CHAPTER 3. FMA AREA FOREST MANAGEMENT IMPLEMENTATION

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3.0 FMA AREA FOREST MANAGEMENT IMPLEMENTATION - OBJECTIVES AND STRATEGIES

"The woods are silent, dark and deep." – Robert Frost

INTRODUCTION

This section presents the objectives and strategies that will be applied by all forest companies operating within the FMA area, including Quota Holders and companies operating under the Commercial Timber Permit Programs[13] of Alberta Sustainable Resource Development. This section covers a wide range of topics. They taken together outline how the forest companies will implement a coarse-filter sustainable forest management approach at the stand and landscape levels. The implementation of the strategies will be consistent with the detailed guidelines laid out in Alberta Pacific's Operating Ground Rules for the Alberta-Pacific Forest Management Area (Al-Pac 2000) and any subsequent ground rules that are developed. Appendix 13, 2007 FMP – Alberta-Pacific FMA Area – Objectives / Strategies / Monitoring Matrix, details all 29 objectives and the associated strategies and indicators, plus the measurement criteria and monitoring activity to achieve plan compliance. The matrix also lists the subsequent reporting document(s) for each strategy or indicator.

3.1 FOREST INVENTORY

Alberta-Pacific initiated the Alberta Vegetation Inventory (AVI) of the FMA area in 1991 and completed the inventory in 2001. The forest is constantly changing through growth and disturbances, both natural and human caused. Forest inventories quickly become outdated if they are not maintained. The forest companies will be updating the FMA area on an ongoing basis to ensure that the forest cover and land use information remains current to the provincial standard. The AVI is used for all operational planning, the timber supply analysis (TSA) and other users plans.

The photo-based AVI is the provincial inventory and is designed to facilitate information sharing and the collection of a broad range of vegetative information. These features, as well as the use of digital mapping, will continue to provide a valuable inventory for forest management planning, analysis and modeling.

With the completion and government approval of the FMA area AVI[14], the previous Phase 3 inventory is no longer used by Alberta-Pacific, the Quota Holders or the Alberta government for planning or timber supply analysis.

FMA area updates will meet or exceed minimum requirements identified in the Alberta Sustainable Resource Development AVI Standards Manual (Version 2.1) and will continue to include conifer understorey mapping. This understorey mapping, using leaf-off colour-infrared photography (CIR) after deciduous leaf-off, was initiated for the first AVI.

[13] Quota Holders (Millar Western, Northland Forest Products, Alberta-Plywood, Vanderwell Contractors, St.Jean Lumber, Spruceland, Ed Bobocel Lumber) and participants in the Commercial Timber Permit (CTP) and Miscellaneous Timber Use (MTU) programs of Alberta Sustainable Resource Development.

[14] The FMA area's AVI was approved in 2002; the exception was A5 (now part of A15) that was approved in 2003.

As the update program is not required for continued government approval of the AVI, the data will be submitted at Alberta government request. The update program examines areas of change (e.g., cutblocks, oil and gas activities, not-sufficiently-regenerated areas) and updates the data sets to better represent the landscape. These updated data sets will greatly assist in operational planning. The timber supply analysis will utilize the approved AVI and updates.

All updates of basemap features (watercourses, lakes, roads, etc.) will be digitally captured and coded as per Alberta Government Map Base Update Specifications and Procedures. The working map scale will be 1:15,000 and will be based on the Alberta Township System.

OBJECTIVE (#2):

To update the approved AVI forest inventory and continue to provide sound data for planning.

STRATEGIES:

- Maintain the AVI through a photo-based update and field program.
- Continue to utilize existing leaf-off colour-infrared photography to enhance the identification of conifer understorey and crown components in mixedwood stands and map to AVI standards.
- Update one-tenth of the FMA (approximately 65 townships) every year.
- Systematically update harvest depletions, natural disturbances and land use. The FMA area harvest and disturbance depletions will be updated annually through remote sensing, and land use activities (roads, etc.) will be updated on a ten-year cycle using Al-Pac's remote sensing products.
- Supplement the temporary sample plot program with additional samples to ensure representative and statistically sound data for each of the common forest cover strata.
- Continue to establish and maintain the current network of applicable permanent sample plots to monitor and measure growth and succession in forest types.
- Prepare a growth and yield strategy to meet future growth and yield needs (Strategy to be approved by Alberta SRD).
- Continue Alberta-Pacific's participation in the Western Boreal Growth and Yield co-operative (WESBOGY).
- Monitor regeneration success on roads, decking and processing areas.

The AVI update schedule may deviate throughout the FMA area if natural or man-made disturbances produce shifts in the forest mosaic that require an earlier update to meet operational considerations. The AVI inventory will continue to be a photo-based inventory largely based on the acquisition of black and white photography. New photography will be utilized when revised attribute data is required. This update will generally target areas of relatively rapid change such as disturbed areas.

The colour-infrared photography taken in the 1990's will still be utilized in the FMA area to provide information on conifer understorey and crown components in mixedwood stands. This information is paramount to the ability of Alberta-Pacific and the Quota Holders to enact a forest management program on the FMA area. Identification of conifer understorey allows the forest manager to choose appropriate silvicultural practices for forest stands. As a companion to the upgrade program, a field program for areas of change or information gaps, such as regenerating burns or cutovers, will be implemented using a reconnaissance air-call program or a field sample.

In addition to the upgrade of the FMA area, the forest companies will continue the annual systematic update of harvest depletions (i.e., Alberta-Pacific and Quota Holder cutblocks), fires and other natural disturbances. Air photos will continue to provide the update information. In addition, the age class of regenerating stands and immature stands will be based on disturbance records as much as possible. The FMA area's land use activities (roads, seismic, pipelines, etc.) will be updated using aerial photography on a 10-year cycle (one-tenth per year), with every land use update completed in conjunction with the ten-year re-inventory.

Alberta-Pacific will also investigate several new methods to produce update data. New techniques include satellite imagery, mono-restitution (single photo digitizing), and 'Softcopy' technology (smaller scale photographs working in a complete digital environment). Thus, using various data sources (satellite, air calls, field visitation, photo interpretation and a stand growth model) the forest inventory maps will be updated to reflect forest growth and succession, land use alterations, depletions, and disturbance.

VOLUME, GROWTH AND YIELD PROGRAMS

The volume and growth programs provide the tree and stand volume information for planning current harvesting operations and the growth information required to calculate sustainable annual allowable cuts. Three programs will be continued and a fourth will be initiated:

1. Temporary Sample Plot program (TSP)
2. Permanent Sample Plot program (PSP)
3. Western Boreal Growth and Yield Co-operative (WESBOGY)
4. Growth and yield initiatives with the Alberta Mixedwood Management Association

The Alberta-Pacific FMA area Growth and Yield Plan is presented in Appendix **7**. The plan is prepared under the following sections:

1. Overview
2. Growth and Yield Programs
3. Sampling Stratification Scheme
4. Plan for Continued Data Collection
5. Ongoing Development

The following discourse briefly describes the main components of the growth and yield plan.

TEMPORARY SAMPLE PLOT PROGRAM

The primary purposes of the temporary sample plot (TSP) program are to provide a "snap-shot" on stand composition, volume and piece size data for operational planning, yield curves, the Tree List Generator (TLG) and calibration of growth models (i.e., Mixedwood Growth Model[15]). Approximately 4,000 TSPs in the merchantable forest strata exist on the FMA area. Additionally, from 2002-2005 over 200 pine TSPs were measured to adjust pine yield estimates to meet a growing concern on jack pine merchantability. Alberta-Pacific and the Quota Holders will continue to establish sample plots as needed to fill growth and yield information gaps.

PERMANENT SAMPLE PLOT PROGRAM

The objective of establishing permanent sample plots (PSPs) on the FMA area is to monitor and measure the growth and succession of representative forest types over time. As the PSPs are re-measured the changes observed with respect to plant species, tree growth, stand development, stand structure and tree mortality contribute to the understanding of the dynamics of the forest. The re-measurement data provides needed information for predicting the growth and succession of forest types through time. By 2005, Alberta-Pacific had established over 400 PSPs throughout the previous 10 years and will continue, if applicable, to re-measure the Alberta Sustainable Resource Development's 41 PSPs on the FMA area, 16 of which are in deciduous types.

The biological response of the mixedwood forest to an alternative silvicultural treatment in targeted stands is poorly documented throughout the Western Canadian boreal forest. Alberta-Pacific, in co-operation with the major Quota Holders, will build upon the plot database by inputting new PSPs in target strata that have previously been under-represented or not represented. Plots will assist in the calibration of yield models and provide data for the Tree List Generator.

Targets are dependent on accessibility and operational considerations. No air-access-only plots are planned. The program will continue to expand the geographic range of the plot coverage to provide representative coverage over the entire FMA area with the assistance of the major Quota Holders, and will build upon the current 400+ plot database by inputting new plots in target strata. In general, these strata are within new mixedwood silviculture systems and forest types that are under-represented in the current coverage.

The actual number of plots will be determined through a growth and yield gap analysis. The program is a dynamic process designed to meet emerging growth and yield requirements.

WESBOGY

The Western Boreal Growth and Yield Co-operative (WESBOGY[16]) is a Western Canadian industry-sponsored organization managed by the University of Alberta. (Alberta-Pacific has been involved with the co-operative since 1993). The co-operative is involved in forest growth and yield issues in Western Canada's boreal forest. The co-operative facilitates co-ordinated research and development efforts in boreal forest growth and yield data sharing and also provides a forum for communications.

[15] Mixedwood Growth Model (MGM) - University of Alberta Research program initiative. http://www.rr.ualberta.ca/research/mgm/mgm.htm
[16] Wesbogy – http://www.rr.ualberta.ca/wesbogy/

The main objectives of WESBOGY and its members is to:

1. Encourage the continued monitoring of standardized PSPs
2. Assist in quantifying the effects of intensive forest management practices, and co-ordinate the acquisition of high priority growth and yield data
3. Further the knowledge and understanding of the growth and yield of boreal forests
4. Expedite the development of managed-stand yield models for the major commercial tree species in the region; for example a mixedwood growth model is a major priority project
5. Fund a full-time researcher at the University of Alberta to pursue growth and yield priorities as set by the co-operative

Alberta-Pacific will continue to participate in WESBOGY and will maintain two FMA area WESBOGY research installations.

ALBERTA MIXEDWOOD MANAGEMENT ASSOCIATION

Starting in 2001, the FMA area forest companies assisted in defining and establishing a mixedwood management co-operative. Selected forest companies within Alberta are signatories of an agreement to participate in a co-operative program, known as the Mixedwood Management Association, for the following purposes:

1. The forecasting and validation of managed stand growth and yield, particularly of aspen / white spruce mixes
2. The establishment of research needs and priorities; facilitating the completion of research projects, and ensuring that the research results are disseminated. Where possible, co-ordinate with other research groups. Where high priorities can not be addressed by existing research groups, the association will carry out its own research
3. Facilitate discussion and understanding within the forestry community of mixedwood management issues
4. Develop standardized research and data-collection protocols considering the long-term need for reputable data in forest management decision making

ROADS, DECKING AND PROCESSING AREAS MONITORING

The forest companies will initiate a monitoring program to account for landbase losses due to ineffective or less than desirable reclamation of roads, decking and processing areas. To-date the forest companies have limited quantifiable data on the performance of growing stock on these areas. Appendix 8 provides the forest companies with direction on how to assess and manage the impacts of road, decking and processing areas on the Al-Pac FMA area timber supply.

3.2 WOOD SALVAGE

Timber salvaged from forest fires, blowdown (windthrow), insect and disease attacks, agricultural land clearing and industrial clearing will be utilized where it is economical to do so. Al-Pac's use of fire-killed timber will have the limitation that charred wood cannot be allowed into the pulpmill. Sawmill fibre requirements are less stringent than pulpmill requirements, and this generally results in greater wood salvage.

As fire is the predominant natural disturbance on the FMA area, and since some species of plants and animals are strongly associated with post-fire environments, the forest companies recognize the need to leave some portion of the burned landscape unsalvaged. It is unclear from a scientific standpoint as to what levels of burnt-timber retention are necessary to maintain natural disturbance ecological elements[17].

Salvage intensity of merchantable burnt timber has historically varied tremendously in relation to factors such as size of fire, amount of merchantable wood that is available to salvage, distance to road infrastructure, burn intensity, and tree species. It is informative to examine a case study conducted regarding fires occurring on the FMA area in 1999 (a relatively representative year with regards to fires and fire salvage). There were 403 fires in 1999 that affected the FMA area with the vast majority (>350) of these fires being less than 4 hectares in size. There is a strong linear relationship between fire size and amount of area salvaged ($r^2 = 0.85$). The smallest fire with any salvaging was 1,273 hectares (with 555 hectares of merchantable timber). The salvaged fire with the smallest amount of merchantable area (241 hectares) available for salvage was 2,472 hectares in size. The majority of fires (395 of 403 fires), including many that were up to several thousand hectares in size, did not receive any salvage logging.

Of the 61,592 hectares that burned in 1999 (fires > 4 ha), there were 13,790 hectares of merchantable timber within the fire boundaries (of which 54% was conifer and 46% was deciduous leading species). The forest companies planned to harvest in 8 fires in 1999. The merchantable area planned represented 6,915 hectares (12.5% of the total fire area or 56% of merchantable area within the fire boundary). Merchantable conifer was planned at a higher rate (66%) than deciduous (31%). Rephrased, 69% of the merchantable deciduous that was available for salvage was left unsalvaged on the landscape, while 34% of the available burnt conifer remained unplanned. On a fire-by-fire basis there is a tremendous variation in the percentage of merchantable area planned for harvest (ranging from 10% to 96%). Data is not available as to what per cent of the planned area was actually harvested, but undoubtedly not all of the area planned would have been harvested (e.g., a portion would be too charred). Also, Alberta-Pacific follows its typical stand structure guidelines even when harvesting in fire salvage areas so that in-block retention is at a minimum five per cent.

Alberta-Pacific, in collaboration with the University of Alberta, Alberta Research Council, Canadian Wildlife Service and Alberta Sustainable Resource Development was conducting a study at the time of FMP writing that evaluated the effects of salvage logging on fire-associated birds, plants and invertebrates on deciduous-dominated landscapes. The goal of the study was to inform guidelines regarding future fire salvage.

[17] Alberta, Sustainable Resource Development, Forest Operations Branch, 2002.

Given the variable nature of fires and associated fire salvage. Landscape guidelines for retention of unsalvaged timber (merchantable and non-merchantable) need to be flexible in their application (i.e., not applying the same rule to every fire). The flexibility will allow economic salvaging to occur while ensuring the maintenance of fire-associated species on the landscape.

OBJECTIVE (#3):

To salvage and monitor the flow of suitable timber that can be utilized by the forest companies, while recognizing economic and ecological constraints.

STRATEGIES:

- promptly evaluate fire-killed, wind-thrown or insect and disease damaged timber for salvage.
- purchase industrial salvage (from pipelines, seismic lines, etc.) and assist industrial users in feasibility and salvage plans; apply salvage volumes to FMU cut control.
- utilize the Timber Damage Assessment (TDA) process to monitor industrial (energy sector) salvage and report on such volumes for cut control purposes.
- prepare an annual salvage plan for FMU A15 Mineable Oil Sands Area (MOSA) (See appendix 9) (This strategy is reiterated in objective 9).
- purchase salvage from agricultural land clearing.
- follow the provincial fire salvage policy (Alberta SRD, Forest Operations Branch 2002):
    - at the Forest Management Unit level, plan to leave on average a minimum of 10 per cent of the merchantable black timber[18] in patches greater than 100 hectares; and
    - at the planning unit level, leave on average 10 per cent of merchantable black timber in patches greater than 10 hectares and a minimum of 5 per cent merchantable black timber in small patches and single trees according to loggers choice[19]
- evaluation of the effects of salvage logging on conifer-dominated landscapes should be undertaken by the forest companies
- incorporate into the next OGRs new fire planning protocols – landscape and stand structure retention, utilization, timelines

Where the forest companies are salvaging fire, blowdown (windthrow), insect or disease damaged timber, the retention of stand structure to meet stand level structure objectives for biodiversity will remain in practice. However, in windthrow situations there may not be standing trees available for structural retention and thus the protocol would be waived. This protocol could also be waived if the tree harvest is required for sanitation of the area to inhibit further progression of

[18] Merchantable black timber will vary by fire size, thus there is limited rationale for the netting down a burnt landscape. The size of the landscape at which this strategy / target is engaged should be fairly large.
[19] These guidelines are subject to change as new information from research studies arise and flexibility should be available on a fire-by-fire basis.

insects, disease, biotic threats (e.g., dwarf mistletoe on pine) and / or fire potential. In fire salvage blocks, where operationally feasible, green clumps or fire skips and clumps of standing burnt timber will be incorporated into the retained structure.

Agricultural salvage is seen as a positive contribution to the local economy, as well as a way of minimizing the waste (i.e. land clearing and burning of the timber piles) of a valuable resource. The main concerns of private land forestry are the cumulative impact of further tree removal from farm areas and the absence of management over private land harvesting.

Within the FMA area, salvage wood is generated by industrial clearings for such things as roads, seismic lines, well sites and pipelines. The Government requires the disposition holders or exploration companies to salvage merchantable timber. The forest company's role in such operations could include the following:

- evaluate the feasibility for salvage and assist the industrial user in the development of a joint pre-operational salvage plan
- provide detailed log specifications to ensure timber is salvaged to an acceptable and readily usable form
- purchase properly salvaged volumes from the industrial land user

Alberta-Pacific and the Quota Holders are interested in all economic salvage opportunities on the FMA area and the white zone and will be reviewing salvage guidelines for inclusion in the next version of the Operating Ground Rules.

3.3 FOREST PROTECTION

Understanding the role fires and other natural disturbances have played in the development of the boreal forest, including the full range of biodiversity is a key to successfully implementing ecosystem management. Fire is the predominant natural disturbance in the boreal forests; however large catastrophic fires can have devastating affects on human life, communities, natural resources, and infrastructure developments. It is critical then to manage fire and other natural disturbances, such as forest insects and disease, and restricted and noxious weeds to reduce the negative impacts on values at risk on the FMA area.

FOREST INSECT AND DISEASE

Alberta-Pacific and the Quota Holders will cooperate with Alberta Sustainable Resource Development in the suppression of insect and disease epidemics in accordance with Paragraph 29 (4) of the Forest Management Agreement. It must be recognized that both insects and diseases are natural processes inherent in forest ecosystems and forest succession (See Chapter 2).[20]

Woodlands staff and contractors are trained to carry out insect and disease reconnaissance surveys in conjunction with inventory (AVI) and planning fieldwork. FMA area pest damage concerns will be documented on a standard form and reported to Alberta Sustainable Resource Development regional headquarters.

[20] Further information on insects and disease available at: http://www3.gov.ab.ca/srd/forests/health

The forest companies participate in the Northeast Regional Integrated Pest Management Working Group. This is a joint government / industry group which meets periodically with the objective of developing joint policy and action plans for provincial and regional insect and disease management. The forest companies will continue to support the management programs agreed to through this process.

Additionally, when infestations affect large areas of productive forested land, each occurrence will be evaluated on an individual basis to ascertain current and future risk to growing stock. If control, salvage and / or sanitation harvests are deemed necessary, co-operative harvest strategies (volume, location, and timing) will be developed for affected blocks. These blocks would then be noted for inclusion in the spatial timber supply analysis.

WEED MANAGEMENT

The forest companies will continue to participate in the Northeast Region Co-operative Weed Management Working Group inaugurated July 2001 that monitors pest conditions, including restricted and noxious weeds. In addition to this program, the forest companies' employees and contractors monitor weed situations on major public land dispositions within the FMA area.

Alberta's Weed Control Act exists to enforce the control of weeds in order to protect landowners and the environment. Weeds are designated into one of three categories; restricted, noxious and nuisance. The following list (From the Alberta booklet – "Weed identification in Alberta")[21] may or may-not be found in the FMA area (Table 3.1).

Table 3.1: Restricted and noxious weeds in Alberta

Restricted Weeds	Noxious Weeds	
Dodder	Russian Knapweed	Canada Thistle
Eurasian Water Milfoil	Perennial Sow-thistle	Scentless Chamomile
Nodding Thistle	Ox-eye Daisy	Common Tansey
Yellow Star-thistle	Field Bindweed	Whitle Cockle
Diffuse Knapweed	Bladder Campion	Knawel
Spotted Knapweed	Cleavers	Toadflax (Common Yellow)
	Dalmatian Toadflax	Hoary Cress
	Leafy Spurge	Cypress Spurge
	Stork's Bill	Blueweed
	Spreading Dogbane	Field Scabious
	Hound's Tongue	Tall Buttercup
	Purple Loosestrife	Persian Darnel

[21] Weed Identification In Alberta – booklet with photos available at Alberta Sustainable Resource Development offices throughout Alberta.

FOREST PROTECTION (Insects and Disease, Weeds and Fire)

OBJECTIVE (#4):

Support the Alberta Sustainable Resource Development in its strategies to minimize losses from epidemics of forest insects, diseases, infestations of restricted and noxious weeds, and large catastrophic fires on the FMA area.

STRATEGIES:

- Adhere to the "Alberta Forest Health Strategy and the Shared Roles and Responsibilities between SRD and the Forest Industry" document. [22]
- Identify outbreaks of insects / disease / weeds to Alberta Sustainable Resource Development.
- Continue to train forest companies' personnel in pest identification.
- Cooperate in the Northeast Boreal Co-operative Weed Management Committee.
- Cooperate in the Northeast Boreal Integrated Pest Management Working Group.
- Cooperate with Alberta Forest Protection with their Firesmart program.
- Promote public awareness of fire through prevention and detection discussions during tours, on signs, and in advertisements.
- Ensure continued awareness of staff and contractors to fire conditions and the importance of fire precautions during operations.
- Provide Woodlands personnel and contractors with adequate training to initiate action on newly discovered fires and to assist with the suppression of fires during emergencies on the FMA area.
- Experienced personnel will obtain "Industry Dozer Boss" (or equivalent) level training through courses provided by Alberta Sustainable Resource Development.
- Provide fire fighting personnel and equipment as outlined in the Fire Control Agreement and annual plans. During fire season, equipment caches will be located near operating crews and forest companies and contractor vehicles will carry fire-fighting equipment; as identified in Section 5 of the Forest and Prairie Protection Regulations 135 / 72.

WILDLAND FIRE MANAGEMENT

The Forest Protection Division of Alberta SRD has the primary responsibility for wildland fire management on the FMA area. It is expected that because of high social and economic risks, Alberta Sustainable Resource Development will maintain an aggressive fire management program throughout the FMA area.

Alberta-Pacific has entered into a Fire Control Agreement with the Province of Alberta. Pursuant to this agreement and to Paragraph 23(1) of the Forest and Prairie Protection Act (1986), Fire Control Plans are prepared and submitted yearly in March, prior to fire season. (See Appendix 5)

[22] http://www.srd.gov.ab.ca/forests/health/default.aspx

Al-Pac's role in fire management will remain primarily preventative, including cooperation with the Firesmart program. Pre-suppression and suppression responsibilities are supported by Alberta-Pacific through an annual "Holding and Protection Charge." The forest company's roles will be limited to those areas defined in the Forest and Prairie Protection Act and Regulation, Alberta-Pacific's Forest Management Agreement, and the Fire Control Agreement.

Al-Pac's main goal with respect to fire management is to support Alberta Sustainable Resource Development efforts to limit the area lost to fire. Additionally, The Timber Supply Analysis (TSA) has incorporated SRD's current "Firesmart" initiatives throughout the FMA area.

Al-Pac will continue to play an active role in fire prevention in the region by publicly promoting fire awareness, prevention, detection and training of staff. Woodlands staff and contractors will be kept aware of the importance of fire precautions during all active operations and will be informed of current fire hazard conditions. Additionally, at the request of Alberta Sustainable Resource Development, the forest companies will assist with the suppression of fires during emergency situations on the FMA area.

The forest companies will cooperate with and strongly support Alberta Sustainable Resource Development's forest protection programs by participating in the Alberta Forest Protection Advisory committee.

The forest companies will work with Alberta Sustainable Resource Development and other stakeholders to reduce the risk and severity of fires to values at risk through the integration of fire into forest management planning and community protection; i.e. Firesmart initiatives. Strategic initiatives are intended to follow Alberta Sustainable Resource Development lead in investigating operationally viable planning tactics. The forest companies will also pursue opportunities to assist in community protection programs in conjunction with local authorities and Alberta SRD by integrating the TSA and company harvest activities with forest stands identified in the community protection plans. Additionally, the forest companies will work with other stakeholders to reduce negative impacts of wildfire and other mutually agreed-upon initiatives.

FIRE FIGHTING RESOURCES

Details of Alberta-Pacific's commitment to supplying fire fighting resources are contained in the Fire Control Plans.[23] Resources include woodlands staff and contractors, fire fighting equipment, vehicles with hand tools, communications equipment and a first aid facility at the millsite. The location and movement of the fire equipment cache will be co-ordinated with crew moves and fire hazard conditions, as need arises. Equipment location changes will be communicated to Alberta SRD as they occur.

Some woodlands staff have been appointed as Forest Guardians, pursuant to Paragraph 4 (1) of the Forest Prairie Protection Act. Forest guardians encourage and promote prevention of wildfires and assist in the detection and suppression of the same.

[23] See Appendix 5 – Alberta-Pacific 2007 Fire Control Plan.

AWARENESS PROGRAM

Most of the forest companies have instituted a Forest Protection Awareness Program and participate in the "Partners In Prevention Program". Alberta-Pacific's program informs employees, contractors and visitors to the pulp mill site of local fire hazard information and the importance of a fire prevention program. A fire hazard rating and awareness sign is maintained at the entrances to the Alberta-Pacific millsite. Additionally, during fire season the fire hazard rating is communicated daily to woodlands operations staff via voice messaging. Pre-season memorandums on fire protection responsibilities are circulated to staff, and Alberta-Pacific will work collectively with Alberta SRD and local timber companies to present a common approach to prevention messages. Individuals are reminded of their responsibility to take general fire prevention measures such as obtaining fire permits, ensuring there are proper spark arresters on motors, safe use of power saws, and not smoking where there is risk of starting fires.

PRE-SUPPRESSION

A level of fire action readiness is ensured by requiring that contractors maintain, at the work site, designated fire-fighting equipment, which employees are trained to use and maintain. The forest companies' personnel periodically check contractors' fire equipment and the familiarity of their employees with fire reporting procedures. All fires are to be reported immediately to the Alberta-Pacific emergency number **1 (780) 525-8200**. This desk is manned 24-hours-per-day and will in-turn contact the nearest Alberta SRD fire centre or the provincial fire number **310-FIRE**.

FIRE SUPPRESSION

The forest companies' staff and contractors will take aggressive action on all fires they discover and will continue action until Alberta SRD personnel relieve them. In emergency situations that exceed the capabilities of Alberta SRD, and at the request of Alberta SRD, the forest companies will provide supplemental resources to the best of their ability. Alberta-Pacific will appoint one operations co-ordinator in each working area to liaison with Alberta SRD on campaign fire operations.

SLASH HAZARD ABATEMENT

Management of forest slash is generally done to decrease fire hazard, assist in nutrient cycling, facilitate Silvicultural activities and potentially provide small mammal habitat. Slash disposal by burning will only occur in cutblocks where it is considered to be the appropriate course of action (i.e., heavy slash in conifer types). Logging debris will be left in small piles, and/or scattered throughout the cut blocks to maximize the reforested area. In areas where slash reduction is required, a disposal plan (including follow-up, extinguishing and scanning reports) will be submitted. Brush and debris disposal from road construction projects will be completed in conjunction with the project itself. All related burning during the fire season shall be under the authority of a Fire Permit. All winter burning will be scanned and extinguished prior to the commencement of the fire season. Currently, a new Alberta Sustainable Resource Development debris management process is under development and will be incorporated in the future update of the FMA area OGRs.

If a prescribed burn is a silvicultural treatment recommended for a particular cutblock, a detailed burning plan will be submitted as outlined in the Alberta SRD's Prescribed Burning Planning Process. This plan will be reviewed by the Quota Holders active in the FMA area. To date, the forest companies have not carried out nor are planning an active prescribed burn for any of their operational cutblocks.

3.4 ACCESS DEVELOPMENT, ACCESS MANAGEMENT AND SOILS RESEARCH

The companies are committed to minimizing the effect of road developments at all levels of planning throughout the FMA area. Additionally all forest companies constantly strive to minimize the amount of road construction required to achieve an efficient and effective primary and secondary road system. Approaches to minimizing the effects of roads on the landscape include: regional long-term planning, route selection planning (permanent and temporary), road construction and reclamation, management of human use on roads (i.e., access management), and soils research.

Roads result in a net reduction in the forest landbase and can have negative ecological consequences associated with habitat fragmentation and increased risks of mortality to wildlife (collisions with vehicles, increased hunting / fishing pressure, and increased risk of predation). In light of these effects, minimizing the amount, distribution and duration of the roading footprint is a key goal of the Integrated Land Management (ILM) program. ILM is detailed in Section 3.13 and provided the impetus for a regional planning in the FMA area. See Access Development Map (hereafter the AD-Map) in Appendix 10.

