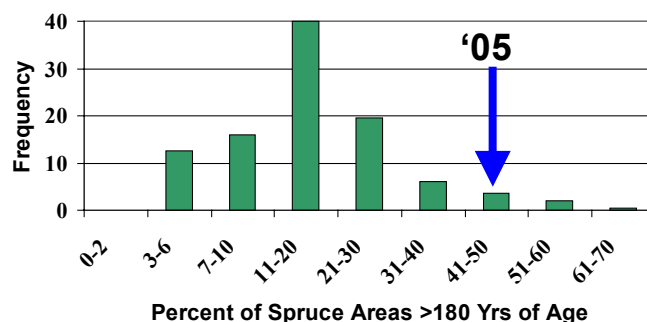
The other way of considering proposed disturbance levels is within the context of the existing landscape condition. For example, forests in this area burn on average every 80-110 years (Andison 2000), which translates into an average burnt area of about 7,000 ha every 10 years. Note that the difference between this estimate, and the previous one is the “at least” clause for the probabilities in Table 1.

However, wildfire burning levels are not a constant over time. It is possible to have several decades of no fire activity followed by one with very high levels of burning. Allowing for these natural levels of variation over many centuries would create old forest levels something like those shown in green in Figures 5 and 6 (Andison 2003a). The current levels of old forest in the study area (shown by the blue arrows)

**Figure 5. Natural Range of Pine-Dominated Areas >180 Years of Age in the Upper Foothills Natural Sub-region.**



**Figure 6. Natural Range of Spruce-Dominated Areas >180 Years of Age in the Subalpine Natural Sub-region.**



suggest that old forest levels today are on the high to very high end of the natural range. Within the next 10 years, they will become extremely high.

This by no means translates into a requirement for disturbance – FMF research suggests that large contiguous older patches of forest were common features of foothills landscapes. The same research suggests that fewer of these large contiguous patches of old forest exist on foothills landscapes today than occurred naturally (Anderson 2003a). Furthermore, the biological value of these older areas is well recognized.

However, whatever the reason, and regardless of how many other such areas exist in the foothills, the fact remains that the study area has to some degree beaten the odds until now with respect to wildfire activity. The concern is that such areas face an increased risk to natural disturbance agents. In particular, both wildfire and mountain pine beetle currently pose significant threats to not only the study area itself, but the forests, timber, and habitat beyond its borders.

In summary:

1. What is the natural range of variation (NRV)? On average, about 7,000 ha burnt every 10 years in the study area, although it varied dramatically. Over extended periods of time the level of older forest that occurred naturally varied between zero and over 50% of the study area.
2. What is the current range of variation (CRV)? The level of disturbance dictated by higher-level plans is 3,500 – 6,000 ha in the study area for the first decade. This is slightly lower than the average historic level, but well within the natural range. The high existing, and projected future very high levels of older forest provide important and increasingly rare habitat, but are becoming a concern from a natural disturbance risk perspective.
3. (Why) Is NRV different than CRV? CRV is within NRV. The only NRV concern is the high existing levels of old forest, that are a result of both fire control efforts, and avoidance of this area by forest management companies over the last 20 years due to woodland caribou concerns. However, CRV was determined by higher-level plans, and the Hwy40 planning team has neither the mandate nor the authority to change it.
4. What management objectives would converge with moving towards NRV in this case? Reducing the level of older forest in the study area may reduce wildfire threat, reduce MPB threat, and allow greater access to mature timber and natural gas resources, potentially without significantly increasing the industrial footprint, both of which translate into social and economic benefits.

5. What management objectives would conflict with moving towards NRV in this case? A reduction in the level of old forest in the study area will likely reduce the local habitat quality for woodland caribou.
6. (How) can we move towards NRV from CRV? It is not within the power of the Hwy40 planning team to deal with this particular question, nor is it the mandate of this project.
7. Are there policy or practise implications? Not applicable.
8. What are the new questions / issues? Are all disturbances equal in their ability to influence risk of various types, and impact values? Although often debated, there was no consensus on the planning team on this issue, and no precedent in the literature in terms of whether, or to what degree the impacts of a natural based disturbance plan might differ from those of other cultural disturbance activities in terms of influencing the values at stake.

## **Planning Decision #2: How Big Are Disturbance Events?**

The second question in the sequence for the Hwy40 planning team was the size of the disturbance events. To address this, the team took advantage of the FMF definition of a *disturbance event* (*sensu* Andison 2006b) as follows.

From question #1 (see above) it was determined that the target amount of *disturbed area* is 3,500 – 6,000 ha. We know from Andison (2003b and 2004) that an event includes an average of about 8% of its area in island remnants, and another 31% in matrix remnants, although this varies greatly. In other words, about 39% of the area of the average foothills natural wildfire event is at least partially unburnt.

So, a target disturbance level of 3,500 – 6,000 ha combined a 39% residual level creates a *disturbance event* area of about 4,865 – 8,340 ha, calculated as follows:

$$3,500 \text{ ha disturbed} + (39\% \text{ of } 3,500 \text{ ha}) \text{ residual} = 4,865 \text{ ha event}$$

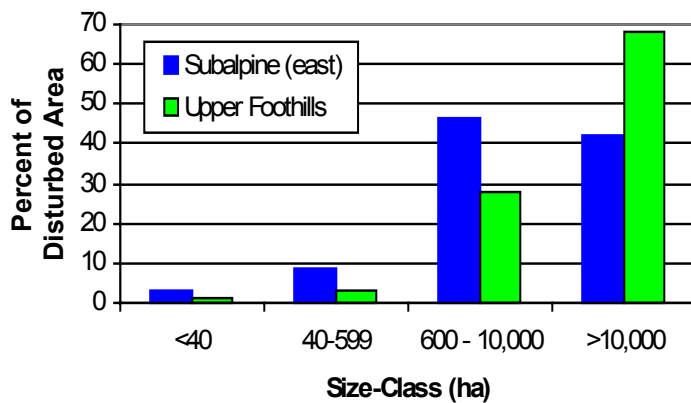
$$6,000 \text{ ha disturbed} + (39\% \text{ of } 6,000 \text{ ha}) \text{ residual} = 8,340 \text{ ha event}$$

In other words, the Hwy40 planning team needed to identify 4,900 – 8,300 ha of disturbance event area (within which there will be only 3,500 – 6,000 ha disturbed).

So how would Mother Nature distribute do this? The natural range of wildfire event sizes on the landscapes relevant to the Hwy40 area suggests that most of the disturbed area is accounted for by large wildfires. In fact, wildfires larger than 600 ha cover 90% of the foothills landscape (Figure 7). In contrast, over the last 50 years, the largest disturbance in the Hwy40 area was only 106 ha.