Access development deals with route selection planning, construction and reclamation concerns. Access management specifically addresses issues related to the human use of roads (i.e., public safety and management of wildlife, fish and the environment) throughout the life of a road system. Research on the effects of harvesting on forest soils is identified as a concern for future Research & Development (R&D) programs.

Table 3.2 details the status (2004) of permanent roads in the FMA area. As can be seen in the table the forest companies are only responsible for 5.25 per cent of the permanent road footprint in the FMA area.

Table 3.2: FMA Area Permanent Road Status (2004)

Ownership	Kilometres	Per cent (%)
Forest Companies	2,140	5.25
Public Roads / Highways	1,533	3.75
Energy Sector	37,068	***90.9***
TOTAL	**40,741**	**100**

ACCESS DEVELOPMENT

OBJECTIVE (#5):

To develop an efficient road network for log deliveries throughout the FMA area that minimizes the amount, distribution and duration of the roading footprint, and to mitigate the effects of roads on fish and wildlife and sustaining ecosystem functions.

STRATEGIES:

- Continue to develop an AD-Map of the forest companies' expected future roading needs to facilitate government and industry synergy in road corridor planning (Appendix 10).
- The forest companies expect not to exceed an additional 1,500 km of permanent road in the FMA area throughout the duration of the approved harvest sequence.[24]
- The forest companies expect not to build more than 3,000 km / year of temporary road in the FMA area throughout the duration of the approved harvest sequence. [22]
- Implement and support an aggressive ILM program to maximize synergies among industrial users and government agencies to reduce the human footprint on the landscape. (See Objective #21).
- Locate and design main haul roads to:
    - minimize total hauling and maintenance costs
    - avoid duplication of existing road corridors
    - maintain the highest level of safety
- Minimize development within key wildlife areas (as agreed upon between the forest companies and Alberta Sustainable Resource Development) and negative environmental effects, including effects on soil, water, wildlife habitat and populations, and losses in productive forest growth.
- The forest companies will continue to work with Alberta SRD staff to ensure effective mitigative processes are undertaken for negative environmental effects.
- Utilize temporary roads to access cutblocks from the main haul roads and identify those temporary roads that will see recurrent use so modified reclamation procedures can be implemented to minimize erosion potential and costs.
- Utilize signs to notify the public of the temporary access roads.
- Continued co-operation and compliance with the Boreal Caribou Committee guidelines.

[24] The forest companies recognize road thresholds are a regional, multi-sectorial responsibility and can only assist in FMA area access development and only address landscape fragmentation under an ILM program. Additionally, Al-Pac is not responsible or accountable for Quota Holder, nor energy sector road dispositions. Thus no specific targets for total roads (km or density) can be prepared by Al-Pac for the FMA area.

- Investigate efficient road planning with innovative spatial forest planning tools at the TSA level throughout the life of the plan.

The forest companies working internally and consulting Alberta SRD staff will periodically review the AD-Map. The review will include adding all existing company LOC roads to confirm the duration of need, and access options. Access options will consider terrain, hydrology and timber supply analysis special scheduling measured against objectives of the ILM process to complete the evaluation. The AD-Map is viewed as dynamic and updated versions will be prepared for interested industries/companies in northeastern Alberta.

Companies recognize that both the loss of productive landbase for timber production and loss and fragmentation of habitat for species health and ecological integrity can be reduced through integrated planning. An ILM program is presented in Section 3.13. As presented in the regional planning section below, a positive consequence of the ILM commitment is the advancing of road corridor planning horizons to reduce the cumulative amount of roads.

REGIONAL LONG-TERM PLANNING

The forest companies are embarking on an integrated landscape approach to industrial development on the FMA area. Historically we have identified only the main road corridors based on long-term forecasted log volumes. The plans were provided in the General Development Plan (GDP) as a 5-year map with the intent to develop support with all users. An additional map is viewed as necessary to illustrate our forecasted future fibre and non-timber (e.g., Caribou guidelines) needs, and to provide other industries (e.g., oil and gas) a map that would influence their access planning within the FMA area and encourage industry access synergies.

In addition to the 5-year GDP, Alberta-Pacific has produced an AD-map that illustrates directional fibre flows and our expected roading needs well into the next decades. Proposed roads and the preferred directional flow of the timber resources are provided on the enhanced future road map (AD-Map) in Appendix 10. The primary goal of the AD-map is to ensure single, efficient road corridor access.

The AD-Map could provide the government and all industrial users with a transportation map projected well beyond the 5-year GDP horizon. Such a map could facilitate co-ordinated access planning to avoid overlapping road networks, reducing the amount of productive land lost and reducing overall costs.

The AD-Map shows established roads, proposed roads from the GDP, projected additional permanent right of ways, and preferred directional flows for wood products without reference to road class or timelines. The map is intended for long-term development planning for all industrial users and specific locations of roads are flexible, based on industry and government consensus.

ROUTE SELECTION PLANNING ON THE FMA

ILM processes identified in Section 3.13 and planning protocols yet to be developed will be implemented to facilitate meaningful interaction with other users to evaluate the route options. Having ensured all interests are considered in the route assessment, Alberta-Pacific will then meet or exceed the Phase 2 road corridor selection process requirements while working with Alberta SRD through the one window approach. The net effect of co-ordinating industry needs through ILM, and Provincial needs through the existing roads planning process (Road Corridor Selection Plans) will be a reduction of the industrial footprint throughout the planned area.

GENERAL DEVELOPMENT PLANS

The five-year GDP map will see continued use with road corridors evolving from a sub-set of the AD-Map. Location reviews and development timing will follow the road corridor development and public review processes already established. When a road corridor is advanced from the AD-Map onto the GDP map, it implies a greater degree of certainty of development and budget preparedness than proposed road corridors only illustrated on the AD-Map. The distinction between the GDP and AD-Map is necessary to ensure appropriate focus during annual reviews of the GDP.

TEMPORARY ROADS

Temporary roads will provide short-term access from the main haul road system to cutblocks. These roads will be built to temporary road Class 4 and 5 specifications as described in the Operating Ground Rules. Protection of aquatic systems is paramount in the construction and reclamation of temporary roads.

The forest companies recognize that some roads identified as temporary for harvest planning provide the best re-entry route into an area for future harvests. This is particularly true where adverse or rugged terrain (i.e. wetlands, slopes) dictate long-term route location. In these cases, rather than re-contour all road sub-grades in a reclamation program the forest companies will specifically identify these roads. Temporary roads will be treated in one of the following ways:

- Where no future use is expected within the rotation sequence the road will be permanently reclaimed, stream crossings removed, and surfaces reclaimed to approximate the original landform after harvesting and silviculture activities are completed. Where a need is identified to restrict access to an area, efforts will be made to ensure quick restoration.
- Where recurrent use is expected, a Licence of Occupation (LOC) may be obtained. The roadbed will be stabilized with the 'front end' reclaimed to discourage vehicle access. The sub-grade and major drainage structures will remain intact and annual inspections of the route will be conducted and reported in the AOP. Such temporary decommissioning will minimize human use of such roads and effectively mitigate many of the negative ecological effects associated with human use of roads.

ACCESS MANAGEMENT

OBJECTIVE (#6):

To ensure that human development, use and management of roads take into account the safety of all users (industrial, recreational, Aboriginal) and mitigates the potential negative environmental effects associated with access.

STRATEGIES:

- Areas with high public use will have appropriate signage in place to caution and inform people about harvesting activities to minimize the potential for accidents.

- Access controls such as barriers, berming, bridge removals, and roll back will be utilized on a site-specific basis and may be addressed in the "Operating Ground Rules for the Alberta-Pacific FMA area".

- The forest companies working with Alberta SRD may investigate the feasibility of the establishment of "No Hunting Zone" corridors (possibly 0.4 km on each side of centre) on all new permanent roads for three years following construction. After this period the need for the no hunting corridors would be reviewed in consultation with local community groups within the scope of an overall wildlife management strategy. Trapping activities would not be affected.

- The forest companies will facilitate research in an adaptive management approach to understand the effects of human access and ways to mitigate such effects (e.g. landscape models).

SOILS RESEARCH AND DEVELOPMENT

OBJECTIVE (#7):

To utilize soils research in the FMA area to minimize in-block road and harvest equipment impacts to ensure vigorous post harvest regeneration.

STRATEGIES:

- Utilize the existing soil guidelines (2000 OGRs) until a new system is developed.

- In co-operation with Alberta Sustainable Resource Development (SRD), and after the new OGR's are approved by SRD, develop a slash hazard protocol for the FMA area.

- Develop a monitoring and reporting program to quantify productive forest landbase losses due to roads, landings and decking areas. (See appendix 8)

The forest companies are involved in a number of research initiatives relating to soils and the effects of harvesting activities on soil productivity due to compaction. In conjunction with the Alberta Research Council, research on the compaction rates of harvesting equipment on varying soils, moisture regimes and seasons of the year is underway.

Working with the Forest Engineering Research Institute of Canada (FERIC), Forest Companies are investigating the impact of in-block roads on forest productivity and the effectiveness of site preparation and other de-compaction equipment on temporary roads.

Successful initiatives will be incorporated into the next set of Operating Ground Rules replacing the OGR Rule *Appendix 3* "Forest Soils Conservation," of the current OGRs, as part of an adaptive approach to forest management.

3.5 WILDLIFE MANAGEMENT CONCERNS

The forest companies are pursuing an ecosystem management approach following the natural disturbance model (i.e. fire in northeastern Alberta). This coarse filter approach assumes that by maintaining forest cover patterns, age classes and stand structure within the natural range of variability the habitat requirements of wildlife will also be met. Therefore, the need for designing harvesting activities to meet the specific requirements of individual species should be minimized.

Currently, moose and furbearers are important wildlife species identified by multi-stakeholder groups in the FMA area. Additionally, Woodland Caribou and Trumpeter Swans are threatened in Alberta and require strategies to mitigate negative impacts on their habitat. It may also become apparent, through ongoing research, and if fish and wildlife species become at risk as identified through provincial or federal species at risk review processes, that management objectives and strategies be developed as an appropriate to respond to the situation.

Lack of information about habitat requirements of many species make it challenging to credibly model maintenance of species habitat through time. Woodland Caribou are an exception to this situation, and the forest companies are supportive of the science-based range planning process proposed by the Boreal Caribou Committee and piloted for the East Side of the Athabasca Caribou Range in 2003/04. The forest companies will participate in initiatives launched by the recently formed Alberta Caribou Committee (under the auspices of the Alberta Woodland Caribou Recovery Plan following its endorsement by the Minister of Sustainable Resource Development in 2005). The forest companies will continue to participate with members of the Alberta Caribou Committee to better understand the effects of disturbance (natural and manmade) on biodiversity and adjust management practises as new information is incorporated through an adaptive management system.

A comprehensive adaptive management program and an overview of biodiversity, forest renewal and timber monitoring systems are presented in Chapter 4 (Objective #27).

OBJECTIVE (# 8):

Protect species identified as “at risk” or as socially important and meet Alberta government guidelines and ground rules relevant to concerns over specific species.

STRATEGIES:

- Administer a furbearer monitoring program throughout the FMA area. Review the program every three years to determine future requirements of the program.
- For fish habitat protection, continue to refine and implement “best practices” with regard to road/stream crossing.

- The forest companies will consult with regional stakeholders and public groups to assist in identifying species recognized as "at risk" or socially important.
- Management strategies to conserve species at risk and socially important species as presented in Table 3.3. [25]
- Project habitat in the FMA area for the following selected species. (Table 3.3 and Appendix 6)

    - Caribou
    - Moose,
    - Canadian Toad
    - Warblers (4 selected)
    - Goshawk
    - Barred Owl
    - Brown Creeper

    (*Note*: This suite of species was selected by Alberta SRD)

The habitat models will only project forest company future landbase activities as per the (Revised) 2007 TSA forecast. Appendix 6 details the habitat modeling and summaries for each species. (The habitat models are available upon request to Alberta-Pacific.) Barred Owl was also a species considered for habitat modeling. However, the absence of appropriate data and model formulations did not allow Al-Pac to predict future owl habitats across the FMA area.

[25] Note: The species or groups identified in Table 3.3 represent a combination identified by the Government of Alberta and the Al-Pac FMA Area Forest Management Task Force.

Table 3.3: Identified species at risk and socially important species within the FMA area.

Species or Group of Concern Management Strategy	
Habitat Modeled Species	
Moose [26]	• Continue to follow Alberta's Fish & Wildlife Moose Guidelines and where applicable modify operational harvest plans to meet these guidelines. (See Chapter 2). • Coarse filter ecosystem management protocols (Objective #11) will be followed to ensure a range of habitat is maintained. • ALCES simulation projections for 'forestry only' (no fire and no energy sector) showed moose habitat supply falling within the Natural Range of Variability (NRV) for the duration of the 200 year simulation.
Woodland Caribou [26]	• Continue to follow provincially approved land use guidelines for industrial operations in caribou range. Participate in habitat modeling exercises and meet guidelines developed through range planning processes under the auspices of the Alberta Caribou Committee. • Coarse filter ecosystem management protocols (Objective #11) will be followed to ensure a range of habitat is maintained. • ALCES simulation projections for 'forestry only' (no fire and no energy sector) showed caribou habitat supply falling within the Natural Range of Variability for the duration of the 200 year simulation.
Raptors (Northern Goshawk) [26]	• Coarse filter ecosystem management protocols (Objective #11) will be followed to ensure a range of habitat is maintained that falls within the natural range of variability (see also Objective #24 regarding maintenance of old forest). • There is insufficient data to develop accurate models for Northern Goshawk habitat in northeastern Alberta. A Habitat Suitability Index (HSI) model was developed in ALCES for Northern Goshawk based on relationships found in the scientific literature and from limited data from northeastern Alberta. Simulation runs show goshawk habitat falling within the NRV for 200 years.

[26] In a letter dated 15 January 2004, AB SRD, Forest Management Division, advised the forest companies to model and report on habitat for Caribou, Moose, Northern Goshawk, Barred Owl, Brown Creeper, Warblers and Canadian toad.

Warblers and Brown Creeper [26] ***(Canada Warbler)*** ***(Bay Breasted Warbler)*** ***(Cape May Warbler)*** ***(Black-throated Warbler)***	• Coarse filter ecosystem management protocols (Objective #11) and old forest retention strategies (Objective #24) will be followed to ensure a range of habitat is maintained that falls within the natural range of variability. • Cumming, Vernier, and Schmiegelow (2006) produced an evaluation of habitat supply (based on the forest companies 2004 spatial harvest sequence) for Canada Warbler (CAWA), Black-throated Green Warbler (BTGW), Bay Breasted Warbler (BBWA) and Cape May Warblers (CMWA). Deciduous-associated (D, DC) species (CAWA and BTGW) habitat supply remained high to moderate throughout most of the planning horizon. Conifer-associated (CD, C) species (BBWA, CMWA) showed declining habitat supply. Fragmentation of habitat should be minimized through the use of aggregated harvest plans. • There was insufficient data to develop accurate models for Brown Creeper habitat in northeastern Alberta.
Amphibians (Canada Toad) [26]	• Coarse filter ecosystem management protocols (Objective # 11) will be followed to ensure a range of habitat that falls within the natural range of variability. Golder and Associates developed a Canada Toad model on the R.M. of Wood Buffalo for the Cumulative Environmental Management Association. Golder ran the model for the forest companies on that portion of the FMA area that overlaps with the R.M. of Wood Buffalo. No significant changes in toad habitat availability were found.
Species at Risk	
Trumpeter Swan	• Continue to follow Alberta's Fish & Wildlife Trumpeter Swan Guidelines and where applicable modify operational harvest plans to meet these guidelines. • Al-Pac FMA area OGRs – special lake buffer requirements
Species of Concern	
Cavity Nesters	• Coarse filter ecosystem management protocols (Objective # 11) will be followed to ensure a range of habitat is maintained within the natural range of variability (see also Objective #24 regarding maintenance of old forest). • Post-fire habitat is recognized as an important habitat for some cavity nesting species. See section 3.3 for strategies to maintain habitat on the landscape for fire-associated species.

Barred Owl [26]	• Coarse filter ecosystem management protocols (Objective #11) will be followed to ensure a range of habitat is maintained that falls within the natural range of variability (see also Objective 24 regarding maintenance of old forest). • A resource selection function model within ALCES is developed for Barred Owl. Al-Pac and AB SRD are continuing to explore improved Owl habitat modelling. • There is currently insufficient data to develop accurate models for Barred Owl habitat in northeastern Alberta.
Colonial Waterbirds	• Follow Operational Ground Rules developed for the conservation of colonial waterbirds

Depending on the model used, habitat models, maps and metrics have been prepared at the FMA area (moose, caribou, goshawk), at the FMU level (warblers) or at the regional level (Canada Toad). As directed by Alberta SRD, the habitat forecasts are based on examining the effects of forest management only. The habitat models are available upon request to Alberta-Pacific.

The model runs do not include fire, the main driver of the boreal mosaic. Also excluded are anthropogenic activities on the FMA area due to the energy sector. Accordingly, habitat alternation and fragmentation due to fire or energy sector roads, seismic lines, pipelines and facilities are not presented in the metrics. Therefore, habitat forecasts are very conservative projections of future habitat supply.

3.6 FOREST MANAGEMENT STRATEGIES IN THE BOREAL FOREST

"Nature provides exceptions to every rule" - Margaret Fuller

Forest harvesting, silviculture systems and forest renewal will continue to follow the coarse-filter ecosystem management approach as laid out in the 2000 DFMP. Over the course of this plan, implementation of forest management strategies by the forest companies will more closely approximate the natural disturbance system (NDS) at the regional, landscape, and stand levels. This means that harvesting and silviculture should be designed to create effects similar to those of natural disturbance (wildfire), with respect to landscape pattern, age, and stand structure, and must be designed to regenerate the diversity of structure and vegetation within forest stands.

The coarse-filter approach, detailed in Chapter 2, assumes that maintaining vegetative communities and landscape patterns and processes, should result in a full complement of native plant and animal species (both seen, unseen, known and unknown). The coarse-filter approach is also being supported by selective analysis of key wildlife species as selected by Alberta SRD (See Objective 3.8).

The forest companies must also be able to demonstrate and monitor the success of the coarse-filter approach at the landscape level. This requires an assessment of stand and landscape metrics to provide metrics for monitoring. Without reasonable and attainable targets and adequate modeling and monitoring, significant deviations at the stand and/or landscape level may go undetected, or conversely, changes in habitat and associated species abundance may be mistakenly associated with forest practices.

Following the NDS approach should be part of an active adaptive management system that monitors and adjusts the long-term activities of the forest companies. (See section 4.1). The approach essentially has an emphasis on different wildfire size, patterns and residual parametres. Accordingly, the coarse-filter and NDS approach requires some important guidelines and monitoring that should be incorporated into a FMP (Lee and Boutin 2003). The coarse-filter / NDS approach should consider and set targets and strategies to develop all the following components within a sustained forest management strategy:

- Widen the range of cutblock size and aggregation of harvest blocks in disturbance units of different sizes.
- A general increase of the in-block residual structure for quota holder and MTU harvest blocks where there is an increase in the overall per cent retained of merchantable volume throughout the FMA area.
- Old forest retention within a portion of the range of natural disturbance – See Section 3.16.
- Maintenance of the current AVI forest composition (gross hectares) for the four major cover groups (D, DC, CD, C) on the FMA area.

- A revised definition of structural retention to include merchantable and non-merchantable species, and retained structure in areas with-in cutblock, in peninsulas, in buffers and in adjacent areas. This transition in monitoring of retained structure is consistent with the revised focus on landscape versus stand metrics and provides a more meaningful representation of ecological features retained over landscapes following harvest. [27]
- Definition and monitoring of landscape metrics – forest cover, species and age-classes, patch size distribution, mature / interior forest areas, and watershed delineation. [28]

AGGREGATED DISTURBANCE UNITS AND HARVESTING SYSTEMS

There are ecological and economic rationale for shifting from a traditional two-pass system that removes 30 – 70 per cent of merchantable timber in the first entry, and the remaining fibre in the second entry. One of the consequences of harvesting in a two-pass pattern is a large road network that needs to be maintained over a long time period. Managing industrial and non-industrial access on roads has always been a major challenge for the resource companies that can result in extreme landscape fragmentation. Thus, short-term access with subsequent road closure can help to reduce fragmentation. Additionally, disturbance due to two-pass harvesting is dispersed to many areas and maintained over a long time, unlike natural disturbance that tends to concentrate on few areas and is generally of a shorter duration. A major negative ecological aspect is that a 2-pass harvest imposes an unnatural pattern of small openings on the landscape; these openings will not coalesce into a single seral stage as the temporal separation of 1st and 2nd pass exceeds 10 years (Lee and Boutin 2003). As a result, this harvest approach creates a highly-fragmented landscape notably without large, even-aged forest polygons, thus reducing potential core areas which may be important for the maintenance of some biota and socially important wildlife species.

White spruce silvicultural success has also been linked to the two-pass system. The second pass areas were thought to provide a potential seed source that would assist in meeting regeneration requirements and protection from natural elements. However, the second pass leave-areas have been seen to have very little influence on weather effects while retained stand structure can potentially reduce adverse weather in cutblocks. Current forest industry silvicultural practices do not rely on adjacent seed sources for regeneration success, thus adjacency to a potential seed source is not required.

The forest companies will be implementing a range of harvesting systems, where collectively, over time, the cutblocks will become more aggregated. The system is based on the NDS approach that creates patterns and large areas (e.g. up to multiple townships) in a single seral stage with varying amounts of residual structure. Thus approximating natural disturbance patterns through modifications to cutting practices is currently promoted as a method of conserving biodiversity where forest harvesting occurs. (Wilgenburg, 2006) It should be noted that in the past, planning units tended to be based on smaller areas within a township or even one or two townships.

[27] Objective 12 articulates retained stand structure strategies. Landscape structure targets are not required by Alberta SRD Forest Management Planning manual.
[28] The forecasts do not include fire nor anthropogenic activities on the FMA area due to the energy sector. Accordingly, these predictions are very conservative projections of a future forest situation.

New planning approaches will result in a removal of some of the current two-pass system footprint, implementation of single-pass harvesting systems and new planning units with an aggregation of first and second pass cutblocks. This deviates from the traditional two-pass system by increasing the range of disturbance unit sizes (planning unit) and initiates the reduction of landscape fragmentation and excessive road requirements of the traditional two-pass system.

IMPLEMENTING FIRE PATTERNS AT THE LANDSCAPE SCALE

There is an increasing trend to use the range of natural variation as a basis for the development of landscape plans (Angelstam 1998, DeLong 2002). Implementation of the natural disturbance template should modify the forest companies' harvest operations so that they more closely resemble patterns created by fire. Lee et al. (2002) describe how the current spatial scale of individual cutblocks are considered too small to be considered analogous to wildfires. When reporting on metrics of landscape condition, simple stand level measurements such as average, maximum, and minimum cutblock sizes and patch sizes are less useful than landscape measures of disturbance such as aggregation of cutblocks.

Aggregations of individual cutblocks within planning units, over a 10-20 year period are a more appropriate analogue of the landscape pattern left by wildfire events. Reporting on metrics of landscape condition is extremely challenging (particularly when the energy sector is excluded from future metrics), and defining whether a group of cutblocks, constrained by a 500 hectare maximum cutblock size is analogous to a larger fire event is difficult.

To implement the natural disturbance model, ecosystem-based management and maintain the heterogeneity on the landscape, the historical range of wildfire sizes could be used to plan areas of aggregated harvest. Following this approach, the distribution of planning unit sizes should reflect the same portion of the range of sizes available for wildfires. Following the guidance of Lee and Boutin (2003), harvesting within these areas would proceed over a period of 10 to 20 years and essentially initiate or maintain dominance of a single seral stage for all major strata.

Based on the Alberta Land and Forest Service (2000) fire database, the size distribution of whole fires follows a right skewed distribution when based on frequency. There are many small wildfires and relatively few large wildfires. Fires up to two hectares account for 74 per cent of fires recorded in the provincial fire database from 1961 to 1998. Larger fires are rare, however, they dominate the landscape in terms of area burned. Between 1961 and 1998, 98 per cent of the total area burned was due to five per cent of the largest fires in the distribution curve. Some of the largest fires exceeded 100,000 hectares. Provincial fire records based on fires >200 hectares indicate that approximately 0.4 per cent of the land area has burned annually since 1961. However, this average is a poor descriptor of the actual yearly rate of burning. Large fires are generally associated with so-called "fire-years" where extreme climatic conditions, including drought and periods of hot and dry weather, increase forests susceptibility to burn. It is also noted that rate of burning varies significantly from year to year (Larsen 1997).

Timber harvest operations require a steady flow of wood and therefore cut rate, unlike burn rate, should not fluctuate annually. Without taking a significant reduction in AAC, it would not be feasible to develop or implement a landscape harvest target for approximating the natural range of fire size if climatic variation (i.e., variability in fire or harvest rate) was taken into consideration. Thus large fires result in immediate recalculation of annual allowable cuts to ensure they are incorporated into landscape plans.

The template of wildfire sizes suggests a mixed distribution of planning units (PU) would have many small PUs with a few intermediate PUs, and a fewer large PUs. However, most of the harvestable land-base will be found within the larger units. Rather than focus on single large cutblocks, it may be more ecological to consider the creation of a single seral stage over a mostly contiguous area. This type of harvest would require that the maximum size of cutblocks be expanded from the operational current practice (adapted from: Ontario Ministry of Natural Resources, 2001).

To translate landscape-scale fire patterns to harvest planning, Lee and Boutin (2003) suggest applying restrictions on the lower and upper size limits of planning units that deviate from a wildfire template. The lower limit would be planning units of 1,000 hectares to insure that areas are large enough to be economically feasible, yet are small enough to fit into the range of wildfire sizes and be useful for naturally occurring smaller planning units, such as mesic sites surrounded by the non-productive land-base. The upper size limit of planning units could be set by the period of time required to harvest all the merchantable timber from a planning unit and the annual allowable cut. Thus, timber harvesting will occupy a middle portion of the fire size distribution continuum, with natural wildfires contributing the very small (<1000 ha) disturbances and the very large (>75,000 ha) disturbances on the landscape.

The implementation of a single-pass, aggregated harvest can only result from the co-operative effort of all forest company operators. Alberta-Pacific harvesting in isolation could follow the principles of aggregated harvest, yet would not harvest conifer or conifer-dominated mixedwood stands in FMUs where they only have deciduous rights. Thus, Alberta-Pacific will continue to strive for co-operation with coniferous operators in most planning units. In an integrated planning unit the majority of merchantable timber is scheduled for harvesting regardless of species. Operators must time the harvest operations to coincide with each other to enable completion of operations in a timely fashion. The co-operative effort also has potential economic advantages such as cost savings due to joint planning and layout, as well sharing of road construction, maintenance and reclamation.

LANDSCAPE DISTURBANCE UNIT SIZE AND MONITORING

For the purpose of future analysis and reporting, Alberta-Pacific considers any cutblock within 200 metres of another cutblock to be the same “disturbance unit”. Disturbance units are identified within a mapping exercise by buffering all planned cutblocks by 100 metres. This definition is subjective, but it does allow the forest companies to report on distributions of aggregations of cutblocks at a landscape scale that is more meaningful than individual cutblock sizes.

Alberta-Pacific produced a typical disturbance unit distribution matrix on all coniferous operators since 1980 and all Al-Pac operations from 1991-2003. The analysis found that “disturbance units” < 1000 hectares represent 63.7 per cent of the total area of all patches (See Table 3.4). However, the natural disturbance regime creates a very different landscape pattern. Fires < 1000 ha in size represent only 5.9 per cent of the total area burned between 1960 and 1999 (See Table 3.5). The large forest company disturbance areas differ from smaller units in that they do not refer to only total area harvested. This is because in disturbance units greater than 1,000 hectares, 24 – 63 per cent of the disturbance unit area, (on average 48 per cent) was not harvested during the analysis period, and was primarily composed of riparian buffers, young forest stands or non-merchantable vegetation (the non-productive landbase). It should be noted that the Al-Pac FMA area is primarily composed of non-productive areas; generally two thirds of each FMU. Additionally, less than 20 per cent of the disturbance areas were planned second pass cutblocks.

Table 3.4: Actual landscape pattern created by harvest in Al-Pac FMA area (hectares).

Disturbance Unit Size (ha)	% Frequency	% Area
< 500	95.5	52.3
501 – 1000	2.3	11.4
1,001 – 5,000	1.7	25.4
5,001 – 10,000	0.5	10.6
10,001 – 20,000	0	0
20,001 – 30,000	0	0
30,001 +	0	0

Note: Actual landscape disturbance pattern created by Al-Pac operations 1991-2003 and coniferous operations (based on aggregation of all existing cutblocks within 200 m of a neighbour (100m buffer)).

Table 3.5: Actual landscape disturbance pattern created by wildfire (hectares).

Disturbance Unit Size (ha)	% Frequency	% Area
< 500	98.6	4.1
501 – 1000	0.4	1.8
1,001 – 5,000	0.6	8.6
5,001 – 10,000	0.2	7.0
10,001 – 20,000	0.1	21.1
20,001 – 30,000	< 0.1	16.3
30,001 +	< 0.1	41.1

Note: Fire size frequency, in Alberta from 1960 to 1999. Based on the Alberta Lands and Forest fire database (Alberta Land and Forest Service 2000). Courtesy of Dr. Philip Lee, Integrated Land Management Program, University of Alberta.

Using the natural disturbance model as a template for forestry operations would require aggregated harvest plans that harvest in disturbance units of more than 100,000 hectares within a FMA area forest planning unit in a 10-year period (Lee et al. 2002). The social implications of such a harvest strategy are unclear, thus the forest companies will not attempt to replicate the full range of wildfire events through harvest operations. However, it is clear that a general increase in average cutblock size and "disturbance unit" size will be required if the forest companies are to maintain landscape patterns over the long-term. Large fire events will likely still occur in the FMA area. Additionally, aggregation of cutblocks assists forestry operations to maintain core areas of old and mature contiguous forest habitat after the first rotation.

FMA AREA LANDBASE MANAGEMENT AND FOREST MANAGEMENT IMPLEMENTATION

Forest management encompasses the full range of forest companies' activities on the landscape, including the monitoring of those activities and results, particularly in forest renewal. The following sections will present forest management implementation objectives (#s 9 – 18) and strategies with respect to:

- FMU L11 and L1 under a mixedwood landbase management system and nine FMUs (L2, L3, L8, S7, S18, S11, S22, A14) under an integrated planning system on the discreet FMA area landbase and, A15 under the MOSA principles.
- Opportunities for exploring conifer intensive forest management - "Enhanced Forest Management" (EFM).
- Coarse-filter ecosystem / sustained forest management (SFM) within the OGRs.
- Forest renewal.
- Silvicultural record keeping.
- Alberta-Pacific incidental conifer replacement and allocation.
- Forest companies' integration.
- Alternative Regeneration performance Standards (ARS).
- FMA area landscape and stand modelling.

Through the implementation of this FMP, the forest companies seek to maintain biodiversity and ecosystem function on the FMA area. Such implementation will occur through the utilization of ecosystem management principles, under the direction of the sound forestry practices outlined in Alberta-Pacific's 2000 OGRs and the subsequent amendments.

The integrated planning on the discreet landbase will be an implementation of traditional silviculture, alternative silviculture systems, and future approved ARS for the entire FMA area. This approach still utilizes the distinct or discrete land-base (Coniferous and Deciduous) designations based on the AVI for AAC and silviculture. The TSA is based on empirical yield curves with back-to-it-self transitions. All forest company partners and stakeholders have assisted in the development of strategies unique to each of the FMUs. Nine FMUs will be managed as integrated (discrete) landbases; L1, L2, L3, L8, S7, S11, S18, S22, and A14. The integrated or discreet landbase planning system involves a progressive management of conifer understorey stands to meet the intent of the FMA 3aii clause, maximize total volumes, and where possible, produce co-operative Annual Operating Plans (AOP). FMU A15 and MOSA is managed under the MOSA MOU. (See Appendix 9)

For FMU L11 the traditional conifer and deciduous landbase system will be replaced with a mixedwood forest landbase management system that encompass mixedwood and standard silviculture strategies, the mixedwood yield curve set within the TSA (also used in L1), and a future approved ARS. The mixedwood landbase system follows all the integrated system improvements and also endeavours to recognize forest succession in the mixedwood stands (particularly deciduous understorey (DU) stands) through dynamic yield curve developments with a stand level model, allow flexibility in silvicultural treatments and attempt to give a better

approximation of landscape patterns. This progressive way of viewing the managed forest allows both conifer and deciduous species groups to be treated equally across the entire forest landscape within a timber supply analysis on the productive forest landscape.

All forest management strategies (harvesting and silviculture) will follow the approved Operating Ground Rules and silvicultural matrix (Appendix 4).

The forest companies will pursue these landbase initiatives in forest management and timber supply analysis (TSA) (See Section 3.15) that should result in stable and sustainable supplies of deciduous and coniferous timber from the FMA area. In general, the direction will encompass the following challenges:

- A continued transition from sustained yield management to sustainable forest management that meets societal, ecological, and economic needs.
- Demonstrate mixedwood landbase management in two case-study FMUs (L1 and L11) as templates for a potential FMA area wide common system. *(L1 Common landbase not implemented in TSA)*
- Implementation of planning and operational systems that approximate natural landscape patterns – aggregated harvest patterns.
- Management of total fibre volume for the FMA area at the FMU level.
- Flexibility in silviculture implementation and monitoring through a future ARS system (when approved by Alberta SRD).
- Examine *(not implemented)* Intensive Conifer Forest Management [29] strategies.
- Stand level successional growth and yield modelling in the mixedwood case-studies.
- Continued amalgamation of the FMA area's FMUs if all quota holders agree.
- Maintaining and enhancing future FMU Annual Allowable Cut (AAC) levels.
- Management of FMU A15's Mineable Oil Sands Area (MOSA) for efficient extraction of all forest growing stock prior to and during mine site development.
- Working towards one working circle or FMA area zone for fibre supply (conifer and deciduous) to reduce fibre risk due to catastrophic disturbances.
- Mitigation of disturbances to the forest landbase due to catastrophic disturbances and energy sector activities.

The innovative landbase path is multi-faceted requiring a melding of the current standard silvicultural monitoring system and the development of ARS for silviculture, landscape and yield monitoring. The systems will include opportunities for only exploring intensive conifer strategies

[29] Intensive Conifer Forest Management – also referred to as EFM – Enhanced Forest Management – definition from Alberta Forest Legacy: Intensive forest management increases the productivity of the site for a particular output beyond that of sites managed to meet basic and current forest management standards. EFM will not be implemented within this plan. EFM is not a transition within the TSA.

(i.e. EFM), basic silviculture, and alternate or mixedwood management silviculture (MWM) strategies.

The forest companies will only provide opportunities for improving conifer fibre supply through the "case-study" exploration (not implementation) of Intensive Conifer Forest Management (i.e. EFM) on one FMU (within the eight integrated FMUs) in the FMA area. (In association with the traditional silvicultural monitoring system on the common landbase) (See Objective # 10).

OBJECTIVE (#9):

Manage eight FMUs under an integrated (empirical yield curve set) planning system on the discreet landbase, two FMUs under a mixedwood (mixedwood yield curve set) landbase system to maintain or increase both coniferous and deciduous fibre flows from the FMA area and FMU A15 through MOSA.

STRATEGIES:

- Continue amalgamation (if all quota holders agree) of the FMA area FMUs into larger sustainable zones under distinct TSA landbase scenarios (See Table 3.6).
- Optimize the fibre volume (conifer and deciduous) flow from the FMA area (See Objective # 24) (i.e. 100% utilization of the approved AAC for all forest companies).
- Include all the FMA area regional landbase exclusions (Non-J) or "donuts" in the TSA.[30]
- Continue to explore TSA / Forest Management simulation models that can perform forest succession and calculate an AAC.
- Continue to develop successional yield curves for mixedwood sites and refine empirical yield curves (see Forest Inventory Section 3.1).
- Implement silvicultural treatments on all cutblocks (see Objective #15) to provide vigorous forest regeneration to meet or exceed silvicultural guidelines.
- Adopt mixedwood management landscape strategies, harvesting techniques, silviculture, and successional yield curves (see Table 3.6 and Forest Renewal Section 3.6).
- Utilize basic harvesting techniques and standard silviculture based on the approved OGRs and silvicultural regulations.
- Manage MOSA under principles agreed to by Alberta SRD, Northlands Forest Products and Alberta-Pacific.
- Operate under the approved OGR protocols and future amendments

Currently, the FMA area is managed under 11 FMUs, 3 conifer zones, multiple operating zones, and two land-based tenures; a challenging administrative maze. This FMP has moved the forestry partners closer to a common landbase system of management and assisted in the potential assent of the partners towards "one working circle" in the FMA area for coniferous and deciduous fibre supply.

[30] Non-J areas in A14 and A15 without an approved AVI will not be utilized in the spatial TSA.

Since the inception of the FMA in 1991 with 21 FMUs, various FMUs have been amalgamated to expedite forest management. (i.e. S4J + S8J = S18J). The current result is 11 FMUs each with distinctive forest management regimes, distinct partners and a proposed Annual Allowable Cut. See Figure 3.1 and Table 3.6.

The next phase of FMA area development is the continuation of this administrative process towards a global FMA woodlands. However, all quota holders and the FMA holder will have to agree to this administrative change.

MINEABLE OIL SANDS AREA[31]

Within FMU A15, approximately 403,000 hectares (J and Non-J) has been designated as an area primary for oil sands extraction. A map of the MOSA area is provided in the accompanying TSA document. Within this area, about 40 per cent is deemed productive forest at various ages. This area is slowly being withdrawn from the FMA area as mine-sites are developed. A Memorandum of Understanding (MOU) between Northland Forest Products Ltd. (NLFP) and Al-Pac and an agreement-in-principle with Alberta SRD provides the following guidelines for the forest companies within the entire MOSA area:

- Each company will utilize salvage volume proportionate to their share of the timber supply and will utilize the full profile of timber types and tree sizes proportionate to their share of the timber supply. This will involve sharing the coniferous timber supply volume based on 35.46% (Al-Pac) and 64.54% (Northland).

- Liquidation of the majority of merchantable growing stock within the TSA's first four periods (20 years) and no growing stock replacement in MOSA within the 200 year horizon of the TSA.

- 20 year Harvest Map for all conifer and deciduous forest stands (polygons) greater to and equal then 16 metres.

- Release of OGR commitments for retained stand structure, aquatic buffers and road / landings reclamation if MSL approval is expected within 5 years of harvest.

- No silvicultural liability; no commitments towards a future forest condition.

- Yearly co-operative MOSA Five Year Plan to optimize forest harvesting in parallel with dynamic mine schedules with an equitable distribution of the conifer volume to the forest companies. (Prepared for May 31 every year).

The forest companies have also prepared a MOSA/A15 accelerated annual allowable cut (AAC) estimation for the first four periods (twenty years) based on probable fibre flows of coniferous and deciduous salvage timber. Starting in period five (years 21-25) the A15 primary AACs drop to a traditional even-flow TSA scenario based on the net landbase from the non-MOSA portion of FMU A15.

[31] The MOSA MOU is presented in Appendix 9.

Figure 3.1: FMA Area Forest Management Units

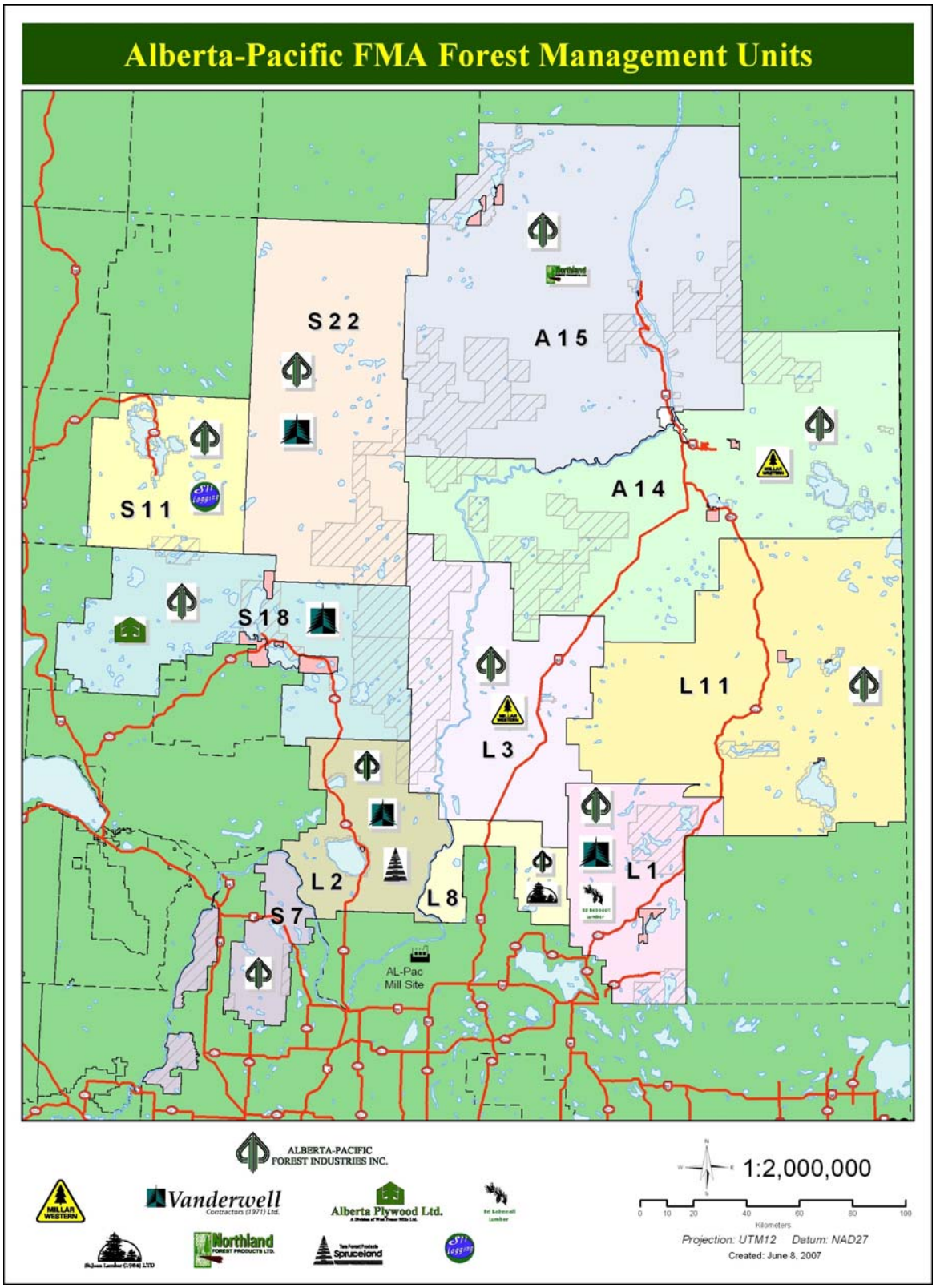


Table 3.6: Forest Management Units and Management Regimes

Forest Management Unit [32]	Major Partners	Management Scenario
L1	Alberta-Pacific Vanderwell Contractors Ed Bobocel Lumber Co. Alberta SRD (MTU)	Discrete landbase Mixedwood G&Y, Standard silviculture, Current regulations
L11	Alberta-Pacific Directed CTP	Mixedwood Management Landbase
S7	Alberta-Pacific Alberta SRD (MTU/CTP) *(Pending new Quota)*	Discrete landbase Standard silviculture Current regulations
L3	Alberta-Pacific Millar Western Alberta SRD (MTU/CTP)	Discrete landbase Standard silviculture Current regulations
S18	Alberta-Pacific Vanderwell Contractors Alberta Plywood	Discrete landbase Standard silviculture Current regulations
L2	Alberta-Pacific Vanderwell Contractors Spruceland	Discrete landbase Standard silviculture Current regulations
L8	Alberta-Pacific St. Jean Lumber Alberta SRD (MTU/CTP)	Discrete landbase Standard silviculture Current regulations
A14	Alberta-Pacific Millar Western Alberta SRD (MTU/CTP)	Discrete landbase Standard silviculture Current regulations
A15	Alberta-Pacific Northland Forest Prod. (MOSA)	Discrete Landbase MOSA - MOU
S11	Alberta-Pacific S11 Logging Company Alberta SRD (MTU/CTP)	Discrete landbase Standard silviculture Current regulations
S22	Alberta-Pacific Alberta SRD (MTU/CTP), Vanderwell Contractors,	Discrete landbase Standard silviculture Current regulations

Note:
1.As of QIV 2007, The conifer quota in FMU L1, held by Vanderwell Contractors is under negotiation with Alberta SRD to be transferred to Millar Western.
2. A FMA area-wide ARS is under development.
3. A new conifer quota (Ghost Lake Timber) in S7 has been initiated by Alberta SRD.

[32] Includes the FMU "J" and FMU "Non-J" units. In all zones Alberta SRD is a managing partner.

FOREST MANAGEMENT IN THE BOREAL FOREST IN NORTHEAST ALBERTA

The majority of the productive or merchantable boreal forest in Alberta-Pacific's FMA area can be classed as a mixedwood forest. Additionally, the conifer component of the boreal forest also consists of jack pine and black spruce. In Alberta, three general definitions have been used for mixedwoods: [33]

- Forest Region: A large region that includes forests of a wide range of species composition, particularly mixtures of spruce and aspen.
- Inventory: Pure stands are usually defined as a forest where the majority of the stems, volume or crown cover at time of inventory is derived from one species (75-80%). The stands below the cut-off are mixedwood stands.
- Ecological Site: A mixedwood site is defined in terms of soil type, moisture, and fertility within a given climatic zone. A mixedwood site could potentially support a range of species compositions from pure stands to a range of mixtures.

Within this FMP, mixedwood management is defined as the combination of harvesting and silvicultural systems, implemented within a FMU, in a manner that is based on successional changes and strives to maintain the inventory and ecological mixedwood characteristics of the forest. Thus, stand-level mixedwood management will require an improved understanding of forest site components and how they interact to provide forest growth, yield and biodiversity. This forest management plan is attempting to set the stage for stand-level mixedwood management and landscape level monitoring of the boreal mixedwood forest.

The boreal mixedwood forest addressed in this section is composed of deciduous and coniferous tree species, the deciduous dominated by aspen but including balsam poplar and birch, the coniferous component consisting mainly of white spruce. We also address the silviculture of pine and black spruce and balsam poplar artificial regeneration in the forest renewal section.

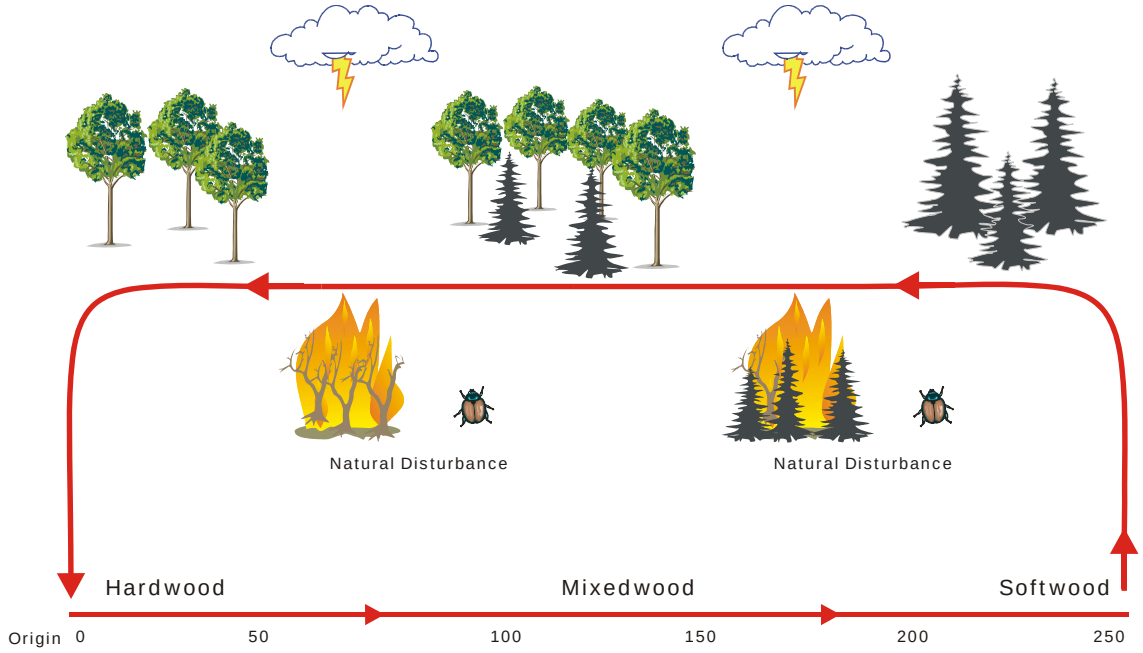
Mixedwood succession includes all four major forest groups (Deciduous-D, Deciduous/ Coniferous-DC, Coniferous/Deciduous-CD and White spruce in Coniferous-C), which represent stages in the mixedwood forest (Please refer to Chapter 2 describing succession). A simple illustration of the dynamics of mixedwood succession is shown in Figure 3.2 (Adapted from: Bergeron and Harvey 1998).

In addition to the mixedwood forest within the FMA area there are areas where one species, generally pine or black spruce, dominate in pure or sometimes hardwood mixed states. These two major conifer species are adapted to certain sites and do not undergo major successional changes like mixedwood forest sites. Thus, pine and black spruce species require a different silviculture program that fits within the parametres of the overall mixedwood objectives and sustained forest management. These species contribute to the FMA area AAC and as such have silviculture strategies to ensure their ecological perpetuation.

[33] Forest Regions of Canada (Rowe 1972)

Figure 3.2: Simple Boreal Mixedwood Forest Succession

This schematic represents a simplified cycle of mixedwood forest succession. The move back to deciduous from conifer requires a natural disturbance event, such as a wildfire and/or infestation, or a timber harvest.



FOREST MANAGEMENT GOALS

For Alberta-Pacific, the Quota Holders, other fibre users and the government, there are three crucial targets that will drive the forest management program:

- Maintenance of the economical supply of deciduous and coniferous fibre to the current industrial infrastructure.
- Ensure the long-term sustainability of the fibre resource while maintaining the ecological characteristics (e.g., biodiversity, ecosystem function) of the mixedwood, black spruce and pine forest.
- Ensure harvesting and reforestation treatments (silviculture) provide for vigorous forest regeneration to meet or exceed silvicultural regulations.

FOREST MANAGEMENT CHALLENGES

Traditional silviculture practices to meet past silviculture regulations (pre-2000), created concerns about the ecology and biodiversity of the boreal forest, particularly when the successful application of these practices may have involved the unmixing of the aspen-spruce boreal mixedwood. Additionally, broad traditional application of techniques for management of white spruce has created some amount of uncertainty in conifer plantation growth responses. This also holds true for black spruce ecology and regeneration.

Traditional silviculture has resulted in some deviation from the natural composition of the boreal forest. Thus, the long-term sustainability of the ecological characteristics of the boreal mixedwoods are potentially tenuous under dual landbase designations and the pre-2000 silviculture regulations.

Industrial fibre demands on the forest will require targeted stands to be managed intensively for pure conifer and extensively for pure deciduous, but that still leaves an opportunity to approximate natural ecological processes through mixedwood management on the majority of the FMA area landscape. The extent of pure deciduous or conifer management, including intensive conifer, within the FMA area will be a policy decision by individual companies and stakeholders, driven by the need to provide fibre to the mills. Balancing the need for fibre and maintaining biodiversity through a varied forest composition is a challenge to the forest manager.

Two new approaches to forest management are addressed in the plan; mixedwood management and EFM. Intensive Conifer Forest Management (or EFM) is being explored by Quota Holders at a feasibility level only and will not be implemented during the life of this plan. Each of these management strategies, including standard silviculture, will be utilized in varying combinations, within the ten targeted FMUs.

BENEFITS OF MIXEDWOOD MANAGEMENT

MWM embraces multiple silvicultural options on how to manage stands, depending on site, successional stage, and species mix. The MWM philosophy is based upon the idea of working within the natural successional pathways of the boreal forest utilizing natural processes to achieve the desired future forest. Some of the benefits of a mixedwood management approach may be:

- Maintenance of the conifer and deciduous leading mixedwood forest
- Maintenance of other non-timber values such as biodiversity
- Building forest succession into the yield curves
- Silvicultural practices that approximate natural patterns and processes
- Increased protection of juvenile white spruce from insects and disease
- Potential increase in overall forest productivity

As outlined in Chapter 2, aspen or poplar is usually the pioneer species that aggressively appears on the site after disturbance, usually followed by white spruce in the understorey, which can eventually dominate the forest stand. Researchers report that white spruce is partially shade tolerant and can grow successfully under an aspen canopy. The aspen canopy can also prevent

most late season frost damage, moderate temperature and humidity extremes, and control competing herbaceous vegetation. A hardwood canopy also provides protection of spruce from insects and disease as the occurrence of terminal weevil and spruce budworm are markedly reduced in mixed species stands. All these factors can reduce mortality of white spruce seedlings in the understorey of a mixedwood forest.

Growing aspen and white spruce in a mixed setting also increases productivity of the landbase as compared to single species sites. Preliminary research data suggests that aspen volume is similar in pure aspen stands and aspen stands with a white spruce understorey, at least until the spruce becomes a significant component of the stand (i.e., when the stand succeeds from a deciduous leading mixedwood stand to a conifer leading mixedwood stand; as per the inventory definition.) Consequently, a common landbase can successfully grow both species in the same stand.

Within the current regeneration standards (as of May 2000) a mixedwood block must be replicated post-harvest. However, as growth rates of white spruce differ depending on associated aspen densities, white spruce management should be a landscape issue (See section 3.7) that must be balanced in the silvicultural records and the timber supply. If a sustained flow of deciduous and conifer fibre must be maintained from the land base, a combination of mixedwood stands and pure stands will be required from the future forest emanating from a range of silvicultural techniques.

CHALLENGES OF MIXEDWOOD MANAGEMENT

The forest companies realize many unanswered questions remain surrounding implementation of MWM. As we do not fully understand all the dynamics of the natural processes that govern successional changes in the boreal forest, we must utilize adaptive management recognizing research findings if we are to obtain the desired future forest. MWM offers effective forest management strategies to maintain a full range of forest values.

Thus, the issues in mixedwood management that must be proactively pursued and detailed to ensure sound decision making in boreal mixedwood forests include (but are not limited to):

- The ecological and economic implications of alternative silvicultural systems and the retention of conifer understorey
- Management of the resource within the current tenure system, particularly block-level silviculture liability and a proposed ARS
- Decision support systems linking stand level actions to forest level plans and to strategic wood supply planning
- Information on site productivity and growth yield relationships to support management decisions
- Information on long-term ecological implications
- An increase in knowledge for the local calibration of growth and yield and stand development modeling
- Continued expansion of knowledge of ecosystem dynamics and stand development as influenced by silviculture activities

These issues do not mean MWM cannot be implemented, but we have to acknowledge and proactively deal with these uncertainties and modify practices through adaptive management. Many research initiatives are presently attempting to resolve these issues (research currently underway is outlined in Appendix 12). The move to MWM is the natural evolution of the forest companies' management strategies. Support for the move in this direction was confirmed by the May 2000 change in Alberta's regeneration standard and the 2002 Alberta SRD request that a common landbase approach be investigated.

MIXEDWOOD AND UNDERPLANTING

(Discussion only, Al-Pac trials only within selected FMUs) (Not enacted within the TSA)

Currently, white spruce underplanting trials are investigating the methodology and success of under-planting mature aspen stands 10-20 years prior to harvest. This mixedwood system is not employed within the TSA or detailed in the FMA area silvicultural matrix as no empirical data exists with which to formulate future yield estimations.

CONIFER INTENSIVE FOREST MANAGEMENT PROGRAM (FEASIBILITY ANALYSIS)

The intensive conifer management system, or enhanced forest management (EFM) program, represents one potential component (the conifer component) of the intensive management pillar of the TRIAD approach to ecosystem management. The term EFM originates from the Alberta Forest Legacy as a future forest strategy beyond the legislated requirement for conifer silviculture, designed to meet fibre objectives, while respecting ecological limitations.

OBJECTIVE (#10):

Provide the opportunity to investigate/evaluate the feasibility of improving fibre supply through Intensive Conifer Forest Management (i.e. EFM) in the FMA area.

STRATEGIES

- A conifer Quota Holder will prepare a conceptual Intensive Conifer Forest Management "case-study" within the Alberta SRD enhanced forest management technical protocols [34], including:
    - expected yield curves and crop-plans, yield verification protocols
    - economics, magnitude and specifics of implementation – TSA level
    - framework to rank/manage fibre objectives vs societal and ecological objectives
    - monitoring techniques
    - prepare the EFM plan by year 10 of the FMP and present the results to all FMA area forest companies and Alberta SRD

[34] Intensive Conifer (*Enhanced Forest Management*) technical protocols are available from Alberta SRD. The conceptual plan is a desk-analysis only that could be implemented in the next FMA area DFMP. (Al-Pac will not prepare this plan.)

This forest management plan supports only the investigation ("desk-analysis") of intensive management, as envisioned in the Alberta Forest Legacy to*:*

1. Increase conifer timber production from the productive forested landbase;
2. Increase the conifer annual allowable cut; and
3. Offset landbase losses to other users (i.e. oil and gas) and protected areas.

A conceptual or feasibility analysis of an intensive conifer program is a cautious approach to further analysis and potentially a graduated design and implementation in the next DFMP. The program is to be prepared by a Quota Holders throughout the life of this plan in a selected FMU (Quota holder dependent). The forest companies recognize that there are social, economic and biodiversity limits to intensive conifer management implementation and establishment as indicated in the Alberta Forest Legacy document. These limits, magnitude, and specifics of implementation of a program will be determined with input from other stakeholders where a framework to rank and manage the tradeoffs can be developed.

Exploration of this program is first done as a case-study at the timber supply (yield) modelling stage, which can address spatial limits to intensity at two scales; the broad landscape level, and the smaller stand level. This program is merely a first-step in a multi-stepped EFM program.

COARSE-FILTER SUSTAINABLE FOREST MANAGEMENT

Within sustainable forest management, regardless of the landscape implementation system and silviculture system, there are block level strategies that must follow the practices as laid out in the OGRs. These all-encompassing block-level and stand-level sustained forest management strategies follow a coarse-filter approach.