The sharp contrast between historical disturbance event sizes and the existing cultural event sizes strongly suggests that distributing the required area of disturbance in the

**Figure 7. Historic Disturbance Event Size Distribution for the Upper Foothills and Subalpine Landscapes (adapted from Andison 2003a)**



Hwy40 area into one or two large events would be preferable from a natural pattern perspective.

Given this as the foundation, the Hwy40 planning team then considered the impact of creating one or two large disturbance events from the perspective of other values (relative to a greater number of smaller

disturbance events). Ecologically, clustering disturbance activities into a small area allows for larger areas of intact interior forest elsewhere, which benefits woodland caribou and other old forest interior species. Fewer events translate into fewer roads, which is more economical, and benefits both caribou and grizzly bear. A single large event also has the potential to provide a substantial barrier to both wildfire and mountain pine beetle. One possible drawback of a single large event is that it may not be appealing from a social perspective, although it does provide an opportunity for discussion and education.

Based on this analysis, the planning team agreed to look for opportunities for creating one or two disturbance events in the Hwy40 area covering a total area of 4,900 - 8,300 ha.

The following summarizes our process in the form of the original eight questions:

1. What is the natural range of variation (NRV)? Historically, large to very large disturbance events dominate the landscape area.
2. What is the current range of variation (CRV)? Virtually all existing cultural disturbance events in the study area are small to very small.
3. (Why) Is NRV different than CRV? The existing cultural disturbance patterns are a legacy of the previous land management paradigm, combined with the cumulative impacts of two fundamentally different systems of land management (*i.e.*, energy and forestry). What little cultural disturbance there is in the study area is accounted for by well sites, gravel pits, and a few harvest blocks that were installed at a time when it was thought that small, well-spaced harvest blocks was the best way of reducing the impact of harvesting across the landscape.



4. What management objectives would converge with moving towards NRV in this case? Increasing the size of disturbance events would potentially meet the objectives of most of the identified values in the study area, including minimizing access, reducing cost, mitigating fire threat, reducing MPB threat, increasing opportunity for learning, and minimizing the larger impacts on habitat for species that require interior old forest (because it results in vast areas of undisturbed forest for most of the study area).
5. What management objectives would conflict with moving towards NRV in this case? The most obvious value that may conflict with the adoption of very large disturbance events is social acceptance. There is also a risk that a large disturbance event would have the potential to negatively affect the migratory habits of the local woodland caribou herd. Finally, if the concept of a single disturbance event in the Hwy40 area were ever to be imposed at a higher level of policy affecting all resource agencies involved in forest land management, there would potentially be a cost in terms of short term revenue from the energy sector.
6. (How) Can we move towards NRV from CRV? The Hwy40 planning team accepted the concept of developing one or two harvesting disturbance events of the appropriate size for the study area, and there were no significant regulatory barriers. However, it became clear that the planning team had little to no power to influence the size or location of disturbance activities of the energy sector over the next 10 years within the study area.
7. Are there policy or practise implications? The regulatory requirements for operational harvesting designs in Alberta are flexible enough to allow for the design of large harvest events. However, this is potentially the largest cultural disturbance event in Alberta, and there may be public perception issues to consider. The removal of a large amount of timber from a small area over a short period of time may pose practical challenges for the forest management companies. The ability of the energy sector to fit within a medium-term disturbance plan in terms of size and location of disturbances is currently not consistent with an NRV approach, and is well beyond the mandate of the Hwy40 planning team.
8. What are the new questions / issues? Are there locations for the event(s) that facilitate the potential negative impacts of large disturbances? (How) Do exploration and development activities of the energy sector fit into a strategy of clustered disturbance activities?

### Planning Decision #3: Where to Locate Disturbance Event(s)?

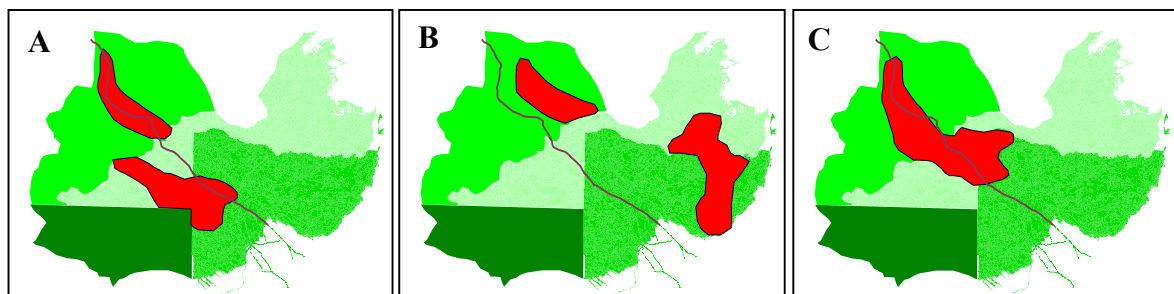
Are there places within the study area that are significantly more or less likely to have a 4,900 – 8,300 ha fire event? In short, the answer is *no*. Current understanding of the historical wildfire regime suggests that the study area is not large or heterogeneous enough to experience significant differences in wildfire activity.

While this means that any disturbance location will be equally within NRV, it does not provide more specific guidance for planning. The Hwy40 planning team thus identified locations that would suit the (eight) other identified objectives (see Section 4).

We know from previous FMF research that wildfire events are very simply shaped (Andison 2003a). Using this knowledge, along with the available spatial data and the requirements of the identified local values, the planning team tabled an exhaustive list of potential disturbance event locations. This initial design exercise was value-free based largely on the expert opinion of both core and extended planning team members. The exercise yielded eight different disturbance scenarios, some of which were entirely based on the perceived needs of a single planning value.

These eight scenarios were then filtered through a coarse set of logical criteria such as feasibility, overlap, obvious and significant negative impacts on other values, and adherence to higher-level plan objectives. In other words, the team eliminated those that were impractical or represented an obvious unacceptable risk to one or more values. This process reduced the list of candidates to the three disturbance event scenarios (Figure 8).

**Figure 8. Three Options for the Location of Disturbance Event(s) Generated by the Planning Team for the Hwy40 North Demonstration Area.**



Keep in mind that the events shown below illustrate only an outline of the disturbed area – recall that only an average of 60% of the area within a natural wildfire event is completely burnt.