The forest companies have been implementing the coarse-filter approach since 1993. However, there are still many uncertainties with regard to our knowledge of biodiversity and natural disturbances, and how coarse-filter harvesting strategies might affect biodiversity differently than natural disturbances. The following is the outline of strategies for the continued implementation of a coarse-filter ecosystem management approach at the regional, landscape and stand levels, within the FMA area boreal forest landbase. There are still some technical and social issues that should be addressed in the future within Ecosystem Management (Swanson et al. 1993). Such issues include (but are not limited too):

- Limits to our abilities to interpret past ecosystem variability.
- Effects of management measures (such as fire suppression) on the natural range of variability.
- Gaps between the state of naturally-occurring ecosystems of the past and desired future conditions (i.e., large fires versus socially-acceptable limits to harvest areas).
- Understanding the cumulative effects of natural and human-caused disturbance on harvest planning and post-disturbance landscape metrics.

These issues will continue to be a part of the forest companies' ongoing research and development programs, and active adaptive management process.

LANDSCAPE MANAGEMENT

OBJECTIVE (#11):

Maintain forest cover patterns by designing and implementing landscape level harvest plans, including aggregated harvesting systems, that more closely resemble natural disturbance patterns at the landscape level. [35]

STRATEGIES:

- Maintain existing forest cover patterns at the landscape level by implementing landscape level harvest plans involving aggregated harvest plans (i.e. single-pass systems), as outlined in the OGRs.
- Landscape level harvest plans and cutblocks are planned and harvested by following natural stand boundaries and stand types.
- Where human activities have fragmented forest cover patterns, the companies may examine the pre-industrial pattern as a template for future landscapes.
- Clustering of cutblocks within a disturbance or planning unit based on the natural disturbance model. Average cutblock size may be similar, but not limited to, the historical average that varied from 15 to 26.4 hectares that was encountered under the two-pass system that was used prior to FMA initiation and in the first 8 years of FMA area management.
- An increase in the variation of patch or cutblock size and shape that should more closely approach the naturally existing variation on the landscape.
- Maximum allowable cutblock size of 500 hectares.
- Variation in disturbance (planning) unit size and distribution within a FMU.
    - No aggregated disturbance (planning) units larger than 30,000 hectares in size.
- Manage for a range of older-forest stands (over-mature) on the FMA area landscape (See Section 3.16 – Old Forest Retention in the Boreal Forest).
- Model the distribution and amount of juvenile, immature and mature seral stages in each major stratum at 10, 50, 100 and 200 years while gradually moving towards a regulated (equal) distribution through the 200 year planning horizon. [36]
- Model the amount of mature/old interior forest patches at the current situation, year 10 and year 50 within the gross FMA forest area, and retain 75% of the current mature/old interior forest patch size. (as per the Alberta Vegetation Inventory hectares). [35]

[35] Forest Companies' plans and landscape strategies do not include allowances due to natural disturbances and/or energy sector activities.
[36] Discrepancies will occur when there are natural disturbance events and energy sector activities. These are non-forecasted events and activities that will change age-class distributions and patch sizes.

- Model the distribution of total forest patches at the current situation, year 10 and year 50 within the gross FMA forest area, for the mesic strata (deciduous, mixedwood and white spruce), jack pine strata and black spruce strata and remain within ≤25% of the total patch landscape of the mesic, Pj and Sb strata within the current Alberta Vegetation Inventory netdown landbase. [35]

SERAL STAGES

Typical forest inventories do not record structural diversity as an analytical attribute, thus coarse age-based definitions of older forests are required for the major forest strata if older forest (i.e. over-mature) retention can be predicted in a TSA. Seral stages differ for each forest type and reflect different stages in the stands function and successional stage. In the TSA seral stages are generally defined by age-classes. Figure 3.3 summarizes the FMA area forest landbase by age-classes from the approved 2001 Alberta Vegetation Inventory. It is this current age-class situation that determines future landscape metrics within the timber supply analysis.

In general, seral stages can be described by four basic forestry definitions:

Juvenile – the establishment or regeneration phase of tree growth (generally years 1-10 or 1-20) - seedlings or suckers. No merchantable volume in this stand type.

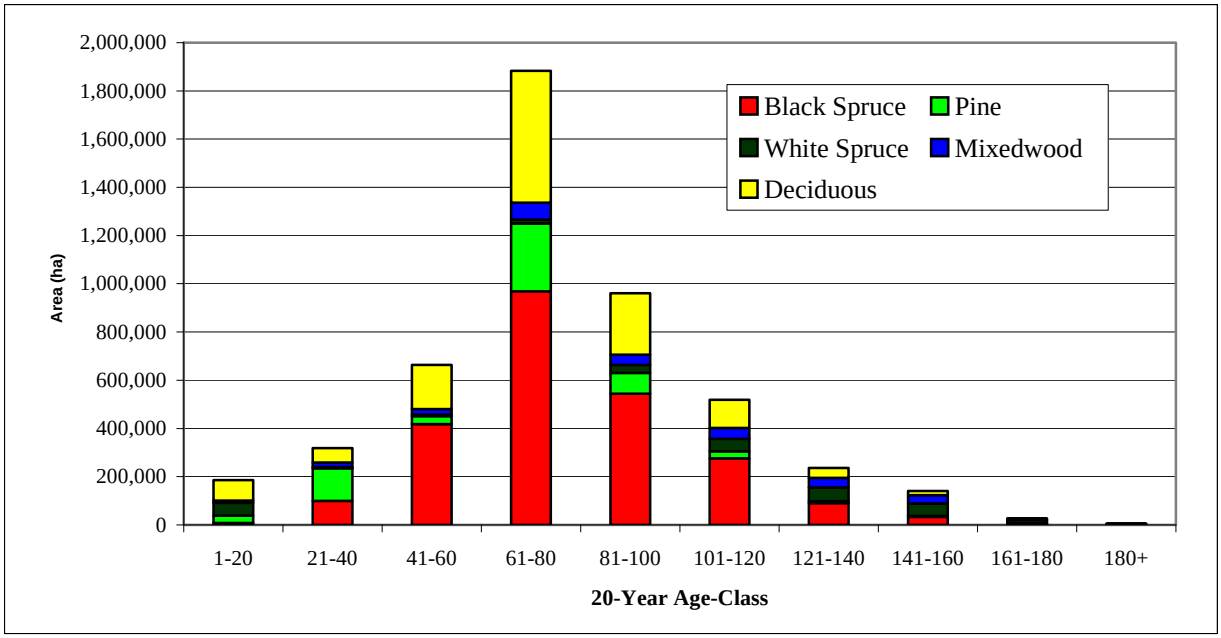
Immature – trees or stands that have grown past the regeneration or juvenile stage but are not yet mature. The age period for this class varies by species (generally years 11-60 or 21-60). These trees are still considered non-merchantable. The stand is represented by the rapid growth segment of a yield curve.

Mature – trees or stands that are sufficiently developed to be harvestable and that are at or near rotation age. The age period for this class varies by species (generally years 61-100 or 71-120). These stands represent the peak growth volume segment of a yield curve.

Over-mature (Old Forest) – an aging stand that is past the mature stage. The age period for this class varies by species (generally greater than 100-120 years). Stands have declining growth volume rates and increased individual mortality. These stands demonstrate changes in the upper forest canopy (i.e. gap dynamics) and have an increasing recruitment of snags and downed woody debris.

In the timber supply model, the amount of juvenile, immature and mature seral stages change over time to become a fully regulated forest. This is due to the timber supply strategy of directing an even-flow AAC for each portion of the AAC species profile. A regulated forest will generally have equal amounts of forest (hectares) in 10-year age class intervals of juvenile, immature and mature stage, usually by the completion of one full rotation or half of the planning period. The over-mature or old forest seral stage also becomes regulated and will become stable and equivalent to the old forest target (Objective # 24). The TSA document illustrates the complete 200-year planning horizon seral stages profile for each FMU.

Figure 3.3: Forest Age-Class Distribution of the Gross FMA Area Landscape (AVI 2006)



PATCH SIZE DISTRIBUTION

One aspect of concern in forest management planning is the spatial pattern or patch sizes of the future forest, where patches are contiguous stands of the same age. In this analysis, a patch is defined as a single or group of forest stands in the same seral stage, and further defined by:

- patches of mesic stands (combination of deciduous, white spruce and mixedwood),
- patches of pine stands; and
- patches of black spruce stands.

However, patches can be split by linear features such as roads, energy sector linear corridors, power-lines and rivers.

A range of patch sizes was selected and utilized in the analysis; 1-5 hectares, 6-20 hectares, 21-100 hectares, 101-500 hectares, and 500+ hectares. The TSA appendix provides patch size definitions.

In the first 50 years of the model's planning horizon, the forest companies' activities primarily effect the forest patches of over-mature and juvenile seral stages; i.e. harvest and reforestation of cutblocks. The FMP limits maximum cutblock size and the conifer/deciduous cutblock pattern following AVI boundaries creates limited changes in future patch sizes. Thus future forest patch distribution is to some extent dictated by the OGRs and the maximum cutblock size. The patch metrics quantitative strategy parallels the old forest strategy by retaining the landscape within 25% of the current situation.

Of particular concern in the FMA area boreal forest is the maintenance of patches of mature and old interior forests. Mature and old interior patches are important for some species of wildlife that prefer the interior of stands away from the effects of exterior edges (Schneider 2002). Thus, the plan has included a strategy that will model and maintain at least 75 per cent of the current amount of mature/old interior forests (patches). The modelling exercise is only for the first 50 years of the planning horizon – the spatial planning component. The target of 75 per cent of the current gross FMA forest area mature/old interior patch situation aligns with the NRV analysis that addressed old forest retention. Old forest stand retention is described in section 3.16 and within the TSA document.

The criteria used to define mature/old interior forests are as follows: [37]

- Sixty metres or more away from a non-forest edge,
- Thirty metres or more away from a non-interior forest edge ("A" density stands, young and immature seral stages),
- Greater than thirty per cent crown closure (AVI density classes B, C, D),
- Greater than two metres in stand height,
- Older than juvenile or immature seral stages and,
- At least 100 hectares in size.

For all landscape metrics, discrepancies will occur when there are natural disturbance events and energy sector activities throughout the planning horizon. These events and activities will change age-class distributions and patch metrics, and are not measured in the timber supply modeling environment.

HISTORIC AVERAGE CUTBLOCK SIZE

From 1993-2000, the average cutblock size reported was 22.1 ha. In addition to harvesting whole forest stands, many forest stands were arbitrarily separated by the two-pass system. Throughout the life of this plan, the forest companies will continue to harvest a range of cutblock sizes. In order to better approximate landscape patterns and minimize roading requirements, it is appropriate to increase the range of cutblock sizes. Social and ecological concerns that are traditionally associated with large cutblocks (visual, line of sight, cover for ungulates, seed sources for conifer) can be mitigated through the implementation of in-block stand structure protocols that retain five pre cent of merchantable volume of all tree species (coniferous and deciduous) within Al-Pac cutblocks, in addition to non-merchantable vegetation.

[37] Alberta Sustainable Resource Development, 2003

FOREST STAND MANAGEMENT

Introduction

Structural retention is one of the critical components required to follow the coarse-filter ecosystem management approach as initially laid out in the 1998 DFMP and continued in the 2007 FMP. This supports the move towards greater implementation of forest management strategies to more closely approximate the NDS at the regional, landscape and stand levels. Thus harvesting and silviculture are designed to create effects similar to those of natural disturbance (wildfire), with respect to block size, landscape pattern and retained stand structure.

By definition, retained stand structure usually consists of live single trees and snags, and clumps of merchantable and non-merchantable trees of all ages that over time will contribute to an increase in downed woody material in the harvest block and potentially block canopy gap dynamics.

The general principles of the post-harvest structural retention program is to:

- Maintain biodiversity and help retain features that resemble patterns of natural disturbance events;
- Create some old forest stand attributes and augment the diversity in young regenerating stands;
- Provide for future snag recruitment and woody debris;
- Potentially increase micro-site variability;
- Provide refuge and habitat for some associated biota; and
- Provide wildlife thermal cover, hiding opportunities and limited line of sight in harvested areas.

OBJECTIVE (#12):

Retain forest structure in harvested cutblocks in varying amounts across the FMA area landscape.

STRATEGIES: [38]

- Live wildlife trees and snags are left standing in order to maintain habitat for cavity nesting species and to facilitate natural stand dynamics.
- Where conifer and deciduous blocks combine to exceed 100 hectares an average of 5% structure will be retained by all operators. This includes all blocks harvested within 1-5 years of each other.
- Stand structure will not be retained in blocks where forest health issues warrant eradication of all mature tree species to combat infestations and diseases (e.g. pine beetle and mistletoe)

[38] Stand structure protocols and subsequent monitoring is not applicable in FMU A15 MOSA area.

Alberta-Pacific Structure Program

- Trees in clumps (minimum of five trees) of varying sizes or individual stems are left throughout the block. Larger clumps may also be left that may provide wildlife cover and habitat. Stand structuring also includes utilizing block features by avoiding damage to patches of understorey shrubs and wet areas (draws, water sources) and leaving large wind-firm conifer (also a potential seed source). Site-specific practices will be dependent on initial stand and site characteristics and desired block-to-block variation.

- Structuring of larger blocks (usually greater then 100 hectares) may include a greater range in clump sizes or treed corridors to provide wildlife linkages and feathered edges on the windward side of blocks. (See Alberta-Pacific Stand Structure Guidelines). Merchantable structure is in addition to any unmerchantable structure in cutblocks.

- In ten FMUs an average of five per cent of the deciduous merchantable volume and five pre cent of the merchantable conifer volume will be retained in cutblocks; in addition to unmerchantable structure.

Coniferous Quota Holders and MTU Structure Program

- For the Quota Holders and MTU, the targets are three-fold for the 10 FMUs: [39]

    - In blocks less then 24 hectares, retention will focus on snags, immature conifer understories, non-merchantable stems and clumps to safeguard special features and/or other forest values – no specific target for merchantable structure.

    - In Quota Holder and MTU cutblocks from 24 to 100 hectares, an average of one per cent of the coniferous merchantable volume and five per cent of the merchantable deciduous volume will be retained.

    - In Quota Holder and MTU cutblocks greater than 100 hectares, an average of five per cent of the coniferous merchantable volume and five per cent of the merchantable deciduous volume will be retained.

The stand structure protocols and monitoring program will be continually monitored and updated to reflect new research and policy.

The amount of stand structure (single trees and clumps) left in each individual block can vary widely depending on operator, stand type, terrain, cutblock size, aesthetic requirements and wildlife objectives [40]. The age and initial composition of a forest stand will determine what structure can be left during harvest operations. This allows for greater amounts of structure in larger cutblocks and more sensitive sites, balanced by potentially reduced amounts in smaller cutblocks. Variation between cutblocks is also desirable under a natural disturbance management program. Thus, the forest companies' intent is to continue to leave variable residual structure.

It is not practical in the coniferous Quota Holder and MTU stand structure program to meet a strict cutover target for all blocks. In areas where Quota Holder blocks are part of larger aggregated harvest area or large planning units (> 100 ha), large patches and increased structural retention (five pre cent for all operators) will be required.

[39] Stand structure protocols and subsequent monitoring is not applicable in FMU A15 MOSA area
[40] "wildlife objectives" – provided by Alberta SRD.

The majority of Quota Holder and the MTU harvests will, however, continue to be in harvest blocks less than 100 hectares in size. Thus, the lower structure limits (zero to one per cent will be the more common practice.

In addition to operator designed structure, areas of within block structure such as buffers on sensitive ecological sites or wildlife habitat may also be considered residual structure and contribute towards overall landscape structure and block structure. Treed buffers for AVI defined aquatic features are considered part of the greater landscape structure and will not contribute to measured/monitored retained structure on conifer blocks. These two areas of retention do not contribute towards the strategic targets for in-block retained structure.

Harvesting contractors are the most important link to the successful implementation of sustainable forest management. Operators are responsible for maintaining stand structure during harvesting operations through protecting various structural features found within the pre-harvest block. Operators are instructed to be creative and visualize future aesthetics when harvesting a block, leaving residual material in the types of areas that fire may have skipped. Without their continual buy-in, the harvesting objectives would not be met. Harvesting contractors must work with the forest companies to provide operators with an understanding of the program objectives. Contractors are the key link for implementing stand structure retention protocols. Contractor training is further reinforced during operations through direction and feedback from supervisory staff with the aim of gaining support and instilling pride in operators.

Operator's stand structure can be augmented by larger, planned and laid out patches/polygons in the aggregated harvest plan system. Aggregated harvest strives to remove most of the merchantable stands in a single pass entry, imitating natural disturbance pattern and creates larger cutblocks in the process. Research into natural disturbance patterns and processes suggests that more residuals and larger residual polygons should be left if opening size increases. Planned structure in these plans is developed at the Final Harvest Plan (FHP) stage of the planning process when block dynamics are further refined.

At the Final Harvest Plan (FHP) level, unplanned merchantable stands (stands that are part of the SHS, but remain unplanned for various reasons, such as aesthetic or wildlife concerns, terrain etc.) can contribute to these planned stand structure as long as they are:

- Merchantable;
- Within the block;
- Attached to the block boundary as a peninsula, where the area is longer than the widest portion reaching into the cutblock; and or
- Between blocks where the structure forms part of continuous merchantable timber: e.g. attached to riparian buffers (not the TSA netdown buffer itself).

Stand Structure Monitoring and Analysis [41]

In order to monitor the amount of in-block merchantable stand structure retained by operators, a monitoring program has been implemented:

Cutblock Aerial Survey Monitoring

Al-Pac Harvest Blocks

- Leaf-on cut-block update photography will be utilized.
- Up to 50 per cent of Al-Pac's annual cutblock photography will be interpreted (minimum 25 per cent).
- Each Forest Management Unit and FMU planning unit will be represented in the sample. The sample will be area weighted by planning unit.
- Block selection will be a random sample within a planning unit.
- The area of residual clumps of merchantable trees will be measured.
- The residual clump area is assigned pre-harvest m^3/ha volumes.
- Planned and laid-out stand structure in the aggregate harvest plans are assigned inventory volumes.
- Un-merchantable structure is not included in the analysis

Quota Holder Harvest Blocks

- Leaf-on cut-block update photography will be utilized.
- All Quota Holders will provide a random sample of at least 25 per cent of cutblocks greater than 24 hectares (all applicable FMUs and licences)
- The area of residual clumps of merchantable trees will be measured.
- The residual clump area is assigned pre-harvest m^3/ha volumes.
- Planned and laid-out stand structure in the aggregate harvest plans are assigned inventory volumes.
- Un-merchantable structure is not included in the analysis

[41] Stand structure protocols and subsequent monitoring is not applicable in FMU A15 MOSA area

Field Survey Program – Alberta-Pacific Cutblocks

Alberta-Pacific will ground-survey a sub-set of the interpreted cutblocks in the first three years of the program (2005–2007).[42] The Quota Holders are not committed to a field survey program. This will provide a base-line field sample to assist in photo interpretation. Block selection will follow these guidelines:

- Ten blocks will be selected from two to three all-weather accessible planning units
- The boundary of each merchantable clump will be GPSed
- Within each clump, the trees will be compiled by height category:
  - 5 – 15 m
  - 15 – 20 m
  - >20 m
- Single trees will be tallied individually
- Compare field surveyed areas with photo interpreted blocks

In addition to operator designed structure, some of the larger aggregated harvest areas will have planned/laid-out stand structure patches/polygons that can count as additional stand structure. These areas will either have their boundaries measured by GPS through the FHP process, or will be assessed through remote sensing under the same criteria listed above. These areas will form part of the spatial harvest sequence (SHS) variance if they were originally in the SHS and won't be sequenced within 15 years.

For conifer quota holders and the MTU program operators, aerial photography may not be available for timely interpretation, therefore a field survey of cutblocks, based on the above methodology, may be employed by some of the small operators. Alternatively, Quota Holders may independently develop other methods of measurement that would require SRD approval.

Stand Structure Reporting

Stand Structure monitoring results will be reported annually by FMU in the forest companies' General Development Plans (GDP) and/or Annual Operating Plan (AOP). Alberta SRD is responsible for MTU monitoring through their AOPs. Each company and the MTU program will independently report their annual results. This will permit variation between cutblocks and even between planning units. The actual merchantable volume left will be reconciled with the targets over a five year Cut-Control-Quadrant, allowing variation between years. Al-Pac's stand structure monitoring results will also be collated and reported every five years in the FMA Area Stewardship report.

[42] The program is compete as of QIII 2007.

FOREST RENEWAL

Forest renewal, or silviculture, is the theory and practice of controlling the establishment, species mix, growth and quality of forest stands to achieve forest management objectives. Using a combination of harvesting, site preparation, reforestation and stand tending interventions, forest vegetation is manipulated at the stand and landscape levels to balance timber production with other societal values. To ensure objectives are being met, forest renewal programs monitor crop tree performance and adjust scheduled treatments as required.

As approaches to forest management evolve, silviculture practices will be modified to adapt accordingly. The traditional management focus ("reforestation" in the following list) will be augmented with one major practice mutually referred to as "Mixedwood Silvicultural Strategies" and a case-study on intensive conifer system (i.e., EFM). Mixedwood Management embraces alternative silviculture, basic conifer and deciduous reforestation, and potentially intensive conifer silviculture[43] strategies.

OBJECTIVE (#13):

Utilize reforestation treatments that provide for vigorous forest regeneration to meet or exceed reforestation standards in order to achieve yield objectives as set out in the TSA.

STRATEGIES:

- Use silviculture strategies as laid out in the Al-Pac FMA Area Planning Level Silviculture Matrix.
- Until ARS is approved, the reforestation standard will be as described in the Alberta Regeneration Survey Manual.
- The forest companies will move towards ARS for future reforestation standards.
- No reforestation / reclamation of any forest company cutblocks within FMU A15 Mineable Oil Sands Area (MOSA).
- In the TSA all post-harvest stands return to their pre-harvest yield strata (composition /density/yield)

Within the TSA, all mixedwood and conifer stand types (DC/CD/C) always transition to their original yield strata – a "back-to-itself" forecast. Thus, "open" stands or "A" and "B" density stands return to an "open" yield forecast. However, in the silviculture matrix table, these stands are treated/managed to meet "closed" or "C" density stand parametres. This would potentially provide a future overachievement of TSA yield forecasts. Silviculture failure is not a model option. The TSA is modelled this way to provide a degree of conservatism to the yield forecasts. A future TSA would be designed to correct forecasted yield imbalances; negative and positive.

Deciduous stands (D) all transition to an "closed" yield forecast – the "D Comp" curve. This is in alignment with the silviculture matrix table.

[43] EFM is not implemented in the Timber Supply Analysis.

The forest renewal program ensures that harvesting and reforestation treatments will provide for vigorous forest regeneration and the maintenance of a sustainable supply of fibre for the forest companies on the FMA area. Alberta-Pacific's harvesting will focus on deciduous and mixedwood stands, with about 80 per cent of the mill fibre requirements being met with aspen and balsam poplar. The balance of Alberta-Pacific's fibre and the Quota Holder harvest will be from mixedwood and pure, or nearly pure stands of white spruce, black spruce and jack pine with minor components of balsam fir.

Clearcut with retained structure will be the predominant silviculture system for Al-Pac. Most stands or similar forest groups (particular conifer stands) can be assessed prior to harvest for regeneration implications relating to soils, soil moisture, competition, conifer understorey, pest hazards and other site concerns.

Landform-based ecological unit classification was undertaken in part of the L1J FMU in 1999; the pilot project demonstrated that this classification had very limited value. In the Al-Pac FMA Area 2000 DFMP, landform-based ecological unit classification was a quantifiable commitment. Further work using this approach is not currently planned for this FMP, as the utility of this type of information within the FMA area's boreal forest has been deemed ineffectual by forest companies' silviculturists.

Currently, silvicultural pre and/or post harvest inspections are preformed by company co-ordinators, company silviculturalists and silviculture contactors, and appropriate silvicultural interventions are applied. Potential treatments are listed in the silviculture matrix. Al-Pac's conifer seed zones and inventory is presented in Table 3.7.

FOREST RENEWAL STRATEGIES

DECIDUOUS REFORESTATION (ASPEN AND POPLAR)

The normal prescription for deciduous sites is "leave for natural" (LFN) regeneration. Natural suckering from the root systems will provide good regeneration in most cases and maintain the genetic composition of the pre-harvest stand. Removal of most of the mature timber (in accordance with the utilization standards in the Operating Ground Rules) is necessary as it provides sufficient sunlight to heat the ground surface and stimulate suckering.

On colder, wetter sites, bluejoint grass (*Calamagrostis canadensis*) can develop prolifically following harvest in response to increased light levels and moisture at the forest floor and this rapid proliferation can shade out establishing suckers, particularly during cooler years when Shepard's Crook and other factors reduce early height growth. As well, logging on moist soils during non-frozen conditions can result in inadequate regeneration; probably due to compaction. Ensuring that blocks are harvested during dry and/or frozen periods aids regeneration by minimizing potential site damage. Where regeneration is not adequate, sites may be planted to an appropriate coniferous or deciduous species.

ARTIFICIAL REFORESTATION OF BALSAM POPLAR

Native poplar cuttings will be planted as required, either directly, or following mechanical site preparation, into deciduous cutblocks that fail to meet regeneration standards or are determined to be marginally stocked by the company silviculturist.

WHITE SPRUCE REFORESTATION

White spruce is the primary conifer species managed on the FMA area. Under the current silviculture legislation, conifer - spruce (C), and mixedwood (CD and DC) cutblocks are regenerated to standards as described in the Al-Pac FMA Area Planning Level Silviculture Matrix.

White spruce performs best on sites with adequate drainage and low to moderate aspen re-growth which inhibits grass competition. In most instances, a silvicultural prescription will detail reforestation treatments and may include actions such as site preparation, planting, and vegetation control using mechanical or chemical methods. These treatments may be utilized in a standard and/or an intensive conifer reforestation program (EFM is not objectively expressed in this FMP - See 3.10).

Mechanical site preparation (e.g. elevating, mixing, scalping) will be prescribed as required to control competition and improve micro-sites or tree survival and productivity. Reforestation will commonly occur by planting. Wet sites, sites with heavy duff and sites with a high potential for aspen, poplar, woody shrub or grass competition commonly require both site preparation and planting. Stand tending will be through a combination of mechanical and chemical treatments.

The retention of spruce/aspen patches, larger windfirm spruce, and smaller understorey spruce will enhance spruce regeneration by providing seed and in many cases, surviving until the next harvest. In some large, relatively pure stands there may be little opportunity to leave wind-firm clumps of trees.

Currently, mechanical stand tending is performed (a minimum of two growing seasons prior to the performance survey) on all white spruce blocks to remove competing herbaceous cover within the free-to-grow circle. This ensures the crop tree meets silvicultural regulation. Al-Pac will begin to apply ARS during the 2008-2009 timber year and based on the results of these surveys, tending regimes will be adjusted.

Quota holders use variations of mechanical and chemical stand tending methods to meet their silvicultural objectives in all white spruce stands.

BLACK SPRUCE REFORESTATION

Black spruce sites are normally harvested under frozen conditions with the objective of minimizing site disturbance. Planting will be the primary reforestation method and may be preceded by light scarification. Advanced growth (understorey and patches of smaller trees) will be protected when practical with the expectation they will augment reforestation. On some Sb sites, harvesting will leave undisturbed wind-firm clumps of trees and clumps or patches of immature trees (stand retention).

Within the TSA, only AVI based “good” black spruce sites are included in the netdown for nine FMUs (L1, L2, L8, L11, S7, S11, S18, S22, A15). In L3 and A14, Millar Western has requested that all sites (Fair, Medium and Good) are included in the productive landbase and will be treated to meet silviculture standards.

PINE REFORESTATION

Pine sites will be harvested using the stand structure protocols previously outlined in Chapter 3. Pine will normally regenerate from on-site seed. Light drag scarification may be necessary depending on duff depth and harvest season. To ensure pine-cones are adequately spread across the site, harvested trees will normally be stump-side processed or roadside slash scattered back across the site. Cone surveys are completed after harvest. Planting programs are scheduled as required (See silviculture matrix). Pine structure will not be left in cutblocks with identified mistletoe infestations to prevent spread into the regenerating stand. Alternately, spruce crops may be planted to assist in eliminating the mistletoe fungi.

HIGH-EFFORT (STRIP-CUT) UNDERSTOREY PROTECTION (DECIDUOUS LANDBASE)

High-effort understorey protection [44] (UP) is only used in stands with coniferous understories (on Al-Pac's deciduous landbase) in excess of 600 stems/ha. There are also stands identified with <600 stems / ha of immature conifer and these stands undergo "Avoidance Harvest"[45]. Within the Al-Pac FMA area, upwards of 400,000 hectares (distributed throughout all 11 FMUs) has been interpreted as having an immature conifer understory. These D and DC (within applicable FMUs) stands have been given the "DU" designation within the timber supply.

In pure deciduous stands (D) and deciduous leading mixedwood stands (DC), at the time of harvest, can have coniferous understories that are still small; their crowns vertically separated from the aspen crowns, or they can be co-dominant. Deciduous stand understories are also highly variable in density, stocking and distribution. This variation is reflected in the variable empirical timber supply transitions and two mixedwood understorey yield curves. Understorey protection works within the realm of natural succession, simulating an earlier over-story stand break-up and potentially shortening the remaining (post-harvest) coniferous rotation age.

Over the past five years, field experience and continued AVI interpretation through the use of leaf-off CIR photography, has illustrated that the density and spatial distribution of immature coniferous stems is not contiguous throughout deciduous polygons with an interpreted understorey. However, the AVI was designed to homogenize the understorey attribute to the entire deciduous polygon, and thus present a fully stocked understorey polygon at the TSA level. This AVI label inaccurately illustrates the actual spatial layout of understorey conifer and averages the understorey density. Also, based on operational experiences of the past five years, understorey protection harvest operations typically disturb at least 55 per cent of the stand's area due to skid-trails, landings, roads and block boundary back-line.

[44] High-Effort Understory Protection (also referred to as "Strip-Cuts") - Used in deciduous harvesting containing greater than or equal to 600 sph of pre-harvest acceptable stems that are 10 hectares or larger. Wind buffering tactics utilizing structure retention, pre-planned strip harvest/skid trails. (Source: Northeast Alberta Operating Ground Rules, 2008)

[45] Avoidance Harvest – Used in deciduous harvesting containing less than 600 sph of pre-harvest acceptable stems or harvesting that contain greater than or equal to 600 sph of pre-harvest acceptable stems and are less than 10 hectares in size or in coniferous harvesting containing understorey. Wind buffering tactics and pre-planning not specifically required. The objective is to identify and retain understories through either non-harvesting areas with understorey, or harvesting of the overstorey with protection from direct harvest impact of the understories at the harvest, skidding and reforestation phases. (Source: Northeast Alberta Operating Ground Rules, 2008)

Thus, within the TSA yield systems, the following TSA parameter/transition are enacted to reflect inventory reality and operational experience from the past five years:

- Deciduous stands (DU) undergoing high-effort understorey protection (UP) transition as follows:
    - 40 per cent of DU regenerate as CD strata with an advanced age of 40 years
    - 40 per cent of DU regenerate as DC strata with an advanced age of 40 years
    - 20 per cent of DU regenerate as D(C) strata at year I.

Al-Pac's intent is to try and balance this post-harvest TSA ratio with actual treated stands' hectares and declarations in the reforestation stage of the operational life of the forest polygon. .

This dynamic transition, within the aspatial timber supply model, promotes flexibility in balancing silviculture liability to reflect a dis-contiguous inventory. This transition is employed in FMUs L2, L3, L8, S7, S11, S18, S22, and A14. In FMU A15, MOSA blocks do not transition to a forest stratum.

All other deciduous "D" and/or "DC" stands with an interpreted understorey (<600 stems / ha) transition to a 1-year-old D(C) stand. These stands have an "Avoidance Harvest Treatment", where the harvest operation and operators have an increased awareness of the standing pre-harvest immature conifer stems with the objective of minimizing damage to the retained stems. Consequently, these stands can best be described as Aw stands with an increased content of immature conifer stems; i.e. a boreal mixedwood stand.

Other types of stands (DC, CD and C) could be eligible for understorey protection depending on the actual stems/ha and viability of the coniferous understorey, but the TSA is designed to only transition "D" and "DC" stands that meet the eligibility criteria. The TSA does not create new DU stands, thus once treated and transitioned to a new stand type, DU will slowly be eliminated over one rotation within the TSA as a treatable strata. However, if a DU stand escapes harvest, at stand senescence, the stand returns to a juvenile DU state; this is not significant in the current TSA. Understory protection methodologies (high effort and avoidance) for layout and harvest are detailed in the 2008 OGRs and supporting documentation.

Within the mixedwood TSA systems employed in FMUs L11 and L1, "D" stands that meet the eligibility criteria of having an identified understorey, transition to two unique understorey strata and a deciduous strata; using the 40/40/20 ratio. The two unique curves better represent a post-harvest UP stand and are essentially the equivalent of the CD and DC cover group designations.

The forest companies will also commence the use of new guidelines on understorey protection when they are incorporated into the Al-Pac FMA area new OGRs. When the next FMA area TSA is scrutinized for submission in 2016, all TSA understorey transitions and strategies will be re-examined to provide a more accurate representation of the future forest landscape. (See objective # 17).

The forest companies on the FMA area will continue to initiate, whenever practical, co-operative planning and harvesting that utilizes understorey protection in all forest stand types. The result will be an improved actualization of the significance of the DU strata and practicality of the current strategy within the next TSA. Some of these initiatives are, but not limited too:

- Management of lower levels of coniferous understorey through patches of retained conifer, avoidance tactics, other selective harvest tactics, and retention of wind-firm individuals.
- The continued utilization of colour low-level, leaf-off photography interpretation and ground-based assessments will provide the forest companies with information to develop block plans.
- Continued monitoring of post-harvest understorey protection treatment blocks.
- Investigating the reforestation of non-regenerated areas within UP blocks.
- Continue to refine the TSA ratio transition of 40/40/20 (CD/DC/D) to account for variations in post-harvest condition.
- Continued appraisal of mixedwood successional pathways, particularly the stand's pathway in the absence of a treatment.
- Ongoing examination of potential AVI nomenclature changes in DU stands due to inventory updates
- Within the 5-year Stewardship report, detail the actual post-harvest declaration / condition of treated DU stands vis-à-vis the TSA ratio.

FMU A15 - MINEABLE OIL SANDS AREA (MOSA) -SILVICULTURE OBLIGATIONS

Within this forest management plan and TSA, the Mineable Oil Sands Area has been designated as an area for the harvest of all merchantable forest stands within 20 years (forecast of four TSA periods). This area's primary land-use is for extraction of heavy oils. The entire MOSA merchantable forest area is transitioned from productive empirical yield curves to "Anthropogenic Non-Vegetated" netdown status. This TSA transition reflects the MOSA future forest condition for the duration of the entire planning period of 200 years. This TSA does not represent the oil companies actual land-clearing plans, but merely a theoretical clearing of the forested landscape within four model periods. Oilsands companies' operational and mine expansion plans are not part of the Al-Pac FMA area FMP process.

Accordingly, no reforestation and/or reclamation objectives and practices are required from the forest companies for all MOSA harvest openings. Additionally, for pre-existing openings within MOSA, the forest companies have no reclamation or silvicultural obligations. This is reflected within the silviculture strategies matrix (Appendix 4) where no current or future MOSA harvest blocks transition to a forest strata with a regenerated yield trajectory.

Table 3.7: Alberta-Pacific – Current (2007) Seed Zones and Inventory

Species	Seed Zone	Total
AW		
	CM3.1	0.065
AW Total		0.065
BW	CM2.1	0.0375
	CM2.4	0.1103
	LBH1.5	0.0627
BW Total		0.2105
PJ	CM2.1	5.2
	CM3.1	56.541
	CM3.2	14.4
	LBH1.5	1.005
PJ Total		77.146
SB	CM3.1	20.558
	CM3.2	1.029
SB Total		21.587
SW	CM2.1	9.724
	CM2.2	40.136
	CM2.3	148.93
	CM2.4	342.415
	CM3.1	23.629
	CM3.2	373.35
	DM2.2	78.383
	LBH1.3	177.43
	LF1.1	8.7
	REGION E	3.3012
	LBH1.5	2.42
SW Total		1,208.4182
PB	CM2.1	0.11
PB Total		0.11
Grand Total		**1,307.5367**

The Al-Pac seed inventory (Table 3.7) is effective April 30, 2007; the inventory will continually change over time. Al-Pac's AOP provides detailed information on the seed inventory.

SILVICULTURE STRATEGY MATRIX – FMA AREA FOREST COMPANIES

The timber supply analysis and potential future forest yields are predicated on successful reforestation of all deciduous and conifer harvest sites. All forest companies prepare annual silviculture plans designed to satisfy provincial standards. Appendix 4 provides a summary of forecasted silviculture strategies for all forest strata; inclusive to all forest companies. The table indicates modeled strata transitions and suitable silviculture treatments. The table does not account for catastrophic natural disturbances, non-forest company anthropogenic disturbances, and/or changes in the economic climate of north-eastern Alberta that may adversely affect the forest companies' ability to engage manpower, site preparation equipment and/or adequate transportation.

SILVICULTURAL RECORD KEEPING

OBJECTIVE (#14):

Continue the maintenance and enhancement of a block-level silvicultural record keeping system that is compatible with Alberta SRD requirements.

STRATEGIES:

- Continue to utilize and maintain the current woodlands "The Forest Manager" (TFM) for silvicultural records and ARIS integration.
- Continue to report all silvicultural activities to Alberta SRD through the Alberta Reforestation Information System (ARIS).

Paramount to all forest management programs is the administration and cataloguing of all the harvest entries and silvicultural treatments across the forest landscape. The forest companies are continuing the development and maintenance of a Geographic Information System (GIS-based) silviculture record system to track cutovers, prescriptions, treatments, surveys and regeneration success rates. The system is the accounting engine that will drive landscape monitoring. Systems are dynamic, and Alberta-Pacific and the Quota Holders will continue their investigations into improvements in systems to continually advance data acquisition and inventory.

The silvicultural account must be tied to the TSA to ensure that forest-growing stock is maintained within the TSA objective parametres (i.e., species and age-class distribution) to meet future fibre needs. The TSA transitions are tied to the landscape monitoring system.

Regeneration assessment reporting will occur twice a year, following active periods in silviculture and harvesting as per standards. The GIS-based silviculture system will eventually be fully integrated into a comprehensive forest information system, linking all the inventory databases and information systems needed for forest management on the FMA area.

ALBERTA-PACIFIC INCIDENTAL CONIFER REPLACEMENT AND ALLOCATION

Incidental conifer is allocated to Alberta-Pacific and offered to the conifer industry through sales agreements. Incidental conifer refers to conifer wood cut in the harvest of a primary deciduous block - from D, D(C) and/or DC stands (FMU dependent). Likewise, incidental deciduous is cut during harvests of primary conifer blocks. Under a mixedwood common landbase TSA scenario, a portion of the total conifer AAC, will be derived from D and DC stands, and will be part of a the conifer AAC allocated to Alberta-Pacific. This conifer is also offered to the conifer industry through sales agreements.

Alberta regeneration standards require replacement of all conifer volumes on an area basis for all cover types containing conifer (i.e. C, CD, DC). Incidental conifer hectare requirements are tabulated within the block declaration process[46] and adjusted via actual delivered volumes. Opening selected for conifer silviculture are allocated throughout applicable FMUs and tracked as conifer openings in ARIS.

[46] Regeneration Stratum Declaration process as per Alberta SRD – directive 205-1.

OBJECTIVE (#15):

Replace incidental conifer by regenerating or protecting sufficient conifer growing stock to produce an equivalent volume of conifer at rotation.

STRATEGIES:

- Replace conifer from deciduous stands (D and D(C)) by increasing the conifer component in reforested stands (D, D(C), DC, CD).
- Through TFM, continue to track the hectares and volume attributable to incidental conifer replacement on the FMA area.
- For every 200 m^3 of conifer harvested from D and D(C) stands, an equivalent of one hectare conifer growing stock will be replaced in the FMU of origin.
- Replace incidental conifer from DC (FMU dependent) stands in accordance with the silviculture matrix and to meet a future ARS (see Objective # 17).
- Utilize silviculture methodologies as detailed in the Silviculture Strategy Matrix.
- Use retained post-harvest conifer (e.g. high-effort (strip-cut) understorey protection) to contribute to growing stock required for conifer reforestation.
- Report incidental volume replacement in the Annual Operating Plan; incidental reforestation monitoring will be reported in the stewardship report.

FOREST COMPANIES' INTEGRATION

Integral to future forest management of the FMA area is the continued integration of coniferous and deciduous operations. A more unified management system should potentially provide economic (e.g. AAC) and ecological benefits to all forest users. Currently, Annual Operating Plan (AOP), General Development Plan (GDP) and Forest Management Plan (FMP) development all involve a level of co-operation between the forest companies. This will continue and evolve into more integrated planning and co-operative operations throughout the FMA area.

OBJECTIVE (#16):

Continual integration of all forest management activities by Quota Holders, Alberta-Pacific and the Alberta SRD administered Conifer Timber Permit (CTP) program through the co-operative implementation of forest management strategies on the FMA area.

STRATEGIES:

- Continue regular Quota Holder/Alberta-Pacific/Alberta SRD meetings to advance the integration agenda.
- Work with all forestry companies to ameliorate other industrial users activities (i.e., ILM).
- Prepare data-sharing agreements between Alberta-Pacific and quota holders, and Alberta SRD.

- Investigate a collective planning system for selected FMUs (e.g. one planning team).
- Employ silviculture systems as detailed in the Silviculture Strategy Matrix.
- Explore the initiation of timber supply zone based silviculture liability accounts and/or joint reforestation working groups.

Forest landbase management, will require increased GDP/AOP consolidation to ensure that stand level decisions follow sound ecological guidelines and build towards landscape level strategic fibre supply. Successful mixedwood management requires a complete integration of conifer and deciduous activities at the TSA, GDP and AOP level.

3.7 ALTERNATIVE REGENERATION STANDARDS (ARS)

OBJECTIVE (#17):

Alberta-Pacific, the Quota Holders and the Alberta SRD will design and implement Alternative Regeneration Standards (ARS) for FMA area forest growth and yield at the FMU level.

STRATEGIES:

- The forest companies and Alberta SRD will design ARS that strive to link stratum level productivity to approved forest yield curves and the TSA (See Figure 3.4).
- Design a growth and yield monitoring program to support ARS.
- In co-operation with the Mixedwood Management Association, design a boreal forest silvicultural/harvest guide.
- Improve stand level successional growth and yield modeling for alternative silviculture systems.
- Improve empirical growth and yield projections with additional data (See Forest Inventory section).

The boreal forest landscape is dominated by relatively frequent and unpredictable natural disturbances (fire, insects, wind) – a highly dynamic biological assemblage. Thus, forest management systems, silvicultural programs and their monitoring must be flexible and on a landscape basis to achieve overall plan success. What is required is a top-down goal-setting objective based monitoring program – Alternative Regeneration Standards.

FMA area-wide ARS development was initiated in QII 2006 (after the SRD approved "ARS Letter of Intent and Development Plan") and the first ARS approximation is expected in April 30, 2008. ARS is a co-operative program by all the forest companies.

Until ARS is developed, the 2000 regeneration standards (the "Orange Book") will continue to be how silviculture success is monitored. The main management objectives of the ARS development plan are as follows:

- Regenerated yield assumptions – the ARS will develop regeneration standards that ensure that regenerated yields are achieved within the times prescribed in the DFMP.
- Yield class transitions – ARS will monitor and reconcile regenerated yield class proportions with those projected for the FMP.
- Annual Allowable Cut (AAC) - ARS will achieve or surpass the currently approved AAC.
- Understorey Protection – During the span of the FMP, high-effort understorey protection (strip cuts) will be undertaken in deciduous stands with white spruce understories of certain height, densities and/or stocking according to FMP specifications. Understorey protection yield curves will be developed for the second ARS approximation. In the absence of those yield curves, protected understories will transition to CD/DC/D stands depending on pre-harvest composition.

The specifics of the ARS program are detailed in the QII 2006 SRD approved development plan. (See Appendix 11).

3.8 FMA AREA MODELLING

OBJECTIVE (#18):

Alberta-Pacific and the Quota Holders will continue to explore models that reflect succession and silvicultural treatments.

STRATEGIES:

- Continue to investigate stand-based forecasts with models such as GYPSY, FORECAST, TASS, SORTIE,[47] and the Mixedwood Growth Model (MGM) – the design of future forest growth simulation models.
- Empirical yield curves will still be utilized and enhanced through additional field data plots for pine, black spruce, and managed conifer strata - mostly pure strata (see Section 3.1).
- The forest companies will continue to pursue the next generation of TSA spatial simulation models married to stand-based growth and yield forecasts.

Planning a potential future forest condition and AAC due to multiple changes in growth and yield pathways is a difficult task. A future forest model requires that the forest manager's envisioned pathways for a forest are simulated in the computer model. Simulation scenario planning and goal programming based TSA tools are the future; i.e. Patchworks. This type of planning is predicated on the assumption that if you cannot predict the future, then by speculating upon a variety of them, you will hit the right one. A model must provide alternative states of a dynamic future forest to meet a range of biodiversity/ecosystem and fibre objectives.

[47] FORECAST and SORTIE are forest stand growth simulation models currently in development. TASS – Tree and Stand Simulator – a BC Ministry of Forests growth model for conifer stands. (This is not an inclusive list of stand-level models) GYPSY is an empirical yield model. Patchworks is a landscape simulation model. MGM Summary adapted from – www.uofa.rd.mgm.ca.

Mixedwood Growth Model

Through the Mixedwood Management Association, the forest companies are currently supporting several projects designed to improve yield estimations and to enhance capabilities to model complex stand dynamics and silviculture treatments.

Tree List Generator

Alberta-Pacific is continuing to develop a statistical model to assist in estimating volumes of scheduled blocks; this is known as a Tree List Generator (TLG). It is an explicit database available to all forest planners. The generator can predict a tree list or stand table for each stand (AVI label) in the forest using statistical relationships developed from the temporary sample plots and permanent sample plot datasets. The TLG provides stem counts, stem sizes (log populations), initial stand conditions and stand tables. The result can be a unique tree list for each stand in the forest inventory.

3.9 SUPPLEMENTAL REFORESTATION PROGRAM

The Forest Management Agreement, paragraph 26, allows the FMA Holder and the Department (Alberta SRD) to devise and implement a reforestation program on potentially productive forest lands (subject to funds being available). The potentially productive sites (less than five per cent of the gross FMA area) are predominantly areas that have been burned by forest fires. Many of these sites will have regenerated naturally; the AVI will detail their actual vegetative status. Other sites may be valued for other non-timber values as they are, and would not be reforested.

Accordingly, Alberta-Pacific will not be pursuing the Supplemental Reforestation Program during the period of this plan. However, Al-Pac may decide to revisit this clause prior to the next FMP.

3.10 OPERATING GROUND RULES AS A TOOL FOR FOREST MANAGEMENT IMPLEMENTATION

The management, planning and implementation of the harvesting strategies on the FMA area will remain consistent with the detailed guidelines laid out in the OGRs (Alberta-Pacific 2000). The Forest Management Task Force developed the OGRs through consensus. The intent of the OGRs is to ensure the interests and concerns of other resource users and the general public were incorporated in a manner that provides sustainable development of renewable resources, maximizes the value of the timber resources and maintains a high quality forest environment.

The OGRs were based on the accepted understanding of environmental needs at the time of their writing. The strategies put forward in this FMP reflect, through more research, experience and public participation, an improved understanding of the biological, social and economic factors that need to be taken into account to operate on the FMA area. Additionally, Traditional Land-Use studies can provide enhanced information how to modulate operational practices to meet non-timber objectives.

The OGRs will be reviewed,[48] after this FMP and conditions are approved, to update and include any adaptive management recommendations that continue to support the implementation of sustainable forest management or ecosystem management. New OGRs will be aligned with the ongoing provincial initiative to prepare base-line or regional ground rules for all regional operators. Some notable issues that may be addressed in OGR renewal, include but are not limited to:

- Slash abatement standards
- Aggregated harvest
- Treatment and management of conifer understorey
- Birch management guidelines
- Self inspection agreement(s)
- Road and riparian buffer standards
- Mitigation measures for road development
- Habitat requirements for selected species
- Fire salvage protocols (SRD is developing regional protocols)
- Soil guidelines
- Stand structure retention protocols
- Sensitive site identification and operational protocols

[48] Alberta Sustainable Resource Development has prepared new Northeast Alberta zonal ground rules. Alberta-Pacific's FMA area OGRs will be augmented through consultation and remain in effect until the NE AB OGRs are approved *(Approved in June 2008).* The above list was developed by the FMTF.

3.11 SOCIO-ECONOMICS

Maintaining a flow of economic and other benefits from the FMA area forest is an important dimension of sustainable forest management. Where possible, it is important to describe and measure the economic and social benefits derived from the FMA area resource.

The combination of these benefits is referred to as socio-economics. Social sustainability is a community focus that deals with values and attitudes. Economic sustainability is a human focus that deals with companies, products, income and activities. However, through the FMA, the forest companies operating on the FMA area are essentially limited to the task of managing their forest harvesting and silviculture activities. Socio-economic sustainability is a responsibility of all resource industries, the service sector and primarily the governments.

To ensure the forest companies pursue sustainable forest management, there is a regional need to develop criteria and indicators (C&I) that monitor the impacts of their activities on socio-economic dimensions.[49] Considerable work has been done by Canada's Model Forest Network and the Canadian Forest Service in identifying indicators for forest community sustainability, and in evaluation of indicators such as human capital and income distribution within a forest area.[50]

For the Alberta-Pacific FMA area three major elements, wealth creation, non-timber values and recreational opportunities comprise practical and potential criteria and indicators.

1. Wealth Creation: Contribution to the national / provincial / regional economy; goods and services and social health (e.g., employment, income distribution, taxes, education/human capital - wealth creation).
2. Non-Timber Values: Consumptive and non-consumptive use of resources (e.g. trapping and protected areas).
3. Recreational Opportunities: The forest companies will continue to offer support to identified regional interest groups in their identification and development of recreational and tourism opportunities.

OBJECTIVE (#19):

Contribute towards the economic good of the region, and the responsible use and protection of the many social and cultural values.

STRATEGIES:

- Develop realistic and practical criteria and indicators through a socio-economic analysis that measures and monitors Al-Pac's FMA area economic and social benefits.
- Support regional interest groups in the identification and development of the FMA area's recreational and tourist potential. The forest companies, when approached, will work with recognized recreational groups to facilitate economically feasible recreational opportunities.

[49] Adapted from "Criteria and Indicators of Sustainable Forest Management in Canada - Technical Report, 1997, Council of Forest Ministers, CFS, Natural Resources Canada.
[50] Beckley, et al, 1998

- Co-ordinate harvest planning with recreational user groups and commercial tourism operations to protect or enhance their opportunities. Where there are high tourism values (e.g., around lakes and permanent roads) and identified wilderness values, harvesting would be carried out in a manner that could maintain the visual quality.

- Work with trappers, local lodge operators, outfitters and interest groups to identify significant wilderness areas and minimize the effects of harvesting activities and duration on these areas.

- Continue to offer Global Positioning System (GPS) services for Traditional Land Use studies or upgrades of studies in existence.

- Continue co-operative initiatives with non-government organizations (e.g. Ducks Unlimited Canada - Ducks and Trees Program).

- Participate in the Boreal Conservation Project (BCP) with Ducks Unlimited Canada. (See Chapter 2)

- Participate in management planning initiatives affecting the Athabasca and Clearwater River valleys, and other significant ecological and environmental initiatives affecting the FMA area.

The Athabasca and Clearwater River valleys constitute two of the distinctive natural features of the FMA area. Alberta-Pacific will not schedule regular harvesting within the breaks of the Athabasca or Clearwater Rivers for the term of the Forest Management Agreement (Aug. 31, 2011). Currently, quota holders have operations in the valleys that generate conifer sawlogs for their mills and some incidental deciduous fibre, which is utilized by Alberta-Pacific. In addition, chips generated from sawlogs that quota holders harvested from the river valleys, are purchased by Alberta-Pacific. During the development of the next forest management plan, options for the valleys and TSA implications will be discussed, re-evaluated and reviewed for consensus agreement through the community engagement strategy.

CRITERIA AND INDICATORS

Within Canada there is a continual challenge to examine and develop potential criteria and indicators (C&I), particularly for non-market activities where it is not only the importance of the value but also the intensity of utilization that determines long-term FMA area socio-economic sustainability. Sustainability has been partially addressed in the 2002 Alberta-Pacific stewardship document.

Criteria and indicators are used to define, measure and report on the forest values required to sustain and enhance the landscape.[51] They are also intended to provide a common understanding and scientific definition of sustainable forestry in Canada and provide a framework for describing and measuring the state of the forest, forest management practices, values and progress toward sustainability. Information and data can shape future policies and focus research on areas where we need to improve our technology and knowledge. The criteria and indicators framework reflects an approach to forest management which is based on the recognition that forests are ecosystems that provide a wide range of environmental, economic and social benefits to all users.

[51] Prose adapted from: Canadian Council of Forest Ministers, Technical Report 1997.

In examining direct economic and non-timber values (not ecological values), potential indicators (measurable and quantifiable) that have been studied and could be monitored are the following:

- Availability and use of recreational opportunities
- Total expenditures on alternate uses - trapping, camping, outfitting
- Forest recreation expenditures - i.e., local clubs, hunting and fishing organizations
- Hectares of protected area
- Al-Pac's community employment
- Value of goods and services generated by Al-Pac
- Al-Pac's taxes and income distribution (contribution to the economy)

In examining and preparing an initial criteria and indicators approach for the FMA area, a number of existing databases could be utilized, such as, academic reports, Statistics Canada reports, Alberta Government reports, Canadian Forest Service reports, Traditional Land Use Studies and industry publications. The examination of a simple monitoring program using selected criteria is the preferred direction of a socio-economic program and is in parallel with Alberta-Pacific's forest certification endeavour (See Chapter 4, Objective # 26).

3.12 ECOLOGICAL BENCHMARKS AND PROTECTED AREAS

OBJECTIVE (#20):

Identify a series of ecological benchmarks representative of the habitat diversity of the FMA area.

STRATEGIES: [52]

- Complete a protected area gap analysis for the FMA area.
- In association with interested and informed stakeholders, assess existing protected areas (See Chapter 2 - Wildland Parks summary) and areas with limited industrial activity for inclusion in a network of ecological benchmark areas within or adjacent to the FMA area.
- Establish a program that will utilize ecological benchmarks to monitor biological diversity and ecosystem function by comparing harvested vs. non-harvested landscapes as part of an active adaptive management system (See Chapter 4, Objective # 26 – Alberta Forest Biodiversity Monitoring Program (AFBMP)).
- Monitor biological diversity and ecological process (as defined by the AFBMP) over time on ecological benchmarks and areas under sustainable forest management (see Section 4 Biodiversity Monitoring).
- Potential areas may be deferred from the harvest sequence while the forest companies work with interested and informed stakeholders in order to gain legislative protection for sites.

[52] Objective 20 strategies relating to benchmarks and HCVF was completed in 2006/07 in accordance with Al-Pac's FSC program.

- Complete a High Conservation Value Forest (HCVF) assessment for the FMA area and develop management strategies for High Conservation Value Forests, as required.

Stakeholders recognize the value of protected areas to benchmark against the areas under ecosystem management but, amongst all stakeholders, criteria for selection of protected or benchmark areas are diverse. Currently, management principles for protected areas remain undefined, except for the general principle that industrial development be excluded. However, stakeholder interpretation of what a protected area or ecological benchmark should reflect on what time scale they perceive changes to an area occurring (e.g., establish reserves of older forests) and over what landscape scale these changes will occur (e.g., eco-region representation).

Alberta-Pacific staff and the Forest Management Task Force undertook a decision process in the mid 1990's that identified the Liege River watershed (See *2000 DFMP*) as the best available benchmark area that existed within the FMA area. The SP2000 Local Co-ordinating Committee failed to reach consensus regarding protection of the Liege Watershed in 2000. Increasing activity within the Liege watershed and lack of support from designation of the site as an ecological benchmark has made the area untenable as a benchmark site. Consequently, a "Leige Management Plan " as envisioned in the 2000 DFMP will not be prepared. However, Alberta-Pacific is in the process of identifying benchmark areas as part of the Forest Stewardship Council (FSC) principles.

Even with the best available information some uncertainty remains regarding maintenance of ecosystem integrity throughout a managed landscape. Establishment of representative protected/ benchmark areas will allow for comparison of ecological patterns and processes on the managed versus benchmark-landscapes. A number of protected areas are found within and around the FMA area (See Chapter 2 - Table 2.4). Although the utility of smaller areas as benchmark areas is diminished, these areas must be evaluated for inclusion in a network of ecological benchmarks. Rare or unusual ecological sites will continue to be protected, through protective notations or possibly the establishment of ecological reserves. Unique cultural and historical sites will also continue to be protected.

3.13 SUSTAINABLE FOREST MANAGEMENT AND INTEGRATED LAND MANAGEMENT (ILM)

INTRODUCTION

Integrated Land Management (ILM) happens when resource use is co-ordinated to create the smallest and softest human footprint on the landbase while creating economic efficiencies and cost savings to industry partners. From an industrial perspective ILM is based on the premise that activities within and between sectors affect each other's activities. ILM further recognizes that to maintain functioning ecosystems user coordination on a landscape level is required.

On the Alberta-Pacific FMA area, the use of the forested landscape is not restricted to forestry companies. Currently through exploration, extraction and transmission activities Alberta's oil and gas industry is impacting almost as much forested land each year as is harvested through all forestry operations. Energy sector activities occur across a wide range of forest cover types including lands considered from a forestry perspective both productive and non-productive. These land removals are to be long-term and in cases such as the oil sands developments, the productive status is removed from the landbase for the length of the timber supply analysis/FMP - 200 years. These lands may be returned to productive ecosystem status.