The next step was to evaluate each event scenario in terms of the eight fine filter objectives. As a reminder, the eight indicators identified by the planning team were; 1) Fire threat mitigation, 2) Wood fibre quality, 3) Woodland caribou habitat, 4) Grizzly bear habitat, 5) MPB threat mitigation, 6) Integration of industrial activity, 7) Opportunity for

viewing and, 8) Opportunity for learning. In some cases, there were hard numbers to work with (Grizzly bear RSF models, caribou habitat regression model), and for other indicators the team relied on expert opinion of the team members (e.g., opportunity for viewing, wood fibre quality). The members of the planning team then subjectively scored each scenario based on these eight criteria (adapted, standardized, and shown in Table 2).

**Table 2. Summary of Planning Team’s Evaluation of Three Different Planning Scenarios.**

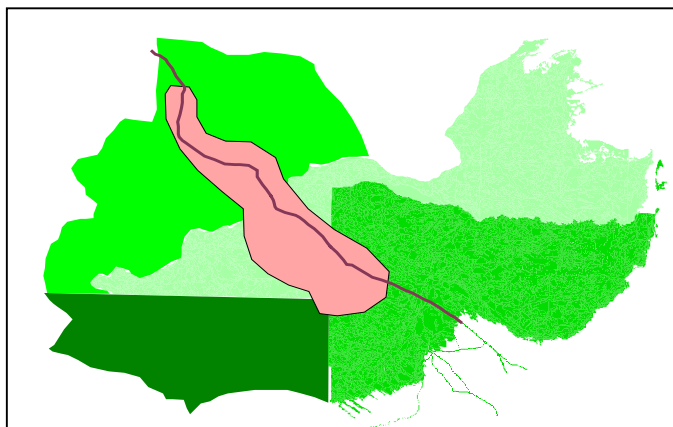
Planning Indicator	Planning Scenario		
	A	B	C
Industrial footprint	Minimal change	Moderate change	Moderate change
Timber quality	Moderate	Poor-Moderate	Moderate
MPB threat mitigation	Moderate	Worst	Best
Caribou habitat impact	Marginally Superior	Marginally Inferior	Moderate
Wildfire threat mitigation	Moderate	Worst	Best
Opportunity for learning	Moderate	Worst	Best
Opportunity for public viewing	Moderate	Worst	Best
Grizzly bear habitat impact	Moderate	Moderate	Moderate

The scores suggested that disturbance scenarios A and C in Figure 8 both had merit for different reasons. Rather than choosing one or the other, the team decided to combine the two scenarios in an effort to capture the best parts of each. The resulting disturbance scenario from this process is shown in Figure 9.

Soon after the team meeting at which it was agreed to develop the scenario shown in Figure 9 as the rough outline of our 10-year disturbance plan, the planning team received an alternative disturbance scenario from an individual external to the Hwy40 process and planning team (Figure 10). The new scenario moved the entire harvest area for FFP north by several km, but left the ANC and HWP portions of the original Hwy40 scenario intact.

The concern raised with respect to the disturbance scenario in Figure 9 was the potential risk of creating a barrier to woodland caribou movement from summer to winter habitat.

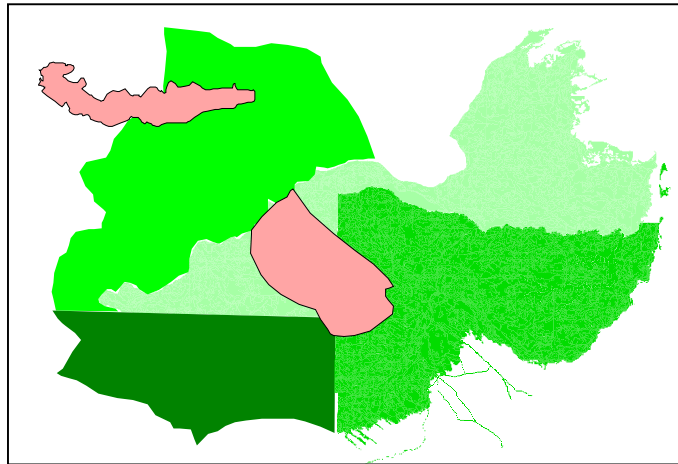
**Figure 9. The Approximate Size, Location, and Orientation of the Disturbance Event Agreed Upon by the Hwy40 Planning Team.**



Although the team agreed to develop a series of east-west travel corridors through the disturbance event shown in Figure 9 to facilitate wildlife movement (facilitated by the 39% retention levels previously agreed to), the individual felt that a more significant corridor of undisturbed forest was necessary for caribou movement.

The planning team was divided on their response to Figure 10. Most of the team expressed two concerns, both of which relate back to the original terms of reference. First, they felt that any externally imposed scenario compromised the integrity of the originally agreed upon Hwy40 planning process. The Hwy40 planning team already included a representative from the

**Figure 10. The Approximate Size, Location, and Orientation of the Disturbance Event Proposed to the Hwy40 Planning Team**



agency involved in developing the alternative scenario in Figure 10. In other words, it was not the scenario *per se* that was troublesome, but rather the fact that it was at no point introduced as an option within the Hwy40 planning process. The second issue with this particular scenario is that it included areas beyond the study area. This represents another fundamental departure from the original project TOR.

Those supporting the alternative scenario were more comfortable with what they believed to be a conservative approach to woodland caribou management in light of a) how little we understand about how and why they migrate, and b) their current status in Alberta.

In an attempt to deal with this issue internally, the Hwy40 planning team decided to first see if it was possible to take a step back and integrate the specific concerns raised into the Hwy40 process. For example, the planning team representative from the agency in question had already made it clear to the group that safe access from east to west for caribou was one of his primary concerns. In fact, the elongated shape of the Hwy40 scenario in Figure 9 was intended to provide a more significant barrier to fire and MPB movement from west to east, but also to minimize travel distance for migrating caribou. Furthermore, the boundaries of the Hwy40 event were far from being carved in stone, and there was still 39% by area in residuals to distribute within the event. Both issues would have been significant future points of discussion within the Hwy40 planning team which would have allowed for ample discussion of caribou travel corridors. In other

words, there was never any disagreement on the concept of providing travel corridors for caribou, and our original disturbance scenario was still very much a work in progress that still had the potential to address this concern.

Unfortunately, the planning team was unable to resolve the issue to everyone's satisfaction. The combined effects of a lack of objective, scientific understanding of travel corridor size, type, or location for caribou, and an information disconnect between the individual involved in tabling the alternative disturbance scenario and the Hwy40 planning team, restricted the nature and quality of any discussion of mutually agreeable solutions. The alternative disturbance solution proposed (in Figure 10) very quickly became a proverbial "line in the sand". In other words, the agency that imposed the alternative Hwy40 scenario was now unwilling as a group to discuss any option other than that shown in Figure 10.