The current growth in Alberta's natural resource industries has led to cross-sector conflict and public concern over cumulative effects on the environment. Current and future activities on the forest landbase reflect multiple business and environmental objectives. Past attempts to co-ordinate natural resource development activities, such as the Integrated Resource Management process, have not been effective as industries generally continue to operate independently.

ILM represents a new attempt to advance forest management opportunities in a proactive approach to cumulative effects management by aggressively addressing landbase issues.

The continual growth of the oil and gas sector and increasing impacts from other natural resource based industries (mining, peat operations) require the government and the forestry companies operating in and around the FMA area to recognize the continuing loss and alteration of forest land and attempt to mitigate negative landbase effects.

Within the scope of ILM there exists traditional planning processes and new processes actively being developed to address the issues around, single uses, multiple use and cumulative impacts on the landscape. The forest companies recognize the following existing processes and propose to consolidate these processes into ILM.

INTEGRATED RESOURCE MANAGEMENT PLANS

The FMA falls within the Peace River and Northeast Integrated Resource Planning (IRP) Regions. Within these, the subregional zones affected by the FMA are:

PEACE RIVER REGION

- Peerless - Graham Subregion
- Wabasca Subregion

NORTHEAST REGION

- Big Bend Subregion
- Lakeland Subregion
- Fort McMurray - Athabasca Oil Sands Subregion
- Birch Mountains - Firebag River Subregion
- Winefred Lake - Pelican Portage Subregion
- Wandering River - Smoky Lake Subregion

Of the subregions, Big Bend, Lakeland and the Fort McMurray - Athabasca Oil Sands IRP have Integrated Resource Plans (IRPs) completed and published. The forest companies will comply with the spirit and intent of existing plans and will support the development and implementation of future plans, in keeping with the Alberta Environment's Protection (the Department's) policy "of providing for multiple uses of the same public land" (Section 8 of Forest Management Agreement – O.C. 193/98).

MITIGATIVE ACTION PLANS

Additional northeast boreal forest initiatives addressing cumulative effects, like the Regional Sustainable Development Strategy (RSDS, see below), the End Land Use (ELU) and the Reclamation Advisory Committee (RAC) were initiated to address the extent and duration of impact of the oil sands mining operations for the North East Boreal region (Fort McMurray area in particular). Alberta-Pacific recognizes overlapping objectives in these programs and is a committed participant in each.

REGIONAL SUSTAINABLE DEVELOPMENT STRATEGY

The oil sands developments (tar sands mines and in-situ developments) in northeast Alberta are intensifying and continuing to expand in scope and number. To address this expansion, a policy document called the Regional Sustainable Development Strategy has been developed. "This document supports the "Alberta Advantage" which recognizes the need to balance opportunities for growth with the need to preserve and maintain the rich environment for future generations. It confirms Alberta's commitment to sustainable development, and describes the provincial government's approach to sustainable resource and environmental management. The RSDS provides a framework for balancing development with environmental protection (RSDS 2000).

In concert with RSDS was the formation of the Cumulative Environmental Management Association (CEMA) who's mandate is to advance the philosophy of RSDS through a multi-stakeholder collaborative forum (e.g., industry, provincial government, First Nations and NGOs).

The forest companies in the region are committed to the RSDS / CEMA vision of sustainable development and actively support this "living process" as changes occur in the region. Working in partnership with government agencies, other regional stakeholders and regulators, and special interest groups, the forest companies will participate in the RSDS / CEMA initiative. Some issues of notable interest to forest companies in the region include:

- Co-ordinating access developments and salvage opportunities
- Improving the timing of salvage activity
- Securing commitments towards the re-establishing of natural and productive forests

OVERLAPPING LAND USE PRACTICES: RECOGNITION OF AN ISSUE

Alberta-Pacific has been designing and implementing sustained forest management or ecosystem management since mill conception in 1992. Largely, the program has focussed on how Alberta-Pacific's operations may be modified to ensure current forestry knowledge is incorporated into operations. As our knowledge of ecosystem function and process has increased so has the depth and breadth of our program. We have also utilized new tools as they become available to help us identify priority issues.

One of the tools is the "A Landscape Cumulative Effects Simulator" (ALCES®)[53] model that has demonstrated the magnitude of cumulative effects that industrial users are having in the FMA area. The cumulative effects of roads, pipelines, seismic lines, well sites and cutblocks, though individually small are beginning to add up to levels that are impacting the productive landbase and habitat.

The ALCES model has indicated that the landbase is undergoing fundamental changes (i.e., a younger and smaller more fragmented landscape) due to the collective impact of all of these incremental industrial land uses. The model also indicates that many of these changes can be mitigated through industry co-ordination. Not only will this co-ordination have ecological benefits but also cost savings may also be realized as redundancies are identified and eliminated.

OBJECTIVE (#21):

Minimize, through integration of industrial activities on the FMA area, the industrial footprint in terms of its size, intensity, distribution and duration on the landbase.

STRATEGIES:

- Apply the ILM philosophy to the entire FMA area.
- Utilize dynamic landscape models to assist in the identification of priority opportunities and the assessment of the impacts of integration and non-integration.
- From the model examine potential energy sector landbase scenarios into the TSA model to examine potential long-term sustainability (see TSA section.).
- At the AOP level continue to identify and implement operational inter- and intra-industry integration opportunities
- Support the ILM Research Chair Position at the U of A.
- Continue to comply and support development of Integrated Resource Management plans for northeastern Alberta.

[53] ALCES® - www.foretech.com

The ILM program recognizes that many parties, whether they be industry, various levels of government or the public, share a common set of goals based around the idea of sustainable management/development. However, sectors have different interests and different motivations. While we all want long-term availability of our natural resources for economic, recreational or cultural reasons our efforts will necessarily be focused in different areas.

As some industrial activities have more severe and lasting impacts on the landscape as compared to recreational and cultural users, the primary focus of this ILM process will be on the integration of industrial operations rather than broader societal endeavours.

For ILM to be successful it must be based on a foundation of science. Changes must be made based on sound scientific advice. Since this is an evolving area it is expected that new research projects will need to be developed that examine specific issues such as the re-vegetation of seismic lines and well sites. Adaptive management can then transfer new information into operations.

3.14 HISTORICAL RESOURCES AND SENSITIVE SITES

In compliance with Alberta's Historical Resources Act, land disposition holders in Alberta must ensure that heritage resources are protected within their operations in a responsible, efficient and cost effective manner. For the forestry companies on the FMA area, an approach is required to predict where heritage resources and sensitive sites are located, determining what forestry practices may harm them and devising a solution to prevent or minimize the chances of damaging those resources.

The FMA area has a number of identified sensitive sites and uncommon plants. The forest companies realize sensitive sites will require some degree of protection and a process to continue identification of sites throughout the FMA area. These sites are important to specific people or groups and can be vital links to biodiversity.

OBJECTIVE (#22):

Continue to develop and refine a system for predicting where heritage resources are potentially located and develop a process for incorporating potentially sensitive sites into operational planning.

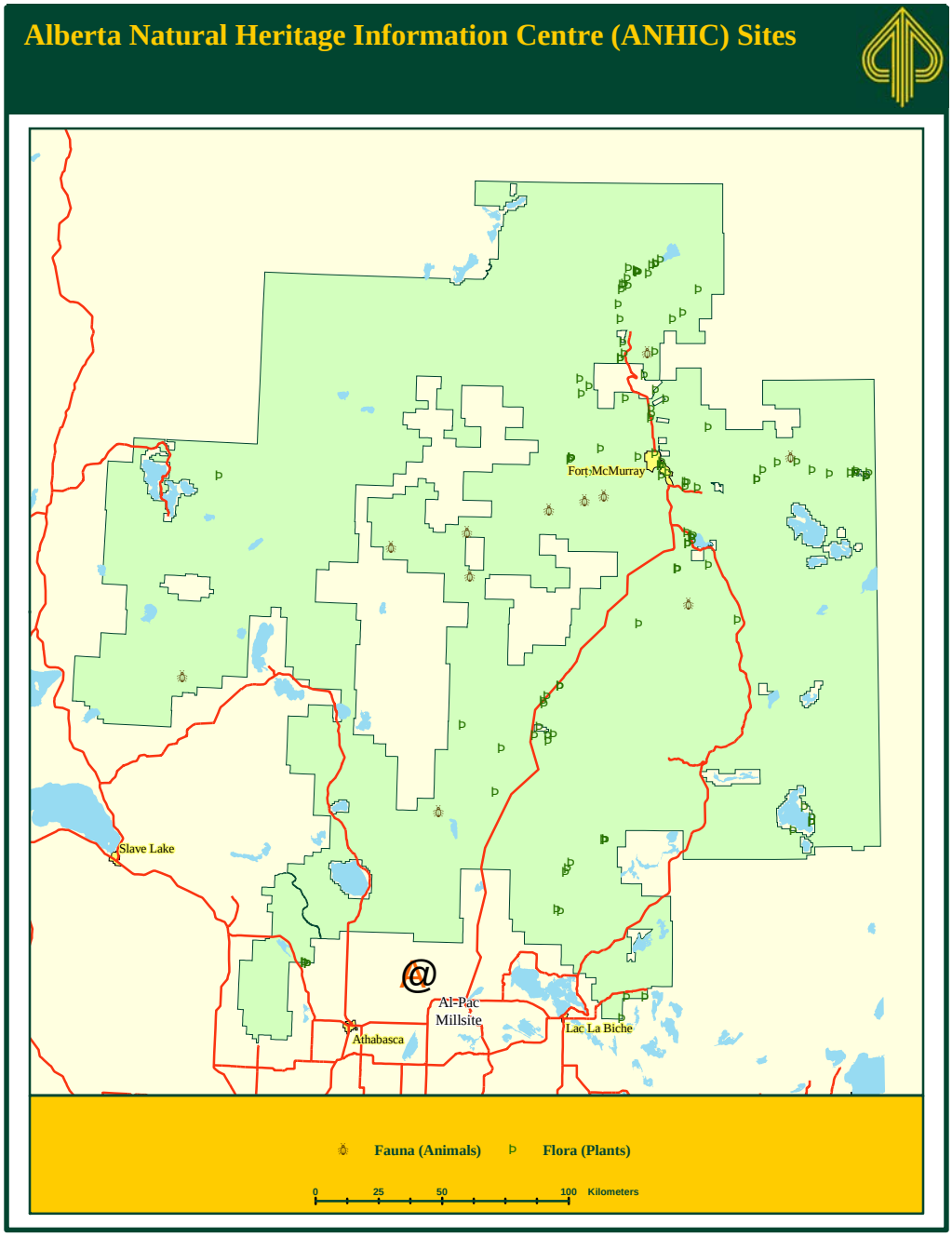
STRATEGIES:

- Continue to develop and refine a heritage resources system with the assistance of a qualified archaeologist to comply with the Alberta Historical Resources Act.
- Through a heritage resource model continue to refine impact conditions for the FMA area landscape.
- If required, prepare heritage protection prescriptions in areas with high heritage potential with the assistance of a qualified archaeologist.
- Use current land-use data, aerial photography and cultural studies to assist in identifying heritage resources and sensitive sites at the AOP level.
- Ensure known (in digital format) sensitive sites are not impacted by the harvest sequence.

- Assist SRD in preparing sensitive site OGRs at the next OGR instalment.

Currently the Alberta government generates a database (Alberta Natural Heritage Information Centre – ANHIC) that identifies various kinds of sites, plants and occurrences in the FMA area. Figure 3.4 illustrates the current status of the ANHIC database. The data-points on the ANHIC map illustrate that a plant / site has been found, they do not offer a factual indication of rarity or the sensitivity of the site.

Figure 3.4: Alberta Natural Heritage Information Centre Sensitive Sites



3.15 TIMBER SUPPLY ANALYSIS

The Timber Supply Analysis (TSA) quantifies the amount of fibre that may be harvested by the forest companies on the FMA area. The TSA delineates fibre at a temporal scale for at least two forest rotations or 200 years and at a spatial scale for 15 to 60 years. This identified amount of fibre available to the forest products industry is referred to as an Annual Allowable Cut (AAC) or volume available within the goals and strategies provided in the FMP. Full TSA documentation is provided in the TSA Appendix. The TSA Document and appendixes are laid-out as follows:

1. Modeling Values / Parametres
2. Modeling Software
3. Empirical Modeling Inputs and Approach (Woodstock / Stanley[54])
4. Mixedwood Modeling Approach (Patchworks)
5. TSA Procedures
6. Modeling Results by FMU -
    - Preferred Management Scenario – Harvest Summary / SHS
    - Netdown Information
    - Conifer Profile and Allocations
    - Landscape Metrics
7. TSA Appendices
    - Landbase Netdown Documentation
    - Treatment Response Patterns for Empirical Based Yield Curves
    - Empirical Yield Curve Summaries
    - FMU L1 – Mixedwood TSA (2004 Analysis) – 2007 Update for L1 and L11 & Patchworks Schematics
    - Development of Empirical Yield Curves
    - Mixedwood Management Yield Curves
    - Natural Range of Variability Analysis (Andison 2003)
    - Mixedwood Understorey Protection Curves (Revised – 2007)
    - Jack Pine Yield Estimates (March 2007)
    - Steep Slope Analysis
    - Traditional Land-Claim Entitlement (TLE)
    - Changes in FMA Area Landbase - 2004…2007

[54] Stanley is a spatial mapping tool companion to Woodstock.

TSA APPROACH

The forest companies have agreed to the concept of managing the TSA on discrete landbases (i.e. divided landbase) but with an integrated approach to planning the spatial harvest sequence (SHS) and AOP. The TSA is designed to simultaneously maximize and even-flow both the deciduous and coniferous volumes over the 200 year planning horizon. Additionally, L1 and L11 will be managed as a mixedwood landbase using a new mixedwood set of yield curves. These two units (L1 and L11) are a template or case-study on how to commonly manage FMUs for the timber benefits of all users. Table 3.8 illustrates the major changes/differences / parametres between the original divided landbase versus this TSA's integrated and mixedwood common landbase methodologies.

The main output of the TSA spatial analysis is to provide an explicit 15-year harvest sequence, and a coarse 15-60 year spatial analysis for each FMU. The explicit sequence will be committed to and divided up among (based on tenure) all eligible forest companies. The sequence must be flexible as the forest landscape is highly dynamic. Start year for the sequence is 2006, which corresponds with the start of a timber quadrant.

As stated in Objective # 9, 11 FMUs will be utilized for this TSA within the Alberta-Pacific FMA area; 8 for an integrated program on the discrete landbase and two for a mixedwood program. Table 3.5 illustrates the management and modeling scenarios. A15 is managed under the MOSA.

Within the TSA approach, two distinct modeling tools are employed; Patchworks and Woodstock / Stanley suite of tools. Woodstock will be the primary aspatial TSA model used to optimize AACs using the approved landbase and empirical yield curves. Patchworks is a goal programming model utilized to facilitate the implementation of a co-operative mixedwood management program. Alberta-Pacific and Millar Western also co-operated in the use of Patchworks as a spatial modeling tool in companion with Woodstock in L3 and A14.

OBJECTIVE (# 23):

Identify spatially explicit, sustainable harvest levels (Timber Supply Analysis - Annual Allowable Cut Calculation – AAC) that are sufficient for FMA area timber users and attempt to sustain the environmental and social values of the FMA area.

STRATEGIES:

- Complete a detailed AVI landbase netdown for all 11 FMUs[55] (TSA Appendix).
- Utilize approved empirical and mixedwood yield curves sets (TSA Appendix).
- Utilize the Woodstock/Stanley and Patchworks timber supply models (TSA Appendix).
- Model and maximize the coniferous and deciduous AACs.
- Develop a fully spatial harvest sequence for the first 15 years of harvest (Initiation – 2006).
- Allocate the conifer harvest sequence based on the AAC leading conifer species profile (white spruce, black spruce and pine).

[55] The approved AVI and SAVI update is the only inventory used in the spatial TSA for the FMA area.

- Maintain the current proportions of coniferous, mixedwood and deciduous broad cover-groups throughout the FMA area within a range of +/- five per cent of the current AVI status.

- Avoid increased fragmentation and excess roading (access) of the FMA area landscape using an aggregated harvest system that will create a range of opening sizes that should sustain larger tracts of contiguous forest habitat (See objective # 11).

- Design harvest plans that follow natural landscape disturbance patterns and stand boundaries.

- Concentrate the forest companies' harvest plans in areas fragmented by the existing two-pass harvest pattern.

- Model and retain old forest stands on the FMA area landscape within +/- 25 per cent of the mean of the natural range of variation (See Section 3.16).

- Deciduous stands (D) from the Athabasca-Clearwater river valleys will not be included in the TSA landbase.

- Assess the impact on the conifer AAC of netting out all productive conifer forest stands in the Athabasca-Clearwater river valleys. (See attached TSA Appendix – separate binder)

- "Doughnuts" (Non-J areas) will be amalgamated with their associated FMA unit for conifer AAC calculations; deciduous stands from these non-J areas will not be sequenced to Alberta-Pacific.

- For "doughnut" areas without AVI, Phase III inventory will be employed. (Aspatial inventory not included in the SHS)

- Continue the development and enhancement of future AACs through the use of Patchworks for selected FMUs.

- For the MOSA area in FMU A15, follow the MOU guidelines as presented in Appendix 9.

Table 3.8: Timber Supply Analysis - Major changes between 2000 DFMP and 2007 FMP

Area of Interest	2000 DFMP All FMUs	2007 - Discrete Landbases L2, L3, L8, S7, S11, S18, S22, A14, A15 Empirical Yield System	2007 Mixedwood Landbase L1 and L11
Netdown	Phase 3 & AVI	AVI	AVI
Growth & Yield	Phase 3	AVI	Successional Mixedwood & AVI
Modeling	Aspatial	Spatial	Spatial
Models for AAC	Alberta SRD set AAC #s	Woodstock / Stanley / Patchworks	Patchworks
AAC Fibre Flow	Discrete Landbases	Maximize AAC within FMU	Maximize Total Fibre
Conifer AAC Profile	No profile	AAC spatial allocation dependent on white spruce, black spruce and pine profile	Same as Discrete
Harvest System	Two-Pass	Aggregate Harvest Systems, One-Pass, Two-Pass	Same as Discrete
Retained Merchantable Structure	5% Deciduous 1% Conifer	5% Deciduous, 5% Conifer (Al-Pac) 0-5% Deciduous, 0-5% Conifer (Quota and MTU)	Same as Discrete
Landscape Metrics	Undefined	Disturbance Unit Size Distribution Patch / Old Interior Forest Metrics	Same as Discrete
Old Forest Retention	8% of merchantable forest	Retain old forest within +/- 25% of the mean of NRV for each strata [56]	Same as Discrete
Other Seral Stage Targets	Not modeled	Defined by the TSA	Defined by the TSA
Roading Targets *	NA	Total forestry Km within FMA area provided on the AD-Map	Same as Discrete
Transitions	Set by SRD	Back-to-itself	Back-to-itself; except DU
White Spruce Understorey Modeling	Succeeded to conifer landbase	Deciduous stands with coniferous understorey, after understorey-protection harvest are mostly converted to mixedwood stands	Four understorey yield curves for DU stands
FMA clause 3aii	Conifer Landbase	See above	See above
Regeneration Standard	2000 SRD Regeneration Standards	Current SRD Regeneration Standards and ARS (In progress)	SRD Regeneration Standards and ARS (in progress)
FMUs	20	9	2
MOSA - FMU A15	na	Liquidation of the majority of the merchantable growing stock within 4 periods in MOSA.	na

[56] Source: Based on Forest Stewardship Certification (FSC) – Boreal Standard 2004.

LANDBASE NETDOWN

A critical element in the estimation of timber supply is the determination of the net productive landbase. The netdown delineates unproductive, inoperable and unavailable lands as follows:

- parks and ecological reserves, aboriginal reserves, private land and PSPs
- oil and gas footprint (up to QII 2006)
- land without forest cover, rivers and lakes
- non-commercial species, forested sites with an unproductive (U) timber productivity rating and subjective deletions of unmerchantable forest stands
- land with greater than 45% slope
- operating ground rule deletions (buffers)
- operating planning losses (isolated stands, protective notations, etc.)
- deciduous landbase below the breaks of the Athabasca and Clearwater Rivers

The intent of the forest stand subjective deletions is to exclude from the timber supply any forest type that is not economically viable to utilize. The deletions are selected by looking at current utilization practices and identifying forested types that cannot be harvested. Figure 3.5 illustrates the FMA management units and Table 3.9 is a summary of the gross FMA area netdown.

The TSA appendix also includes a brief sensitivity analysis of the slope situation in eleven selected townships and selected rivers and streams throughout the FMA area. The townships and water bodies were selected by Alberta SRD. The analysis is based on Phase III data and a field examination of rivers and streams in 1993. Additionally, an aspatial Woodstock analysis is provided that examines the impact on the conifer AAC by removing the conifer landbase from the Athabasca-Clearwater river valleys; subjectively removed from the landbase. Five FMUs are affected by this removal; A14, L3, L8, L2 and S7.

Figure 3.5: 2007 FMA Area Forest Management Units (FMU)

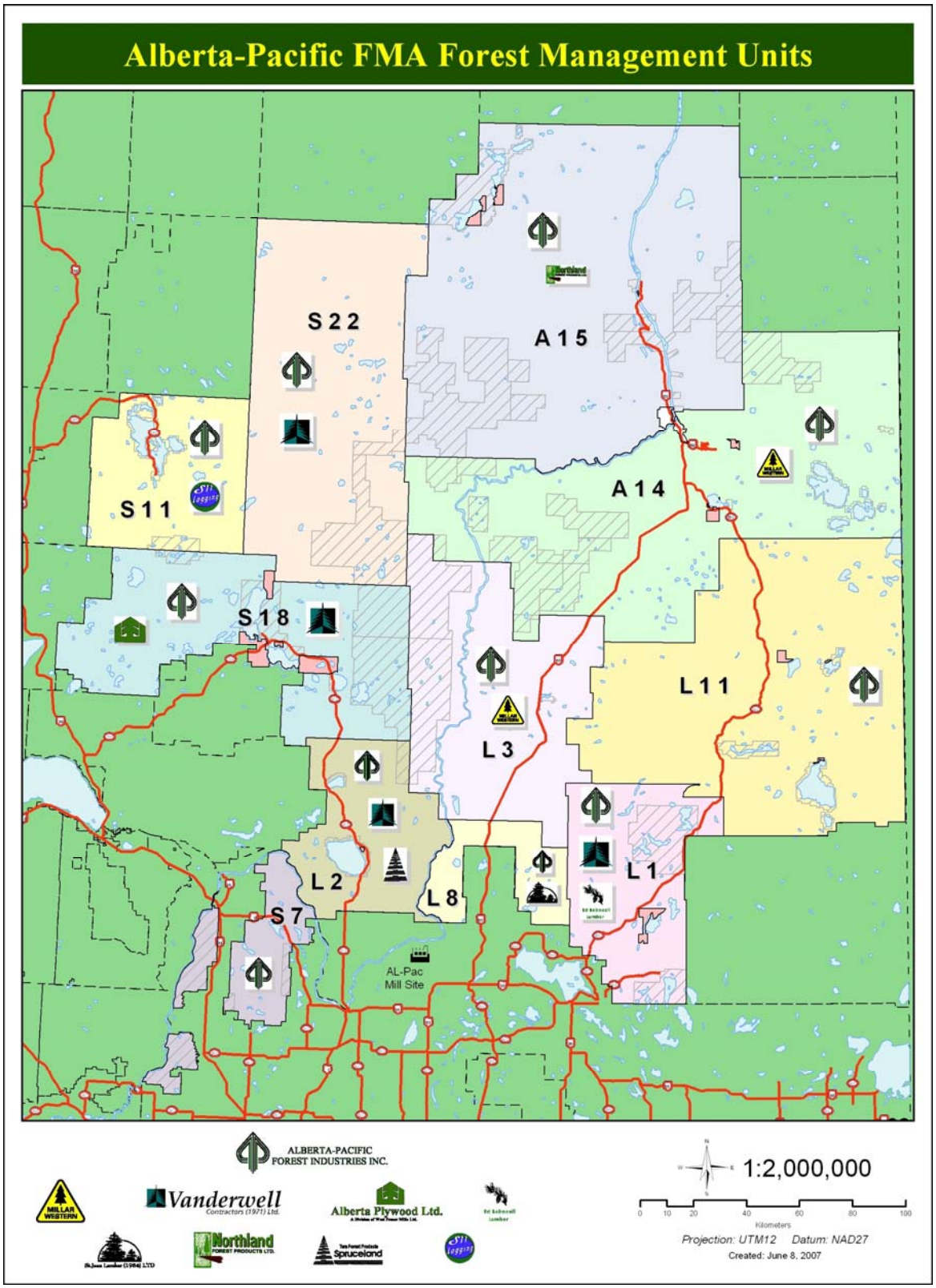


Table 3.9: Gross FMA Area Netdown Summary (as of May 2006 AV1) [57]

Netdown Category	Hectares*
Prohibits / Precludes Timber Harvesting (2.3%)	
Provincial Park	85,700
Aboriginal Reserve	26,600
Ecological Reserve	1,222
Protected Notations	29,700
PSP Buffers	792
River Breaks	38,000
Private Land	6,140
Recently Disturbed Areas (8.5%)	
Fire	476,500
Oil and Gas	109,000
Inoperable / Isolated Forest Stands (49.7 %)	
Slope	24
Isolated Stands	3,500
Non-Forested (CC / Natural Disturbance / Vegetated)	660,000
Anthropogenic Vegetated	17,100
Anthropogenic Non-Vegetated	40,750
Naturally Non-Vegetated	975
Non-Commercial TPR	678,700
Non-Commercial Species	701,250
Non-Commercial Stand Density	76,500
Non-Commercial Site Index	1,261,500
Horizontal Stand Adjustment	2,050
Aquatic & Water Course Buffers (6.4%)	
Buffer	151,150
Rivers & Lakes	263,200
Flooded Areas	25,000
MOSA Productive Forest Area	162,800
Timber Harvesting Landbase (33%)	
Deciduous	1,067,000
Deciduous Leading Mixedwood	114,400
Conifer Leading Mixedwood	114,875
Conifer	753,500
Sub-Total – Timber Harvesting Landbase	**2,049,500**
GRAND TOTAL	**6.87 Million**

* numbers have been rounded

The netdown area tabulations include the legal FMA area (J-Units) plus all " Non-J donuts" within the FMA area perimeter. A complete netdown by FMU (map and table) is presented in the TSA documentation. The Non-J areas without AVI are excluded from all spatial analysis.

[57] Netdown is composed of approved AVI datasets, FMU updates using "Softcopy" (S18, S7, L2, L8, L1, L11 & L3) and recent spatial updates of energy sector and forest companies' activities.

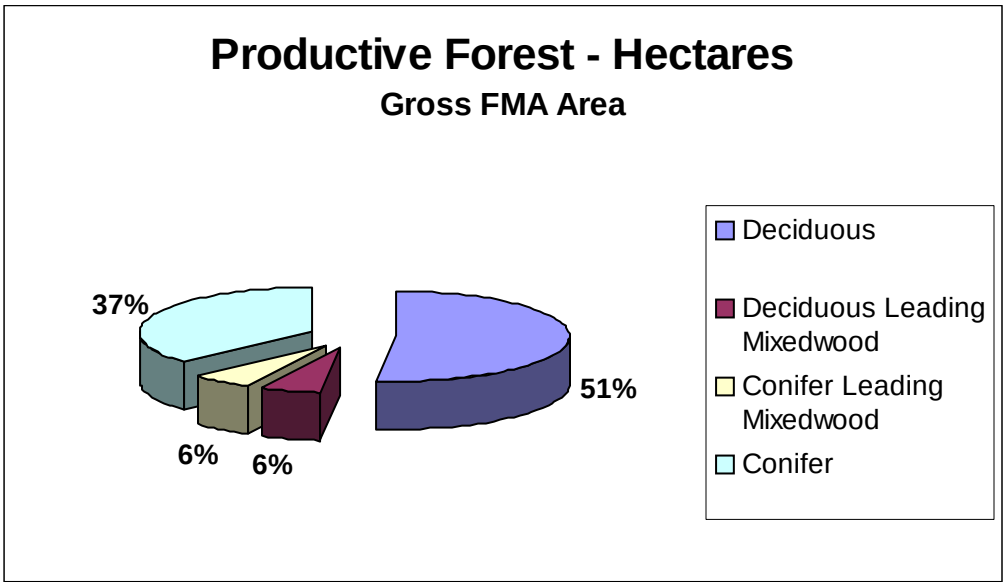
PRODUCTIVE FOREST – MAJOR COVER GROUP COMPOSITION

The gross FMA area has is composed of approximately 30 per cent productive forest landbase. Within this productive classification, four main cover groups constitute the broad classification of the merchantable forest (Figure 3.6). It is this broad cover-group classification and associated hectares, that is used to define the AAC calculation. The FMP has a landscape strategy to maintain the current proportions of coniferous, mixedwood and deciduous broad cover-groups throughout the FMA area within a range of +/- 5 per cent of the current AVI status. Thus, the TSA is designed to retain the following broad landscape metrics throughout the planning horizon (Table 3.10). (All MOSA is excluded from future productive forest hectare metrics)

Table 3.10: Current and Target Proportions of Cover-groups Throughout the FMA Area.