Since the external disturbance scenario suggestion came not only from a person entirely external to the process, but also from a regulatory agency, this situation created a problem for the planning team. Although no dispute-resolving mechanisms were defined within the original TOR, a structural hierarchy was identified. The Hwy40 planning team thus agreed to present the issue to the Hwy40 project team, who in turn referred the matter to senior staff within ASRD (since it was now an internal issue for the provincial regulator).

The strategic direction subsequently given to the planning team by senior ASRD staff was to develop and implement the ANC and HWP part of the disturbance event, collar and monitor local caribou to see if / how they respond to it, and then revisit the location of the FFP portion of the planning scenario at a later date.

Regrettably, this decision offered no succinct direction to the planning team. It suggested that both disturbance scenarios should be fully developed in anticipation of a verdict at some point in the future as to which one was preferred. Furthermore, if FFP was to access the wood in this area in a timely manner, their operational plans needed to be completed within the year. The Hwy40 planning team thus chose to concentrate on the development of the original disturbance scenario designed by the team.

In summary:

1. What is the natural range of variation (NRV)? Historically, there is an equal probability of a disturbance event(s) of any size occurring anywhere in the study area.
2. What is the current range of variation (CRV)? All things being equal forest harvesting usually follows woodsheds, and the energy sector focuses on high potential areas. The current natural gas development in the Hwy40 area (south of Hwy40 in the middle of the study area) represents the most likely

location of concentrated energy sector activities over the next decade (Note: the Hwy40 planning process has no power to influence future disturbance locations of the energy sector).

3. (Why) Is NRV different than CRV? In terms of location, NRV is consistent with CRV.
4. What management objectives would converge with moving towards NRV in this case? Again – all location scenarios created have equal natural pattern value. The only issue is the degree to which each serves the other eight objectives. The chosen location is very close to being optimal for fire threat and MPB mitigation, and it results in few, if any, new road access corridors over the short term since most of the proposed disturbance is already well represented by various energy sector agencies. This option would leave the vast majority of the study area intact - all of which is high to very high woodland caribou habitat. This was the scenario that resulted in the highest value for the caribou indicator (because it overlapped the most with existing disturbances and linear corridors). Finally, the position of the proposed disturbance scenario maximizes the opportunity of the public to experience, and maximizes the potential benefit from new knowledge on the biological response of woodland caribou since the outcome will be a previously untested disturbance design.
5. What management objectives would conflict with moving towards NRV in this case? None as identified. While the caribou travel corridor issue is a legitimate biological concern, it was not one of our original eight fine filter indicators.
6. (How) Can we move towards NRV from CRV? The location decision did not require natural pattern input. It was made entirely based on other values.
7. Are there policy or practise implications? This is an excellent demonstration of how challenging some natural pattern metrics are to integrate. In situations where Mother Nature offers no preferred direction, it may be necessary to develop a more formal decision-making process such as the one outlined above.
8. What are the new questions / issues? The most obvious issue raised by this planning step was the reality of a true natural pattern based planning process. No matter how well intentioned it may have been, the imposition of a planning scenario from someone not part of the planning team, for the perceived benefit of a single value, represents a fundamental failure of the

application of natural patterns as a foundation. It also demonstrates the importance of having a complete, robust list of fine-filter objectives.

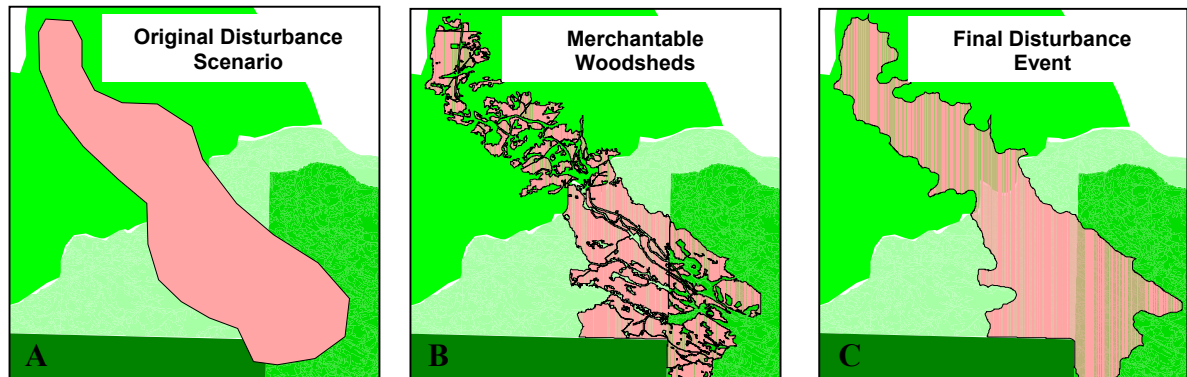
#### **Planning Decision #4: Refining Disturbance Event Details**

To this point the Hwy40 planning team had agreed on the size, shape, orientation and general location of the area in which disturbance activities will take place over the next ten years in the Hwy40 study area. The last step is to translate this generalized disturbance scenario into a more precise natural pattern spatial entity known as the “*disturbance event*”. This translation is a function of six elements as defined by the planning team:

- 1) No disturbance within the study shall include any part of the Willmore Wilderness Area.
- 2) Adaptive management opportunities will be developed collaboratively with scientists and fully developed proposals whenever possible.
- 3) Harvesting and transporting trees is more efficient it is when done in logical woodsheds.
- 4) Non-merchantable and inaccessible areas will all be left as harvest residuals - although some of these areas will be burnt through fire prescriptions.
- 5) Some merchantable forest areas within the event will be left as harvest residuals – although some of these areas will be burnt through fire prescriptions.
- 6) Maximizing opportunities for safe wildlife movement from east to west through the disturbance event. (Note that this reflects our original design objectives).

Recall that the Hwy40 planning team originally assumed a total of 39% residual area when calculating the total area of the disturbance - representing the historical average for wildfires. Furthermore, the forest management companies involved agreed to leave about 20% of the merchantable forest area in residuals. Using these numbers as guides, the team identified merchantable and logically efficient woodsheds close to the original disturbance outline to meet the allowable cut requirements defined by each higher-level plan (shown as B in Figure 11). The point of the exercise was to identify the final outer boundaries of the event area, as well as identify a baseline residual design within which items 1-6 can be achieved. Keep in mind that some of the merchantable areas (shown in pink in Figure 11) will be undisturbed, and that some non-merchantable areas (shown in green in Figure 11) will be disturbed by prescribed burning.