Cover-Group	Current % of FMA Productive Forest	Target Range (%) of Productive Forest
Deciduous	52%	44% to 60%
Deciduous Leading Mixedwood	6%	5% to 7%
Conifer Leading Mixedwood	6%	5% to 7%
Conifer (Sw, Sb, Pj)	37%	31.5% to 42.5%

Figure 3.6: FMA Area Productive Forest - Major Cover Groups (Hectares)



YIELD CURVES

Yield curves are used with the timber supply model to grow the forest types and project changes in stand volume as the stands age. Empirical yield curves have been used for this purpose. Increasingly, empirical curves are being replaced by growth models that offer far more analytical power and more realistic predictions of stand development over time (succession).

For nine of the FMUs the forest companies utilized an approved set of empirical curves, derived from the TSP and PSP data sets. For FMUs L1 and L11 Alberta-Pacific and Vanderwell developed a set of mixedwood curves through a growth model to be used in Patchworks. The yield curve sets and the details of their development are documented in the TSA Appendix. The forest companies remain committed to the continued development and improvement of forest stand growth models.

FOREST MODELS

Two landscape forest models were used to assess the development and changes of the forest through time; Woodstock/Stanley and Patchworks. These models track the development of the forest in response to harvesting and silvicultural activities under specified management regimes. Both models can optimize the AAC projection, and spatially allocate blocks to create a hypothetical harvest sequence. Patchworks is also a simulation model that allows the users to weigh management goals against each other to find strategies that meet the satisfaction of the stakeholders.

Key inputs to the model are net landbase data, forest inventory, yield curves and management strategies. With these inputs, the forest model grows the forest classes on the FMA area, harvests to a specified cut level and then regenerates the stands. The model follows harvest rules that control the sequence in which forest classes or stands are eligible for harvest and in so doing can strongly affect the yield estimates. Stanley and Patchworks also allow spatial constraints that address block size and distribution.

Outputs from the models include harvest levels, residual growing stock, age class distributions, and areas of forest class to be harvested. This last output is important because it helps create an operational sequence used to guide the development of the actual harvest schedule.

GENERAL TIMBER SUPPLY ANALYSIS PARAMETRES / CRITERIA / STRATEGIES

- Empirical & Mixedwood Systems
- Spatial harvest planning period 2006…2021 (3 quadrants or 3 periods)
- 20 year (four periods) harvest plan for the MOSA
- Planning horizon 200 years (40 periods)
- Include all productive conifer land-base (DC, CD, C) from the “Non-J” areas (“Doughnought holes”) in the TSA netdown – where conifer stands meet eligibility parametres (age/volume relationship as per yield curves), utilize these areas in the SHS
- Maximize volume harvest – all species/strata

- 2 year regeneration lag for conifer; No green-up delay
- Fibre Yield (Cull) Reductions: Deciduous – four per cent, Conifer – two per cent
- Stand Structure Retention – five per cent and zero per cent (See Objective #12) (FMU dependent)
- Minimum Harvest Age – varies by species (See TSA document)
- After harvest most forest cover types are grown according to their pre-harvest inventory label, except for stands that undergo understorey protection; portions of these stands shift to mixedwood strata (See below)
- All stands not harvested, break-up at the terminus of the associated yield curve and regenerate to their original strata in period one.
- Older Age-Class Forest Retention – see section 3.16
- Within the TSA model the minimum harvest limit that stands can be selected for harvest is >50 m3/ha for deciduous, and >50 m3/ha for conifer
- Minimum block size – 2 hectares; Maximum block size – 500 hectares
- "A" density deciduous stands are excluded from sequencing in the first rotation and break-up to "B" density deciduous stands – an assumption that will be validated in future TSAs.
- No fire allowances are taken off; recently burned areas are excluded from the net landbase and deemed "potentially productive" (not available for harvest) for the full planning period; a catastrophic fire may require immediate recalculation of a FMUs' TSA
- Jack pine "poor" sites have been subjectively deleted; ~ 23,000 ha.
- Black spruce is only utilized from the "good" yield strata.
    - A quota per cent of black spruce from all site classes (F/M/G) is utilized in A14 and L3; Millar Western allocation within the TSA

UNDERSTOREY PROTECTION

The forest companies conduct harvest operations designed to protect coniferous understories on deciduous stands with >600 stems/hectare of immature coniferous (See Forest Renewal Section). In the empirical TSA, the release and protection of this understorey is modeled to transition to CD/DC/D strata in the proportions of 40/40/20 after the harvesting operations. In the mixedwood system, two understorey yield curves have been developed to deal with variation in understorey stand dynamics (See Mixedwood Yield Curve document). Within the TSA, all FMUs have a sufficient area of deciduous AVI stands with identified understoreys >600 stems/hectare, that can be managed through understorey protection, to replace the stands referred to in the FMA 3(a)(ii) clause.[58]

[58] Alberta-Pacific Forest Management Agreement - O.C. 193/98 – Appendix "C" 3 (a)(ii).

TIMBER SUPPLY HARVEST SEQUENCE / IMPLEMENTATION

This forest management plan incorporates a major change to Alberta's harvest planning requirements. Harvest planning involves identifying and sequencing specific stands to be harvested over a given period of time in such a manner as to meet the plan's management objectives and satisfy the OGRs. Development of this SHS is currently being prepared and carried out to assist in the preparation of the Annual Operating Plans (AOPs) in which specific spatial plans are developed from aerial photos and field reconnaissance for one to three years of harvesting. The GDP further identifies broad areas where harvesting will take place in the next five years.

Forest management plans have normally only dealt with broad spatial information and have not been able to address specific stand level planning due to the limitations of strategic level forest models and inadequate site level information to supply a model to do long-term, Forest Management Unit (FMU) and Forest Management Agreement (FMA) area wide spatial harvest sequences.

Alberta SRD now requires forest companies to include a long term (10-20 yr) SHS in their forest management plans. As well, the new Alberta Vegetation Inventory (AVI) and the associated coniferous understorey inventory provide much improved forest cover data to drive the models.[59] There remain, however, many shortfalls with the timber supply models and the AVI data, that will prevent such a process from generating a precise (~20 per cent variance) long term SHS for most forest areas for many years to come. Supplementary photo and field work prior to submission could provide high levels of precision, however the dynamic nature of the landbase and the extensive amount of work would create impractical timelines and prohibitive costs for even a 10-year SHS for all the timber companies on the FMA area.

So why implement a SHS driven by the forest model? Regardless of the weaknesses and the recognition that these initial efforts will not be perfect, it is important to move ahead in this direction for the following two reasons:

1. The growing complexity of sustainable forest management makes it necessary for operational harvest plans to become strongly linked to the strategic forest model in order to ensure a number of the key objectives and strategies in the forest management plan can be obtained. For example, old forest and core areas can be forecast through time in conjunction with the stands expected to be harvested in order to determine if the planned objectives for the future forest can be met.
2. It is desirable to have a close linkage between the strategic forest model (timber supply model) and the harvest plans to help ensure timber supplies and major forest cover types (D, Sw, Pj & Sb) are sustainable at projected harvest levels. Previous systems have not closely addressed management of the forest cover types, nor has harvest planning attempted to follow the sequence used by the forest model in calculating the harvest.

[59] The coniferous understorey inventory was prepared concurrent to the approved AVI using leaf-off 1-15,000 color-infrared photography (CIR).

Implementation of the Spatial Harvest Sequences

The following points summarize the approach taken by the forest companies for the purposes of this forest management plan. Further detail is provided in the balance of this section.

1. 15-year mapped SHS for all the forest companies are developed for each FMU through timber supply modeling and modified with operational considerations.
2. A "Cover Type Summary Table" (CTST) is developed from the TSA that identifies the sequenced areas (ha) of the major cover types (D, Sw, Pj & Sb) for each FMU.
3. The forest companies' GDP and Final Harvest Plans (FHPs) are developed from the 15-year defined group of stands in the SHS (2006 – 2021 or 3 five-year quadrants).
4. Variances to the SHS and cover type that exceed the criteria indicated in the variance section will initiate a review to determine the significance of the variances. The intent is to correct weaknesses and challenges so the next SHS will be more accurate. Replacement of stands within the SHS must maintain the balance major cover types (D, Sw, Pj, & Sb) to maintain the forecasted target areas outlined in the CTST.
5. At the end of each five year quadrant, the SHS will be extended by another five years, utilizing the stands that remain from the previous SHS (the up-to-date netdown will account for fire, land-use losses & harvesting) plus additional stands from the forest timber supply model to complete another 15 year sequence. Stands identified in the SHS will be harvested within 15 years, subject to the operational sequence variances. Corrective actions identified from the SHS variance (point four), better data, improved ecological knowledge and possibly advanced models will be incorporated into a new sequencing run to continually improve the SHS.

This harvest planning process is new and, as discussed in the introductory paragraphs, the development of a SHS that is linked to the forest model is a very important step forward. The process described in the above points attempts to address many of the shortfalls of the previous system. The forest companies will continually improve our knowledge of the forest resource and our modeling of the harvest sequence as we implement the operational plans. In addition to this learning curve, there are forest fires, energy sector activities, changing government objectives, and steadily improving science, that result in a highly dynamic environment that is changing too fast to allow the forest companies to go very long without reviewing the sequences. For these reasons a 15-year SHS that is updated every five years was chosen.

Fifteen year (2006 – 2021) SHS that address the needs of the forest companies in each unit are included for ten FMUs in the FMA. The SHS addresses the needs of the forest operators in each unit. The 15-year SHSs are developed as part of the spatial TSA that perpetuates the current forest cover. All of the blocks already scheduled and identified in the AOP were incorporated into the TSA. The timber supply model is then run to generate draft 15-year SHSs. The draft sequences were reviewed by planners who modify the sequences to make them operationally, economically and environmentally feasible. The modified sequences were then re-run through the timber supply model to confirm the harvest levels.

Forest companies' block allocations are primarily based on pre-selected planning unit boundaries in traditional geographic spheres of interest. FMU summary AAC allocation tables and planning unit delineations are provided in the TSA document.

There are often numerous iterations between the planners and the timber supply runs for an FMU. When a reasonable SHS is developed, an overview from the air is generally undertaken to ensure there are no obvious concerns.

The start date for the Forest Management Plan's (FMP's) harvest sequence is May 31, 2006. Thus the first five-year period runs from 2006 until 2021. The first five-year SHS update will be prepared for September 1, 2011, extending the SHS to 2026. Commitments to meeting FMP targets, tracking and reporting of variances to the SHS and the CTST will begin upon FMP approval. FMP targets are not retroactive before the timber year in which approval is granted and thus will not take effect until approval. Therefore, the 2006 to 2011 quadrant will be the first quadrant to be reported on fully utilizing this process. These quadrants will be the same as those determined by the FMA and adhered to in the GDP.

Spatial Harvest Sequence Variances

FHPs will vary from the SHS at both the stand and sub-stand level (i.e. parts of AVI forest polygons). These areas will be identified as either permanent deletions from the net landbase or as deferrals that will be harvested at a later time. SHS variances will be tracked annually for each five year quadrant, based on the 15-year SHS. Variance is operator dependent.

Five Year Quadrant SHS Variance

There are two types of variances that will be tracked on an area basis for the five year SHS variance by FMU.

1. Operational Sequence Variance - Based on the stands included in the 15-year SHS, sequence variance area will be tracked by category. The 5 year quadrant threshold for the variance is 20 per cent of one third of the 15-year SHS area by major cover type. The following are the main factors contributing to this variance:

- Replacement of SHS stands by non-SHS stands – whole stands may be replaced due to access concerns, watercourse considerations, amalgamation of stands for efficient harvest, inaccurate AVI forest cover attributes, natural disturbance, land-use, aesthetics, isolated stands etc. (i.e. if 100 ha of SHS stands are replaced with 100 ha of non-SHS stands, then a variance of 100 ha will be recorded).

- Operational adjustments to SHS stands – portions of stands may be deleted or deferred due to historical sites (archaeological), sensitive sites (rare plants), slopes, unmapped creeks, wildlife habitats, aesthetics, etc. However, areas less than two hectares are defined as slivers and will not be reported as a SHS variance.

2. Cover Type Variance (Major Strata Variance) – based on the CTST for the 15-year SHS, cover type variance (ha) will be tracked by each major cover type (D, Sw, Pj & Sb) for each FMU. Variance to the major cover types that exceeds 20 per cent of the five year quadrant area (approximately one third of the 15 year CTST area) will be justified in the AOP/GDP.

REPORTING

FINAL HARVEST PLAN (FHP)

The sequence variance identified in the planning process will be reported in the FHP by several categories, based on the rationale for the variation, for all stands or portions of stands greater than two hectares in the FHP.

The area of the major cover types planned in the FHP will be reported in a summary table.

The variance relative to the quadrant will not be calculated in the FHP. These variances are calculated in the AOP/GDP annually based on actual harvest areas.

ANNUAL OPERATING PLAN (AOP) / GENERAL DEVELOPMENT PLAN (GDP)

Annual reporting in the AOP / GDP will show the actual harvest areas for the completed years of the five year quadrant and the planned areas for the remaining years of the five year quadrant for both the operational sequence and cover type variances.

For all forest companies, the quadrant level volume production of coniferous and/or deciduous fibre, based on each companies' approved AAC, remains the principal indicator of compliance (cut-control) for harvesting in a FMU. In essence, cut control is the crucial reporting function for the primary coniferous and primary deciduous AAC targets that are provided in Table 3.16. The SHS provides an estimate of the hectares, by major cover group, required to meet volume compliance.

The threshold, by FMU, for the operational sequence five-year quadrant variance is 20 per cent of one third of the15-year SHS area by major cover type. Any variance to the major cover types that exceeds the five-year quadrant area must be justified in the AOP/GDP.

Tables 3.10 and 3.11 illustrate a FMU five year summary report for the SHS where harvest area (ha) by operational sequence variation and cover group are tracked and forecast. Table 3.13 illustrates a yearly volume (m^3) report that will indicate the progression towards the quadrant volume compliance.

Table 3.10: Example of AOP / GDP Table: Operational Sequence Variance Reporting for Actual Harvest

FMU #	Year 1 of Quadrant (ha)	Year 2 of Quadrant (ha)	Year 3 of Quadrant (ha)	Year 4 of Quadrant (ha)	Year 5 of Quadrant (ha)	Sum of Variance (ha)	Per cent Variance (Z ha / 1/3 of the 15-Year SHS ha
Operational Sequence Variation of harvested stands	X ha	X ha	X ha	Y ha	Y ha	Z ha	Per cent (threshold is 20% of 1/3 of 15-Year SHS ha

X = Actual Harvest Value; Y = Forecast Value; Z = Quadrant Total

Table 3.11: Example of AOP / GDP Table: Cover Type Harvest Reporting

FMU # Major Cover Type	Year 1 of Quadrant (ha)	Year 2 of Quadrant (ha)	Year 3 of Quadrant (ha)	Year 4 of Quadrant (ha)	Year 5 of Quadrant (ha)	Sum of Harvest and Forecast (ha)	Per cent Variance (Z ha / 1/3 of the CTST area)
D	X ha	X ha	X ha	Y ha	Y ha	Z ha	%
Sw	X ha	X ha	X ha	Y ha	Y ha	Z ha	%
Pj	X ha	X ha	X ha	Y ha	Y ha	Z ha	%
Sb	X ha	X ha	X ha	Y ha	Y ha	Z ha	%

X = Actual Harvest Value; Y = Forecast Value; Z = Quadrant Total

Table 3.12: Example of AOP / GDP Table: Cut Control Reporting (as applicable by forest companies' rights)

FMU #	Year 1 of Quadrant (ha)	Year 2 of Quadrant (ha)	Year 3 of Quadrant (ha)	Year 4 of Quadrant (ha)	Year 5 of Quadrant (ha)	Sum of Harvest and Forecast (m3)	Per cent Variance (Z m3 / Approved AAC m3)
Deciduous	X m3	X m3	X m3	Y m3	Y m3	Z M3	%
Coniferous	X m3	X m3	X m3	Y m3	Y m3	Z M3	%
Incidental Coniferous	X m3	X m3	X m3	Y m3	Y m3	Z M3	%

X = Actual Harvest Value; Y = Forecast Value; Z = Quadrant Total

Stewardship Report

The forest companies' five-year stewardship report will summarize SHS and variance information for the five year SHS quadrant.

- Total hectares harvested versus planned by major cover type; by forest company.
- Summary of operational and cover type variances to the SHS; by forest company.
- The rationale for variances to the SHS and any proposed changes to improve the next 15-year SHS.
- Total primary volumes delivered to all forest companies.

At the conclusion of each 15 year SHS, each forest companies' GDP will include a rationale/assessment for any stands not previously harvested or deleted in their 15-year operability timeframe.

3.16 OLD (OVER-MATURE) FOREST RETENTION IN THE BOREAL FOREST

OLDER FOREST STANDS AND BIODIVERSITY

Within the boreal forest, "old" or over-mature forest stands[60] have unique structural attributes and ecological processes. The key structures of old stands develop over time due to the mortality of individual trees, not age per se. The deaths of individual trees lead to gaps in the forest canopy. Direct sunlight in these gaps then contributes to the growth of herbaceous plants and "release" of immature trees that had been growing slowly in the understorey. Additionally, the older stands in boreal forests gradually accumulate an abundance of snags and downed woody debris. The result is a high level of structural diversity (Schneider 2002).

Old-forest stands are defined as the over-mature seral stage of the boreal forest. Different stand types develop old-forest characteristics at different ages. Additionally, the aging process is usually a slow and gradual process, but for this modeling analysis, exact old-forest commencement ages were utilized for the various stand types. Table 3.14 defines the age classification for "old-forest stands" used in this analysis:

Table 3.14: Old-Forest Stand Classification

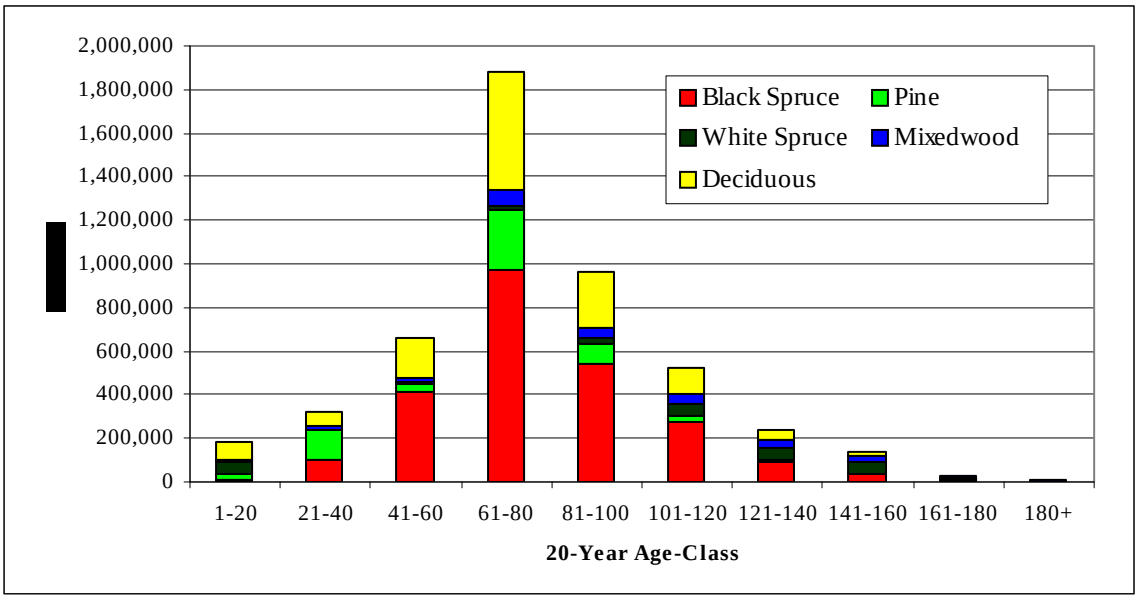
Main Species Cover Type	Age - Years
Deciduous (aspen and balsam poplar)	100
White spruce	120
Mixedwood	100
Black spruce	120
Jack pine	100

(Note: Old forest stand is synonymous with the term over-mature forest stand for this analysis)

Figure 3.7 summarizes the FMA area forest landbase by age-classes from the 2006 Softcopy Alberta Vegetation Inventory. The age-class distribution demonstrates that about 18 per cent of the forest area is currently classed as old forest.

[60] Stand: A grouping of trees with similar characteristics (such as species, age or condition) that can be distinguished from adjacent groups. A stand is usually treated as a single unit in a management plan.

Figure 3.7: Forest Age-Class Distribution of the Gross FMA Area Landscape (SAVI 2006)



OLDER FOREST STANDS OCCURRENCE

In general terms, the complex structure of old stands provides a large variety of habitat types for use by species with specialized habitat requirements. Within the FMA area, the distribution and total area of old-forest stands have varied and will continue to vary through time. Old-forest stands are dependent on the occurrence and development of different forest cover types, the selection of stands for harvest, human-caused disturbances and, primarily, unpredictable natural disturbances such as fire, insects, disease and wind.

The consequence is that boreal forest structure, forest stand ages, and forest stand size are not stationary but vary widely through time and space. Thus, a lack of change or a stationary balance of age-classes within the forest would not be consistent with ecological forest management based on the natural disturbance model. The variation inherent in natural patterns forms the basis for future older forest retention strategies.

In the FMA area, old-forest stands are found frequently in small isolated patches remaining after a natural disturbance and also in large patches that have escaped disturbance. Fire is by far the most common type of natural disturbance. The resulting old-forest stand pattern is highly variable across the FMA area landscape. Individual old-forest stands are not permanent features of the boreal forest.

Although there is always some amount of old forest at the landscape or regional scale, the location and total area will change due to natural and manmade disturbances such as fire and harvesting. Management for retention of old-forest stands within the FMA area must similarly incorporate shifting locations and target amounts that fall within a natural range of variation on large landscape units. Spatially, amounts of old forest can vary from one landscape to the next.

Sustainability of various amounts of old forest and of the associated forest characteristics at the FMA area level is a function of the balance between the frequency and severity of ecosystem disturbance and the rate of ecosystem recovery (Kimmins 2002).

Since the 1950s, forest management in Alberta has been based on sustained-yield management, generally harvesting older stands first and maintaining the rate of harvest at or below the rate of growth. There is currently no government requirement for the maintenance of old-forest stands. Additionally, current forestry practices and timber supply models tend to sequence the harvest of older stands first. The result can be a gradual elimination of most old-forest stands in the productive forest landscape. The FMA area forest companies recognize that old-forest stands are at risk without special management strategies and have therefore developed an old-forest retention strategy.

NATURAL RANGE OF VARIATION

The NRV approach is a method of understanding and integrating natural disturbance patterns into long-term planning. The NRV is defined by the maximum and minimum limits of a characteristic within a natural forest over a long period of time. In applying the NRV to old forest, the intent is to calculate the range of old-forest stand areas that existed prior to modern developments on the FMA area, and then design a management strategy to maintain the presence of old-forest stands on the FMA area within that range.

NRV predictions cannot and should not be made on small landscapes such as Forest Management Units, where natural disturbances can radically alter age-class diversity (Andison 2003). Within the FMA area, the location and size of forest fires are highly unpredictable and include very large fires (e.g., the 250,000-hectare House River Fire in 2002) that can almost entirely deplete old-forest stands. However, the chance of depleting all old-forest stands is lessened when large landscapes are utilized. The total FMA area, excluding areas covered in water and areas lacking treed vegetation, will therefore be utilized for the modeling of old-forest stands.

The NRV model is based on the following eight major assumptions.

1. Average fire cycle (the most critical factor) is 80 years in the FMA area boreal forest
    - Modeling work from neighbouring landscapes in Saskatchewan has illustrated that the pre-industrial fire cycle is likely 0-60 years. However, fire cycle is one of the most debatable fire history parametres. The NRV model was run using both a 60 years and a 80 year fire cycle to provide a range of outcomes. The more conservative result from the 80 year run is used for this plan.
2. Fire size is random
    - Fire size is based on a combination of local historical data and fire size data from similar boreal forest areas. In the model, the probability of a large fire was far lower than a small one. The exact shape or size of fires is not very relevant to the non-spatial output.

3. Conifer burn probability is higher than deciduous

    - The model spreads fires based on probabilities of burning based on stand fuel-type, which is determined by the age and species composition of the stand The fuel-type categories adopted for the model are those used by the Canadian Fire Behavior Prediction System (CFBPS), and the probabilities of burning are the rate-of-spread (ROS) estimates using the high fire threat. Within that system, all else being equal, pine and spruce ROS levels are always higher than deciduous ROS levels.

4. Mixedwood is half as likely to burn as pine and spruce

    - This seems to be a reasonable assumption. Within the (CFBPS) system, all else being equal, mixedwood ROS levels are always higher than deciduous ROS levels.

5. The landscape is defined in five major strata – Deciduous, Mixedwood, White Spruce, Black Spruce, and Jack Pine.

    - These strata are the same categories used within the timber supply analysis. This allows the model's strategic output, as well as its assumptions to be understood in the proper context.

6. The entire forested area of the FMA area was utilized – corresponding to 5.2 million hectares [61] within the gross FMA area (an area that can have an old forest component)

7. Topography is not a modeling factor

    - The model is intended to be strategic and non-spatial. Therefore, any variation in the direction and shapes of fires on this landscape due to topographic features is irrelevant. Additionally, the topographic variation in northeastern Alberta is minimal.

8. All forest stands in the Alberta Vegetation Inventory database returned to their original label after the stands have died

    - Boreal forests are dynamic in both time and space. However, to parallel the timber supply analysis, the natural variation model simply assumed that what was there before the fire will be there after the fire.

Based on these assumptions, the natural variation is predicted for each of the five major strata (white spruce, pine, black spruce, deciduous and mixedwoods).

[61] Upwards of 1.5 million hectares of land is (naturally) a mixture of water, bog, fen, brush and grassland.

OBJECTIVE (# 24): [62]

Within the gross FMA area, retain old-forest stand (over-mature forest stand) areas for each of the five main forest cover types within +/-25 per cent of the mean of the natural range of variation.

STRATEGIES:

- Utilize the entire forested area (productive and non-productive) of the FMA area to predict the old forest stands.
- Use a timber supply model (Woodstock) to predict old-forest occurrence and distribution for all five major strata and track where they fall within the NRV ranges in the first 200 years.
- Utilizing a random landscape NRV model (Andison 2003), model each major stratum for the old-forest seral stage within the +/- 25 per cent range of the stratum's NRV mean:
    - Deciduous 18-32 per cent: Old forest age @ 100 years
    - Mixedwood 14-24 per cent: Old forest age @ 100 years
    - White spruce 12-20 per cent: Old forest age @ 120 years
    - Jack pine 13-22 per cent: Old forest age @ 100 years
    - Black spruce 8-14 per cent: Old forest age @ 120 years
- Ensure the old-forest area for each stratum remains within the NRV by having a 10 per cent "step-down" of the annual allowable cut at year 60 for all strata in 10 Forest Management Units. (Not utilized in A15)
- Predict the distribution and amount of old forest in each major stratum at 10, 50, 100 and 200 years.
- Over the life of the plan continue to explore and improve NRV and landscape models to assist in characterizing the amount, limits, size and core area of old-forest stands in the FMA area.
- Over the life of the plan investigate changes in fire regimes (e.g. fire return intervals) and fire suppression activities that could affect future old-forest dynamics.
- Over the life of the plan investigate anthropogenic landscape changes (e.g. energy sector activities, including land-use expansion and "best practices" reclamation) to help quantify old-forest projections.

[62] All seral stage predictions (amount and distribution) in the TSA are made in the absence of modeled forecasts for natural disturbance (i.e. fire) and energy sector activities. As such, the predictions should not be construed as the archetype future forest landscape.

NATURAL RANGE OF VARIATION (NRV) IN WOODSTOCK MODEL FORECASTS

About 18 per cent of the FMA area landscape can currently be described as old forest; a percentage in the low end of the NRV range. The low percentage is primarily the result of major fires in the first half of the 20th century that created huge expanses of juvenile forest throughout the FMA area. As this cohort ages through time from juvenile to mature, a larger expanse of the FMA area forest will, by default, become old or over-mature; in the absence of catastrophic fires. Thus, the Woodstock timber supply model forecasts that the levels of old forest will continue to increase over the next 50 years as a large mature cohort of the FMA area forest ages (See Figure 3.8). This results in old forest being retained across the landscape at or above the maximum historical NRV levels for the next 50-60 years. The forecast illustrates that for the immediate future (i.e., the next 50 years) the Forest Companies can meet the old-forest NRV objective without constraining the current AAC targets. However, the Woodstock projections do not account for wildfire and energy sector activities that will undoubtedly result in changes to the old-forest forecasts.