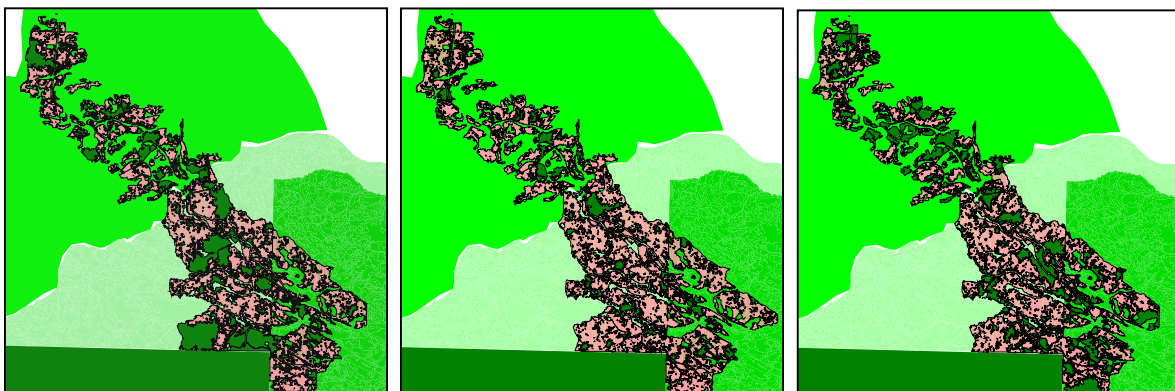
**Figure 11. The Transformation of the Hwy40 Disturbance Scenario into a Disturbance Event.**



The final disturbance event that the Hwy40 planning team agreed to develop is 8,129 ha, of which 2,416 ha is potentially non-merchantable residual, and 1,143 ha is potentially merchantable residual (Option C in Figure 11). The total undisturbed area of 3,559, or 44%, seemingly exceeds our original residual target of 39%. However, keep in mind that about 6% of the area already exists as long-term disturbances such as roads and well sites. Furthermore, prescribed burning will disturb some of these residual areas.

The challenge of refining the Hwy40 disturbance event design to a higher level of resolution is that most parts of this particular event have an equal chance of survival (Andison, in prep). On the other hand, relationships between sizes and shapes and locations of wildfire residuals are well documented (Andison 2003b and 2004). To help address this challenge, LANDMINE was run on the final Hwy40 scenario several times to develop some residual pattern possibilities, three of which are shown in Figure 12. The green areas represent partial or full residuals, while the pink areas represent fully disturbed areas.

**Figure 12. Three Natural Residual Possibilities for the Hwy40 Disturbance Event from the LANDMINE Disturbance Simulation Model.**





The team agreed that residual planning should in principle involve some combination of logical opportunities, access, travel corridors, and natural patterns. The level of detail required was now beyond any reasonable expectation of large team planning. The development of where and how to leave residuals was left to a sub-committee of the three forest industry planners, the natural pattern specialist, and the prescribed burn specialist.

Understandably, Foothills Forest Products was unwilling to use resources to plan detailed residuals for both the original and alternative suggested scenario, and chose to focus their efforts on the alternative scenario since it had a far greater chance of being approved. Both ANC and HWP combined some of the LANDMINE scenarios of sizes, shapes, and locations of residuals with practical information such as topography, stand structure, age, and composition, aesthetics, opportunity for wildlife movement, and accessibility. Both plan on running their final designs through the NEPTUNE GIS-based natural pattern decision-support tool (The Forestry Corp 2006). NEPTUNE will compare 10 key pattern metrics of disturbance events to the historical range of variation for this landscape.

The final element in residual design is the integration of prescribed burning with harvesting. As previously stated, prescribed burning is intended as a disturbance tool within both merchantable and non-merchantable areas in the Hwy40 disturbance event. The integration of prescribed burning and harvesting is a unique element to the Hwy40 project – particularly when the objective is (disturbance) pattern oriented. After considerable discussion of how best to achieve this union, and several field trips to some potential residual and/or prescribed burning sites, it was decided to only develop specific prescribed burn plans once harvesting plans have commenced. Even after obtaining harvesting approvals, forest management companies have considerable discretion in locating (particularly smaller) residuals as harvesting progresses. Furthermore, prescribed burn plans can be flexible to respond to opportunities, and the planning horizon is shorter.

In summary:

1. What is the natural range of variation (NRV)? On average, natural wildfires in this part of the world have an average of 39% of their area in some form of residual, although the variability is tremendous. Wildfires also moderately select against non-forested areas in favour of forested areas (*i.e.* non-forested areas are more likely to survive wildfires). A very rough rule-of-thumb is that about 36% of forested areas in an event wind up as residuals, and about 60% of non-forested areas (depending on the ratios of each). Of the treed portions of an event, older forest has just as much chance of becoming a residual as younger forest. And finally, although hardwood

stands are less likely to burn than softwood areas, the entire study area is almost pure softwood, so this is not an issue with respect to residual patterns.

2. What is the current range of variation (CRV)? Total residual levels in past harvesting events are in the neighbourhood of 5-20% on average, although a two pass harvesting system technically leaves at least 50% residual with each pass. Mature (or merchantable) residual levels tend to be close to zero historically. On the other hand, traditional harvest designs are such that all non-merchantable and non-forested areas are almost always residuals since prescribed burns or alternative treatments within FMAs are rare.
3. (Why) Is NRV different than CRV? The main reasons for the difference are a) the requirement of forest harvesting to disturb only areas of mature and over mature timber, b) the historic perspective that leaving merchantable timber behind was a failure to fully utilize the resource, and c) residuals were not widely understood as valuable biological entities until very recently. Even now, our ability to control or regulate residual design is limited to forest management activities, and does not extend to energy sector development.
4. What management objectives would converge with moving towards NRV in this case? A more representative amount and mixture of undisturbed residuals would have higher biological value for a wide range of species, including woodland caribou. For example, mature residuals ensure that there would be lichen, and residuals provide more opportunities for hiding cover and travel corridors.
5. What management objectives would conflict with moving towards NRV in this case? A more representative mixture of undisturbed material potentially leaves spatial stepping-stones for the spread of both wildfire and MBP. Any merchantable timber left behind as forgone wood (*i.e.*, not to be taken in a subsequent pass) is considered to be a short term economic loss.
6. (How) Can we move towards NRV from CRV? The team agreed to a 40-45% residual level, including 20% merchantable forest. The team also agreed to base residual design on natural levels of residual sizes, and to use prescribed burning to introduce residuals with variable mortality levels. To help with residual locations and orientation, LANDMINE was used to create some residual design possibilities.
7. Are there policy or practise implications? The planning of event details raises several policy and practice issues. The issue of whether, or to what degree merchantable timber may be left behind as forgone wood as opposed to necessitating a 'second pass' of harvesting at some point in the future links

directly to wood supply policies of FMA's. A related issue is the degree to which planned residuals will remain undisturbed in light of increasing levels of energy sector activity (who were not involved in the process). For that matter, the degree to which residual planning becomes a landscape feature will depend on the level at which it is included in the planning process. Although spatial planning is only conceivable at operational scales, there is no reason why non-spatial targets cannot be part of long-term plans for all land management agencies. Finally, since residual design within a disturbance event involves all parts of a landscape, this raises the question of who has management responsibility for areas of the landscape that are unable to produce timber (so-called "non-productive" areas). Such areas tend not to be actively managed by anyone right now (other than for wildfire protection), and forest management tenure agreements in Alberta are heavily biased towards the management of the productive landbase. In fact, one could argue there exist only *disincentives* to FMA-holders to manage the whole landscape right now. For example, while FMA-holders are free to ask ASRD to carry out a prescribed burn, they incur all of the risk, but gain no benefit from it from an administrative / monitoring perspective. It is not surprising that prescribed burns on FMA's are extremely rare events. If there is any hope of moving towards holistic or cumulative land management in Alberta, disturbance event planning needs to be a shared responsibility.

8. *What are the new questions / issues?* The survivorship of residuals, the actual biological impacts of a more natural residual design on caribou and other species, the level of collaboration commitment from local energy companies, the acceptance of the risks of prescribed fire as a legitimate land disturbance tool, and the clarification of management responsibility for the entire landbase (including so-called non-productive areas) are all issues yet to be resolved.

## **7) Obtain Plan Approvals**

At this point, the responsibility shifts from the Hwy40 planning team to the individual planners. The Hwy40 planning team was a temporary, situational entity with no official status, and the FMF does not get involved in any planning or management activities. It is the responsibility of the three forest management agencies involved to pursue preliminary and final harvest approvals for their portions of the project as they see fit based on the information and design work developed by the Hwy40 planning team. For that matter, they are in no way obliged to either pursue approval for this area, or use any or part of the design work generated. Having said that, this was not an academic

exercise. All of the management partners involved agreed from the outset that this plan was to be the backdrop for their individual plans and approvals.

To date, ANC has received preliminary harvest plan approval for their portion of the plan from ASRD with final approval still pending. HWP has completed their layout and has submitting for approval in November 2007. FFP has no immediate plans to be harvesting their portion of the Hwy40 plan. As harvesting approvals take place, Forest Protection Branch of ASRD will identify locations and objectives for prescribed fire opportunities within the disturbance event in collaboration with the respective company planners, and develop and submit their own plans for approval.

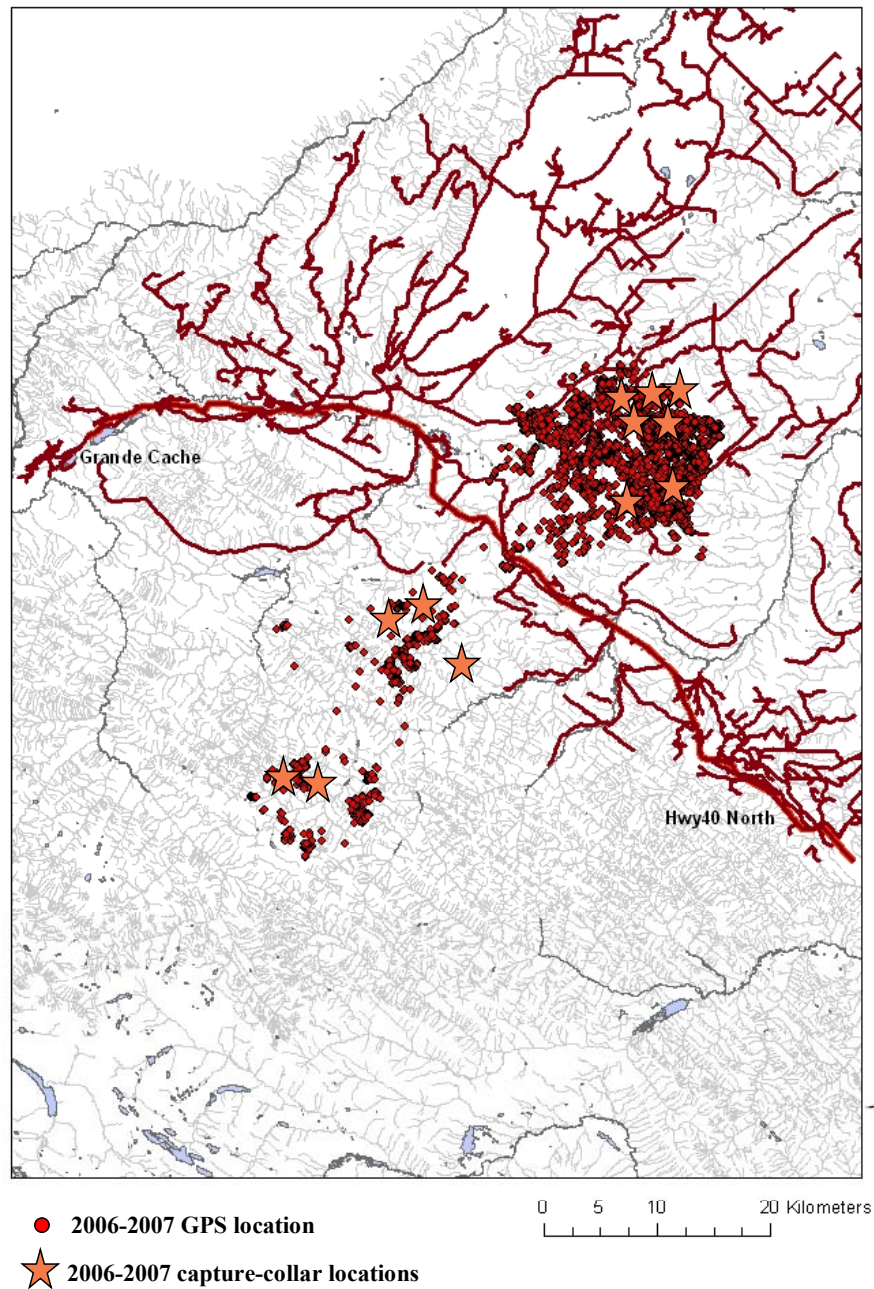
It is entirely possible that the rapid advance of MPB may shift harvesting priorities for all agencies involved. The shift may either away from the Hwy40 study area, or it may focus on it as a priority area. These decisions are beyond the mandate of this project.

## **8) Establish an Adaptive Monitoring / Research Program**

Recall that one of the hypotheses of using natural patterns as the foundation for planning is that it creates viable disturbance solutions for most, if not all, other values. Particularly as a demonstration project, this hypothesis needs to be tested. More specifically, the intention was to monitor the biological, social, and economic impacts of the Hwy40 disturbance plan. This is consistent with our objectives (#5, #9 and #12), terms of reference (#7), project goal, and planning objectives (#4, #6, #7, and #8).

The most obvious target for an adaptive monitoring program is woodland caribou. The Hwy40 project represents a unique opportunity to evaluate the response of caribou to one of the first natural-based disturbance plans in the province. The potential for gaining new knowledge with respect to caribou movement and resource selection is tremendous, particularly given the significant area of existing caribou habitat in the study area. In 2005, the Hwy40 project successfully acquired financial support from the Forest Resource Improvement Association of Alberta (FRIAA) OPEN FUNDS, ANC, and HWP towards a local woodland caribou adaptive monitoring program. During the fall of 2005, 12 GPS collars were obtained and the required capture and research permits were obtained. In the late winter of 2006, one animal was captured and collared using a net gun from a helicopter. In the summer of 2006 a dedicated project biologist was hired, who updated the permits and supervised the capture and collaring of seven more animals within the Hwy40 study area in December of 2006, followed by five more animals to the east in the Willmore (but part of the same herd) in February of 2007. The capture location of the Hwy40 project animals, and some raw GPS data from the animal captured in 2006 are shown in Figure 13.

**Figure 13. Caribou capture locations (orange stars) with scatter plot of GPS data on 4 caribou from 2006-2007. Note, Figure does not distinguish GPS data among animals and cannot be used to imply habitat use as-is.**



The project biologist was also given the responsibility of ensuring that both our research and our data were part of a larger collaborative effort. Unfortunately, the provincial caribou program is still under development and is not yet in a position to coordinate research and data collection. In the absence of a formal provincial coordination body with which to work, the Hwy40 caribou research project has formed a partnership with the caribou research group from Parks Canada and the University of Montana. Efforts to link the Hwy40 caribou research to provincial research efforts through ASRD and the University of Alberta continue.

In addition to caribou monitoring, additional components of a monitoring program were pursued. Within the FMF, it was agreed that the Grizzly bear Program, the Fish and Watershed Program, and the Social Science Program could all use the Hwy40 plan as key components of their respective research initiatives. The potential in each case is still being explored and developed. Beyond the FMF, the Canadian Wildlife Service is interested in testing the impact of the Hwy40 design on local avian populations, and the University of Saskatchewan is interested in evaluating the impacts of prescribed burning on the physical and chemical attributes of soils in non-forested areas. Finally, potentially mutually beneficial links with the Alberta Biodiversity Monitoring Program are being explored.

## **9) Communicate**

The last, but most important step in the Hwy40 North Demonstration project is to share our experiences widely and objectively. This is a complex project well worth talking about. It introduced a new planning strategy, included four land management partners and ten planning partners, imposed an imprecise planning process on a planning team who were not entirely comfortable with idea of operational planning as a group, and challenged individual beliefs in what it is we are managing and how, all in a study area that is politically charged and value-laden. The closing of the Grande Cache mill and the transition of the management responsibility from Weyerhaeuser to Foothills Forest Products over a period of more than a year further increased the complexity of the project, as did the rapid advance of MPB into the study area. And finally, this all happened over the span of a provincial election, which meant “black out” dates were in effect for public participation from any government representatives.

In anticipation of the significant communications effort required, the Hwy40 Project has its own communications plan. In fact, the communications effort began over five years ago – prior even to the completion of the project proposal. Presentations on the concept of the Hwy40 project were given to all of the key partners to solicit feedback. Support for the conceptual outline of the Hwy40 project by high-level decision-makers within each of the partner organizations was significant and unanimous.

The communications focus during the planning process expanded to include, 1) talking about the project to professionals and the public at every opportunity, 2) creating a stand-alone website with all critical information, 3) providing detailed project reports such as this which provide not only the details of the Hwy40 process, but also a critique of lessons learned, and 4) initiating a series of one-page project updates, distributed widely across the province. To date, more than 50 Hwy40 presentations have been given over the past four years to town councils, provincial and federal politicians, professionals both within and outside of Alberta, and the public. The Hwy40 project has also been a part of more than 10 field tours with ENGO's, the public, politicians, senior bureaucrats, and forest industry customers.

This report is the first of two describing the project and the process. The second report will be a critique of the process, and include specific recommendations for a) how it might be done differently next time, and b) policy and practice changes required to achieve holistic disturbance planning in Alberta. A third report is planned sometime over the next 2-4 years, which will highlight the adaptive monitoring results.

Since July of 2004, 17 one-page project updates have been distributed electronically to about 200 people within and beyond Alberta. They cover topics that range from the conceptual foundations of the project and the organization of the teams, to the progress and outcomes of the planning process. At this point, the Hwy40 updates will begin to discuss our findings and adaptive monitoring progress and results. These updates are modelled in both form and function after the FMFND Program "Quicknotes" series. Informal feedback from these updates has been positive.

The Hwy40 website was created in the spring of 2005 and has since then had over 100,000 hits. The website contains all of the information available in the Hwy40 updates, as well as PDF downloads of each issue. It also provides some images, maps, and contacts.

As the various disturbance plans begin to become a reality, the communications effort will shift to how the team members deal with issues of a practical, operational nature. Along those lines, we are hoping to create an interpretive trail, perhaps linked to a public turnout along Hwy40.

Lastly, this report marks the beginning of our efforts to focus on communicating the Hwy40 lessons to a wide range of audiences. Consistent with our objectives, the success of this project hinges not as much on whether, or to what degree the planning team was able to follow a natural pattern planning foundation, but rather on clearly and openly talking about the successes and failures of our ability to do so. It is often during in such post-project debates and discussions that the best learning takes place.

## SUMMARY

The original goal of the Hwy40 North Demonstration project is to ***demonstrate the effectiveness of using natural disturbance pattern knowledge as the foundation for operational-scale forest management planning***. It is both an ambitious and complex goal. At first glance, it is difficult to see how the various elements discussed in this document form a coherent whole. However, by breaking the objective statement up into four logical segments, the need for, and relationship between, the many elements is more obvious.

The first phrase “***Demonstrate the effectiveness of...***” refers to the innovative nature of the project, which demands high quality research / monitoring, communication, and education efforts. Towards this need, the Terms of Reference specifically required the planning process to be flexible to allow for the needs of scientific studies. The project also acquired both internal (*i.e.*, from some of the Hwy40 partners) and external funding to support adaptive management studies of woodland caribou and other biological values, drafted a project communications plan, developed a stand-alone website, drafted and distributed 17 (and counting) one page updates over the last three years, and has so far given more than 50 presentations to various audiences. This report is the first in a series of three on the project.

The second part of the project objective statement, “***...using natural disturbance pattern knowledge...***” is relevant because it demands some innovative planning perspectives. Details aside, we know that natural disturbance patterns occur across the entire land base as singular entities in time and space that respond to various biotic and abiotic land features. Administrative boundaries and unrelated but parallel disturbance activities that focus on only one portion of the landscape are entirely unnatural at best, and irrelevant at worst. This leads to three pivotal elements of the Hwy40 project:

- 1) We must learn to plan seamlessly across administrative borders of all types to meet (more relevant) trans-border objectives. Part of the attractiveness of the Hwy40 study area for this project was the confluence of three forest management areas and a protected area in an area with unique ecological features. This is an excellent example of an area that would not be well served by discrete planning activities.
- 2) The ultimate planning objective is disturbance event(s) pattern. A *disturbance event* in this case is a product of pattern, not process. For landscapes that experience a number of different disturbance vectors from a variety of sources, there is no value in evaluating the disturbance pattern of a single source. While it may exist as an independent administrative entity, it has no biological relevance since biodiversity only responds to the cumulative disturbance pattern. So we



should be focusing on planning, mapping, and tracking cumulative disturbance patterns in time and space - *disturbance events*. Furthermore, consider that disturbance event design is the only aspect of forest land management that we truly have any control over – it thus should be our primary concern. Harvesting, road building, prescribed burning, and well-site installation are the tools with which to achieve disturbance design objectives. Furthermore, habitat, timber quality, and social requirements now become the outputs of disturbance design. This places both responsibility and cause-effect relationships in a logical order: We design disturbance events in an attempt to achieve certain (responsive) ecological, social, and economic objectives.

- 3) The whole landbase must be included in disturbance event design. Specifically identifying harvesting and prescribed burning (in particular) as tools with which to achieve this is helpful.

The third phrase in the project objective is “...**as the foundation for...**” which differentiates between using Mother Nature as a *requirement*, and using it as a *guide*. We cannot mimic Mother Nature. However, we are not prepared as a society to allow Mother Nature’s disturbance activities to continue as they once did. Forest fires, floods, and insect outbreaks are neither socially nor economically acceptable. Our only other choice is to use knowledge of how Mother Nature disturbs landscapes as a benchmark against which to identify and evaluate our own disturbance choices. Once the natural patterns for a particular aspect of disturbance design have been established, only then will other objectives be considered as fine (decision-making) filters to refine the design, or to deviate from historical disturbance patterns.

Using natural patterns as a planning foundation is a significant departure from traditional planning systems, so a set of eight questions was designed to help guide the process:

- 1) What is the natural range of variation (NRV)? (What did Mother Nature do?)
- 2) What is the current range of variation (CRV)?
- 3) Why is NRV different than CRV?
- 4) What (fine filter) management objectives would converge with moving towards NRV in this case?
- 5) What (fine filter) management objectives would conflict with moving towards NRV in this case?
- 6) (How) can we move towards NRV from CRV?
- 7) Are there policy or practise implications?
- 8) What are the new questions / issues?

The first question (above) requires some specific information on NRV, which was provided in this project both by scientific results, but also through the use of a spatially-

explicit landscape disturbance simulation model (LANDMINE). The simulation results were particularly useful in instances where the natural range was too broad to provide specific guidance.

It was also necessary to explicitly define some indicators around other management objectives that would be used as the fine filters. The Hwy40 project identified eight such filters:

- 1) Industrial footprint,
- 2) Timber quality,
- 3) Mountain pine beetle threat mitigation,
- 4) Woodland caribou habitat impact,
- 5) Wildfire threat mitigation,
- 6) Opportunity for learning,
- 7) Opportunity for public viewing, and
- 8) Grizzly bear habitat impact.

The fourth and final part of the Hwy40 project objective statement is “...**operational-scale forest management planning**.” The last level of forest management planning was deliberately chosen to limit both the scope of the project and the decisions required of the planning team. The majority of the strategic decisions were already been made and the management objectives identified. The decision-making required for the Hwy40 project was limited to three questions (see Section 6):

- 1) How big are disturbance events?
- 2) Where to disturb?
- 3) How to design event details?

The Hwy40 planning team also discussed the question of ‘*How much to disturb?*’, and that summary is included at the beginning of Section 6 of this document. However, in reality that particular decision was already established within the various strategic plans.

The focus on operational plans also meant that the study area *must* have pending operational plans – it had to be real. The approved long-term plans of HWP, ANC, and Weyerhaeuser all included harvesting activities in the study area over the next 10 years. And as a *real* operational plan, the Hwy40 team also had to understand and respect the planning requirements of the various partners involved. Although perhaps redundant, this issue was made explicit in the project Terms of Reference.

As expected, the challenges in this project were many and varied. The project timing coincided not only with the replacement of one forest industry partner with another, but also a provincial election, which restricted our ability to communicate at a critical time in the process. Our original plan to use a “charrette” to solicit public input was abandoned

because it was perceived as an unnecessary layer of complexity. No guidance in the form of strategic or operational plans was available for the Willmore Wilderness Area (beyond the Willmore Wilderness Act). The team also had to deal with unsolicited input and advice from individuals from Hwy40 partner agencies not involved in the project, the most serious of which compromised the integrity of both the process and the plan. And finally, the rapid advance of mountain pine beetle has recently created uncertainty over the extent and location of harvesting operations throughout the Alberta foothills.

Although the issues noted here were all disappointments, each one made the project that much richer. In the end, the primary objective of any demonstration project is to maximize learning through an understanding both successes and failures. The ultimate measure of success for the Hwy40 project overall is how much we learn.

New insights gained through this project need to be communicated clearly and widely. This report marks the beginning of our efforts to focus on communicating the Hwy40 lessons to a wide range of audiences. The second report on the Hwy40 project will objectively evaluate the process, and provide specific recommendations to help advance the use of natural pattern strategies in the future.

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