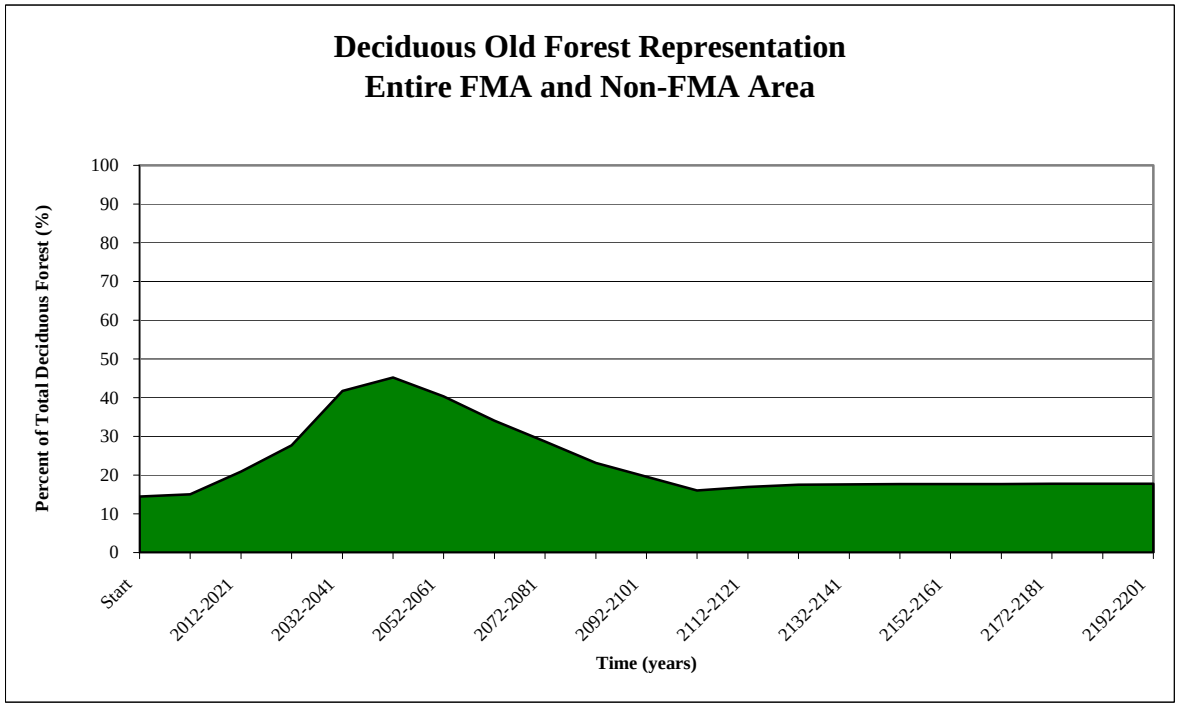
After approximately 50-60 years, the model indicates the old-forest area of deciduous, white spruce and mixedwood cover types would fall below the NRV. This would occur as more of the large mature cohort is harvested or simply dies within the model, based on the model's assumption that stands are harvested at their rotation ages; these rotation ages are younger than the old-forest strata definitions. Meanwhile, the Woodstock model forecasts that black spruce would continue to stay well within the +/-25 per cent range of the NRV for the full planning period; this is due to the continual aging of the large immature and mature black spruce cohorts in the absence of fire. According to the model, the area of old-forest pine stands fluctuates throughout the planning period but remains within the NRV.

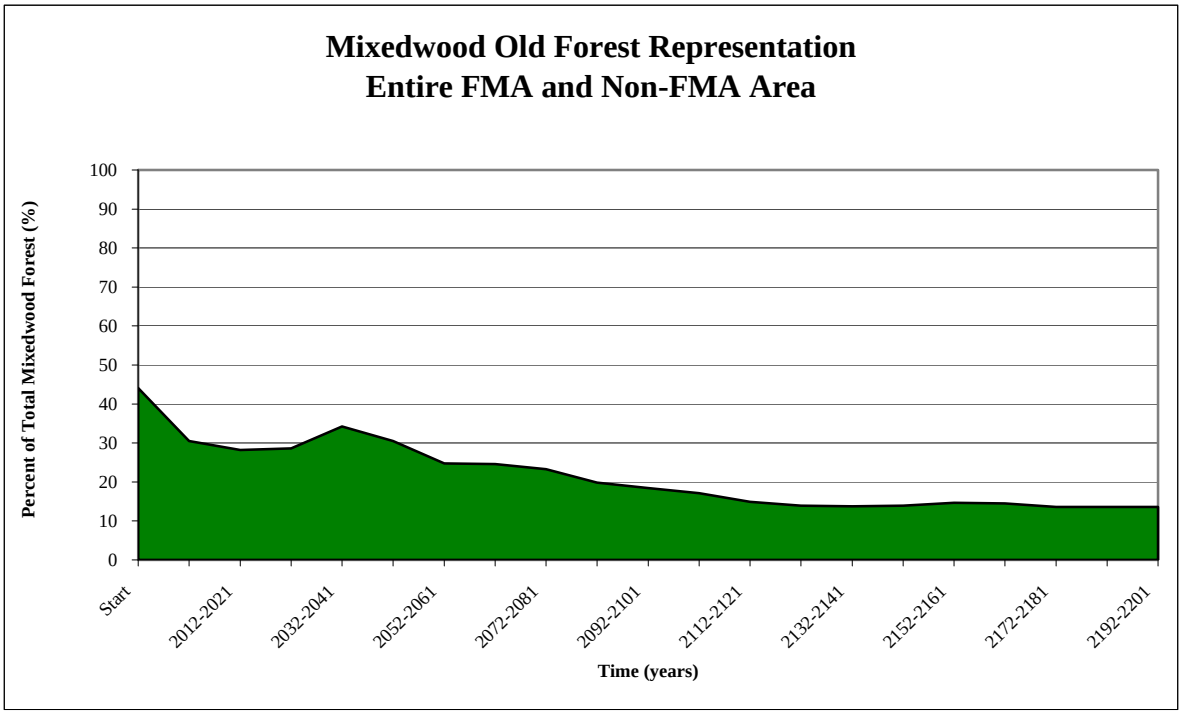
To ensure that the old-forest seral stage remains within +/-25 per cent of the NRV mean, the AAC was "stepped-down" so that a portion of the fibre supply is allowed to become old, prior to future harvest. This is a change from traditional AAC strategies for Alberta. The reduced AAC extends the rotation age of some stands and thus enables the old-forest levels to be maintained in the target range.

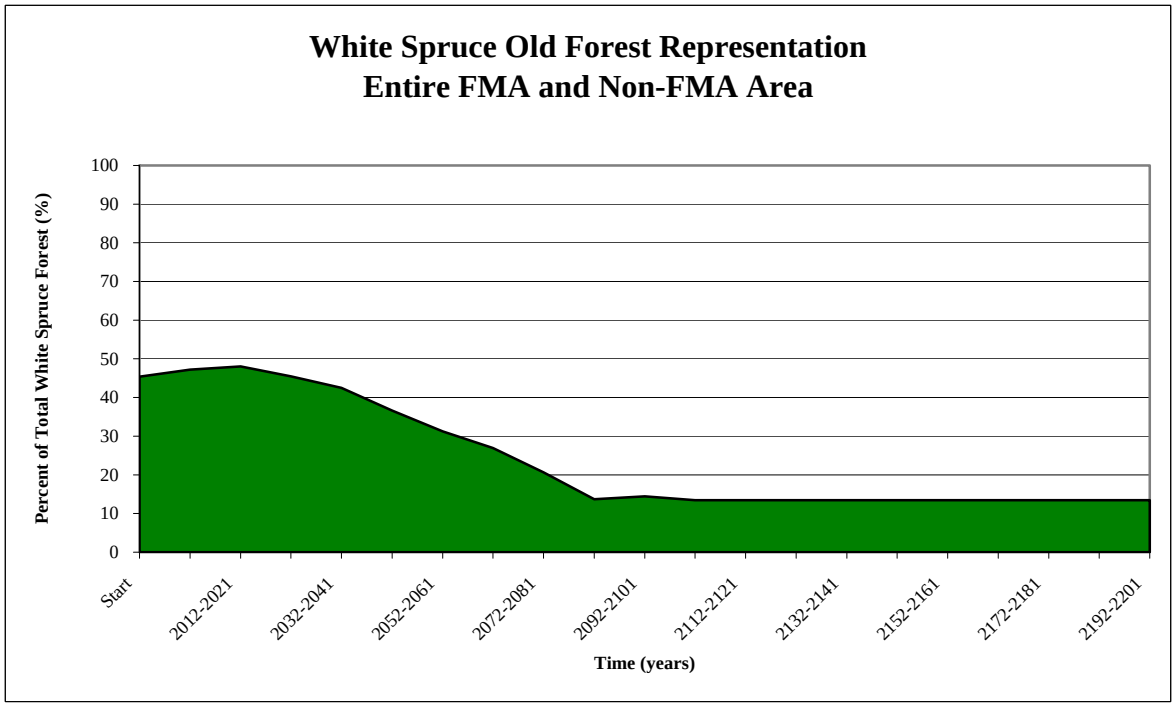
From modeling, model year 60 (2061) was determined as the point to initiate a 10 per cent AAC "step-down" for conifer and deciduous AACs in all 11 Forest Management Units. Year 60 in the timber supply model is the point at which the deciduous, white spruce and mixedwood strata all start to trend downwards. Intervening at this point with a constrained cut ensures that the areas of old forest will be maintained within the NRV. Constraining the cut at an earlier time period is not necessary because of the large area of maturing forest that currently exists. An earlier reduction in AAC would extend the time in which the old forest was above the historic NRV.

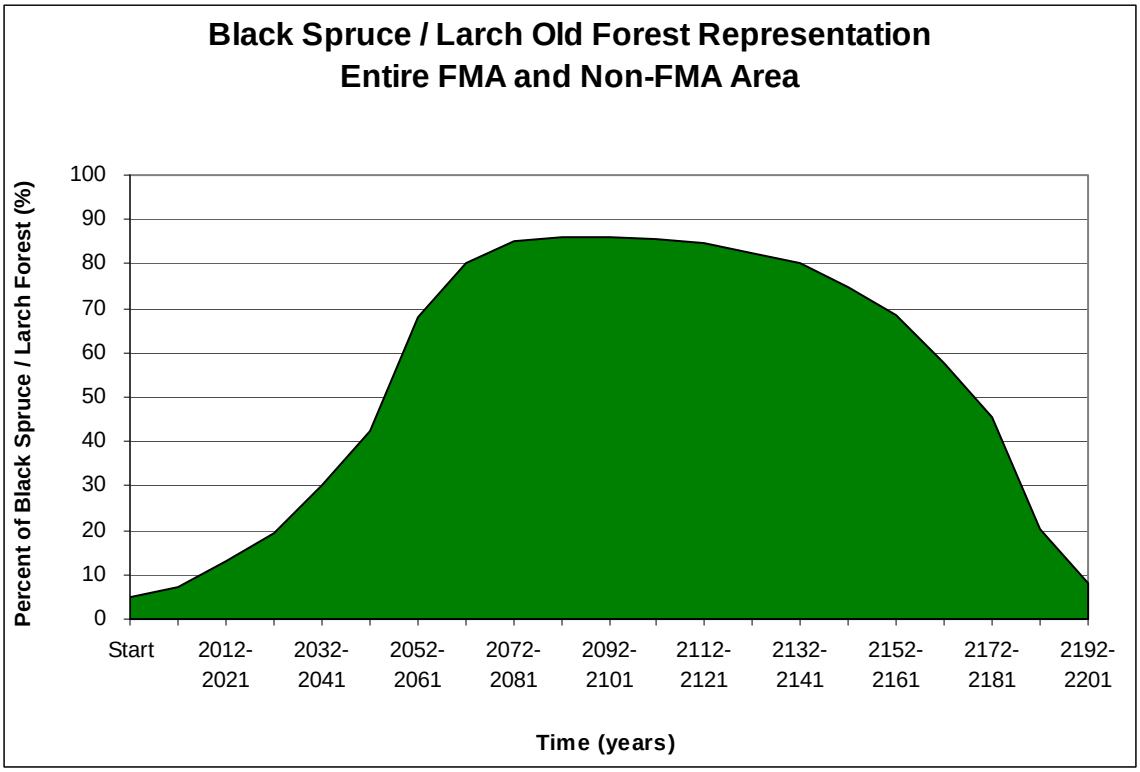
The old-forest analysis will be redone on a regular basis with the AAC recalculations (approximately every five years, or more frequently when there are catastrophic fires). Although the current old-forest projections do not account for fire or land-use losses, the regular recalculation of the AAC and old-forest projections will be adjusted to reflect these changes as they occur. This combination, a predictable element (forestry) plus a partially predictable one (energy sector activity) plus an unpredictable one (natural disturbance), creates a challenging task for future recalculations of the AAC and complicates projection of the preferred future forest scenario (Andison 2003). Figure 3.8 illustrates the FMA area timber supply analysis forecast for old-forest retention in all five major strata – deciduous, mixedwood, white spruce, black spruce and jack pine.

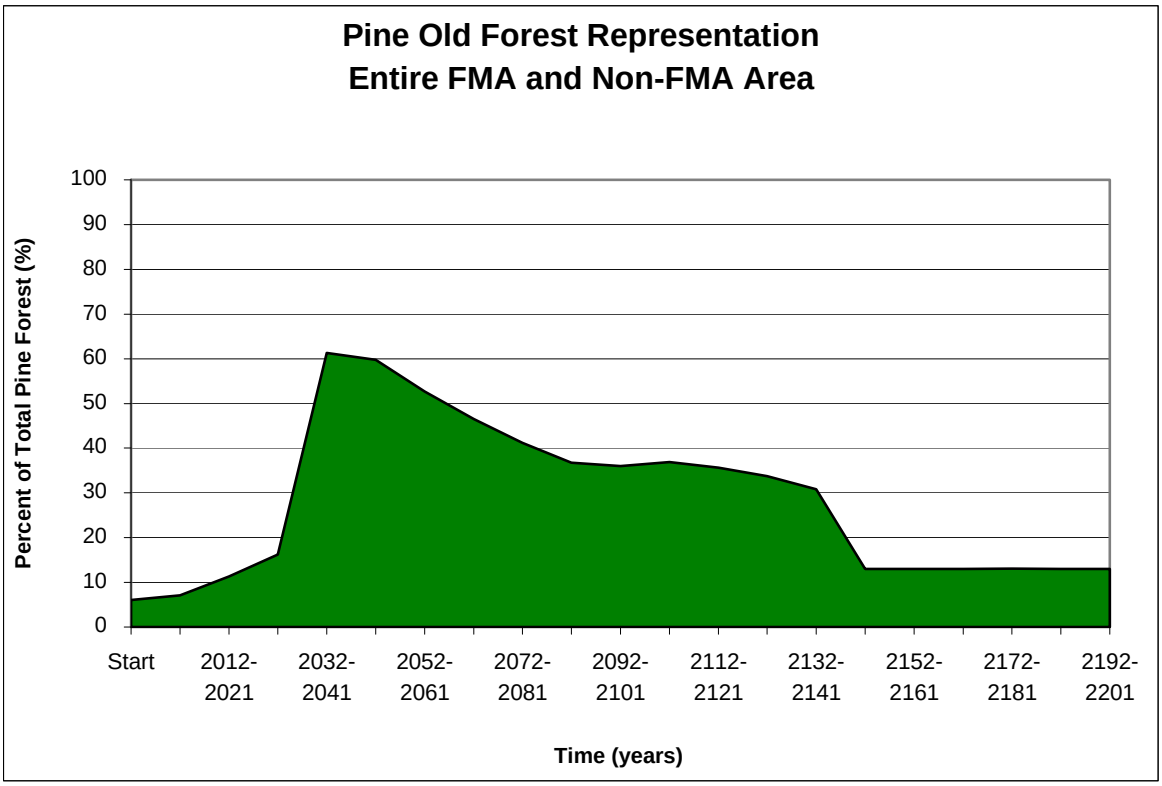
Figure 3.8: Old Forest Retention Woodstock Analysis – Five Major Strata






White Spruce Old Forest Representation
Entire FMA and Non-FMA Area
Percent of Total White Spruce Forest (%)
100
90
80
70
60
50
40
30
20
10
0
Start
2012-2021
2032-2041
2052-2061
2072-2081
2092-2101
2112-2121
2132-2141
2152-2161
2172-2181
2192-2201
Time (years)


Black Spruce / Larch Old Forest Representation
Entire FMA and Non-FMA Area
Percent of Black Spruce / Larch Forest (%)
100
90
80
70
60
50
40
30
20
10
0
Start
2012-2021
2032-2041
2052-2061
2072-2081
2092-2101
2112-2121
2132-2141
2152-2161
2172-2181
2192-2201
Time (years)



FUTURE CONSIDERATIONS - OLD FOREST STANDS / LANDSCAPES

For the life of this plan, the old-forest components of all five strata are projected to remain within or above the +/-25 per cent range of the natural range of variation and thus provide an interval in which to plan for future landscape events.

However, it should be noted that 6.5 per cent of the FMA area landbase is classified as potentially productive (old fire areas that have not achieved a cover type in the Alberta Vegetation Inventory) and upwards of 7 per cent of the area has been deleted for energy sector land-use activities and MOSA. Within the timber supply model, these areas do not contribute any forest age-class stages. In actual fact, the old fire areas will eventually be inventoried and contribute to future forested landscapes. In addition, a best-practices approach within the energy sector should also result in reclamation of a portion of its non-vegetated sites (see Integrated Land Management Objective # 21). Additional FMA area landscape will thus return to a forested state and potentially contribute towards old-forest seral stages.

There are a number of key parametres in the NRV approach that will require continued collaborative research:

- Fire return intervals
- Effects of fire control

- The range of ages within old forest classes
- Boreal forest succession, structure and age relationships
- Future cumulative effects of energy sector activities
- Improved estimations of growth and yield rates on harvested and reclaimed sites
- Reclamation of energy sector sites
- Spatial strategies at an FMU level
- Landscape and patch characteristics of old forest

This old-forest retention strategy is management in a climate of change. A stepped approach, in the absence of provincial policy and broad-based support within the forest products industry will allow old-forest management to evolve within the broader implementation of sustained forest management based on natural disturbance.

3.17 PREFERRED FOREST MANAGEMENT STRATEGY

ANNUAL ALLOWABLE CUT ESTIMATES

Annual allowable cuts have been calculated for both deciduous and coniferous species for each FMU.

Table 3.16 summarizes the proposed annual allowable cuts for each of the FMUs. The coniferous AACs further identify the allocation of Quotas, the MTU program, Alberta SRD programs and FMA holder AAC. The AAC calculation does not account for landbase loses by fire and/or the energy sector. These proposed AAC's are only applicable after Alberta SRD approval. Utilization standards follow the FMA.

TIMBER ALLOCATIONS

According to the FMA, virtually all deciduous annual allowable cut is allocated to Alberta-Pacific. The incidental conifer cut during harvest from deciduous stands and deciduous-dominated mixedwood stands is allocated to Alberta-Pacific and is generally offered to the conifer industry through sales agreements. The allocation of conifer from deciduous-conifer mixedwood stands varies among forest management units. (See Chapter 2 – Management Subdivisions and, Appendix C clause 4 of the FMA)

The new conifer AAC percentages are based on current allocations as supplied by Alberta SRD (primary and incidental) conifer volumes, and will continue to be offered to the conifer industry. Any changes in conifer AAC will be distributed proportionately to the partners with conifer rights.

A decline in deciduous and conifer AACs (e.g., due to natural disturbances or anthropogenic land-base losses, changes in yields, and/or parameter changes) will be proportionately shared by all partners and non-contributing operators. Allocations are illustrated in the Table 3.15.

Operating spheres, block allocations and quota licenses will all be continually dealt with and examined throughout the life of the plan to ensure joint planning and operational efficiencies. The companies are also exploring continued amalgamation of forest management units (FMUs) to improve forest management and reduce the risk to AACs due to natural disturbance.

CONIFER AAC PROFILE

The conifer Annual Allowable Cuts have been calculated to provide a primary and secondary allocation in all FMUs. The primary allocation is based on the premise that the entire conifer growing stock is utilized in the AAC calculation and also sequenced within the 15-year explicit harvest sequence. The primary conifer profile is composed of the three leading major conifer species – white spruce, black spruce and jack pine – from the forest inventory. Conifer leading mixedwood stands are combined within the appropriate leading conifer profile. Table 3.16 details the leading species (primary) conifer volume profile by FMU and allocation.

The AAC calculation (future forest) does not account for landbase changes or loses by fire and/or the energy sector. These proposed AAC's are only applicable after Alberta SRD approval.

ANNUAL ALLOWABLE CUT ESTIMATES 2004 FMP VERSUS 2000 DFMP AAC

Both total conifer and deciduous primary AAC estimations illustrate an increase over the 2000 DFMP approved AACs. These differences (negative and positive) vary by FMU. There are a number of primary reasons for the changes in AAC forecasts.

- The new and approved AVI inventory redefines the landbase.
- There is upwards of 30 years in difference between the AVI and Phase 3 inventories.
- Yield curves and growth projections are based on AVI data, rather than Phase 3 inventory data.
- Yield strata have been changed to reflect the AVI.
- Different models were used to forecast the AAC.
- The new AAC is spatial.

REVISED ANNUAL ALLOWABLE CUT APPROVED 2008 TSA/AAC VERSUS 2004 APPROVED FMP TSA/AAC

Both total conifer and deciduous primary AAC estimations illustrate changes over the approved 2004 FMP approved AACs. These differences vary by FMU. There are a number of primary reasons for the changes in AAC forecasts.

1. **Inventory**: Since 2001, seven FMUs (S18, L2, S7, L8, L1, L11 and L3) have undergone an upgrade of the approved AVI using "Softcopy" technology through 100% coverage with new air photo. This affected over 3,000,000 hectares. The inventory upgrade is referred to as "SAVI." SAVI consists of:

   Spatial and Feature Changes

   - Update of base data features including roads, seismic lines, trails, pipelines, power-lines, railways, streams and lakes.
   - Update of spatial data for anthropogenic change including cutblocks, clearings, well sites, industrial sites, pipeline, and road corridors.
   - Update of spatial data for natural change including fire, flood, and blow-down areas.

   Attribute Database Changes

   - Expand moisture classes and add moisture codes
   - Expand density classes to nearest five per cent crown closure.
   - Add stems per hectare for forested stand.

   Cutblock Update Process

   - The SAVI process is also targeted at classifying older cutblocks within the FMUs. This is primarily the Pre-1991 cutblocks within the approved AVI.

2. **Growth and Yield:** The yield estimations for the majority of the jack pine growing stock have been changed.

   - Utilizing the new Pj medium site yield curve (21 per cent deduction at 100 years)
   - Subjective deletion of all pine fair sites (~23,000 ha in the FMA area) through the land-base netdown process.

3. **Oil and Gas Sector**: In five years since the last netdown, the oil and gas sector (not including A15 MOSA) deleted upwards of 30,000 ha from the FMA area.

4. **Bigstone Cree Nation Treaty Land Entitlement Claim**: This pending claim removes upwards of 60,000 ha from the available SHS area in four FMUs (L2, S18, S22, S11). The area remains part of the net landbase in the TSA.

5. **Wildfire**: Within the entire FMA area (J and Non-J) an additional 35,000 ha of area was burnt (productive and non-productive landscapes).

6. **Landbase Netdown**: The above activities resulted in the following changes to the productive land-base (excluding A15 and MOSA);

   Decrease of 17,821 hectares of deciduous landbase

   Decrease of 55,771 hectares of coniferous landbase (J and Non-J)

   Details are provided in the TSA Appendix

7. **TSA Transitions**: The transition for an understorey protection treatment was changed to facilitate the connection between interpreted AVI forest attributes and actual forest observations. The following changes were incorporated for deciduous stands (DU) with an interpreted Sw understorey > 600 stems/hectare:

   - DU – 20 per cent - D(C) – 1 Year.
   - DU – 40 per cent - DC – 40 Years
   - DU – 40 per cent - CD – 40 Years

8. **MOSA Area**: Two distinct scenarios resulted in changes to the A15 AAC.

   The FMU A15 area defined as mineable (MOSA) increased to a total of 403,000 ha (J and Non-J). This area is designated for primary oil sands extraction. The preferred AAC for the A15 TSA is formulated on the liquidation of the majority of the merchantable forest growing stock ($\geq$ 16 metres in height based on approved AVI) within MOSA in four TSA periods – 20 years. This is an accelerated AAC forecast that represents likely conifer and deciduous volume flow to the forest companies. The forecasted primary volumes are based on ongoing communications with the oil sands companies.

   Throughout the 20-year harvest schedule and after period four (year 20), all MOSA harvest areas and the remaining MOSA net landbase is transitioned to anthropogenic non-vegetated status. Accordingly, MOSA does not contribute to a future forest in A15 after period four.

   The FMP TSA even-flow scenario (periods 5-40) for discrete landbases is represented throughout the remaining A15 planning horizon. The traditional even-flow forecast is based on the net landbase from the non-MOSA area in A15.

Table 3.15: Approved Annual Allowable Cuts (m^3 / year) - 2008

FMU	Deciduous AAC m3 - 60 year avg.			Coniferous AACs m3 60 year average						Alberta-Pacific		Secondary
	Primary Deciduous AAC	Secondary Deciduous AAC	Total Deciduous AAC	Primary Conifer AAC	Quota Holder AAC			CTPs		Primary Conifer		Conifer
					Company	%	m3	%	m3	%	m3	AAC
L1	166,677	10,726	177,403	57,407	Vanderwell	60.80%	34,903			-	-	30,053
					MTU			25.76%	14,788	-	-	
					Bobocel Lumber	13.44%	7,716			-	-	
L2	120,776	31,965	152,741	89,861	Vanderwell	58.05%	52,164	0.07%	63	-	-	26,581
					Spruceland	41.88%	37,634			-	-	-
L3	63,364	34,735	98,099	136,112	Millar Western	93.66%	127,482	6.34%	8,630	-	-	19,939
				15,861	MWI Sb - F/M	93.66%	14,855	na		-		
L8	54,861	10,890	65,751	28,588	St.Jean	83.29%	23,811	16.71%	4,777	-	-	10,940
L11	355,228	32,009	387,237	150,953	MTU	na	na	9.94%	15,000	-	126,897	67,595
					Non-J Allocation			1.57%	2,377			
A14	172,919	50,446	223,365	227,263	Millar Western	52.67%	119,699	2.20%	5,000	41.53%	94,387	46,742
				12,838	MWI Sb - F/M	52.67%	6,762	47.33%	6,076	na		
					Non-J Allocation			3.18%	7,223			
A15	525,000	185,348	710,348	400,000	Northlands	53.17%	212,680	11.37%	45,480	33.39%	133,548	140,650
					Non-J Allocation			1.74%	6,943			
S7E	89,029	13,711	102,740	27,578	Ghost Lake Timber	68.18%	18,803	31.82%	8,775	-	-	17,101
S11	142,029	33,658	175,687	90,251	S11 Logging	91.86%	82,905			-	-	33,675
					Unallocated (MTU)	8.14%	7,346					
S18	222,437	57,560	279,997	156,786	Vanderwell	22.85%	35,826			-	-	58,413
					Alberta-Ply	77.15%	120,960			-	-	-
S22	355,681	21,040	376,721	91,768	Unallocated (MTU)			21.13%	19,391	25.83%	22,518	90,240
					Retained CTP			3.09%	2,836			-
					Vanderwell	48.00%	44,049					-
					Non-J Allocation			1.69%	1,550			
					FMA Local Use			0.26%	239			-
Total FMA Area	2,268,001	482,088	2,750,089	1,485,266	-	-	947,595	-	149,146	-	377,351	541,929

Notes**:**

1. Entire deciduous (less 1 per cent) AAC is allocated to Alberta-Pacific.
2. One per cent of Alberta-Pacific AAC retained for Local Timber Permits (LTPs) as per paragraph 8(2)(a) of FMA. This is not deleted from the total AAC numbers.
3. Primary AAC is even-flow – 60 year average. The 60-year even-flow average (TSA periods 1- 12) reflects AAC prior to old-forest step-down. The AAC from year 60 to year 200 is also an even-flow AAC; less 10 per cent for all primary volumes.
4. Secondary *(or incidental)* coniferous and deciduous volumes are not even-flow; 60 year average.
5. Five per cent of all AAC volume from all Al-Pac conifer and deciduous allocations are retained for stand structure. Only the Al-Pac primary conifer and deciduous AAC has the five per cent structure deduction within the above table.
6. L1 and L11 are mixedwood TSAs where unique DU yield curves are transitions are utilized.
7. L1, L11 and S22 – "DC" strata contributes to primary deciduous AAC.
8. Upon approval by AB SRD, Vanderwell L1 conifer quota will be transferred to Millar Western.
9. Ghost Lake Timber (formally a CTP) will receive a conifer quota in S7; per cent tbd by AB SRD.
10. L2 – Spruceland – formally Tara Forest Industries.
11. In L11 – Conifer Timber Permit (CTP) of 15,000 m^3 volume allocation retained for local operator.
12. L8 - St. Jean is a conifer Quota Holder (83.29 per cent) and generally receives the directed CTP (16.71 per cent).
13. S11 – directed CTP (91.86 per cent) to S11 Logging. CTP (8.14 per cent) is generally directed to S-11 Logging.
14. FMU A14 – 2.20 per cent of conifer volume retained for Conifer Timber Permits (CTP).
15. A14 and L3 – Black Spruce (Sb) - Primary Conifer AAC for Black Spruce Fair / Medium Site – a Millar Western allocation (yield curves 16 & 17). MTU and Al-Pac only utilize Sb from "Good" sites. In L3 ~60% of Sb AAC is Sb strata F/M. In A14 ~56.5% of Sb AAC is Sb strata F/M.
16. In A15, the first 20 years of the accelerated AAC is dependent on utilization of fibre from oil sands MSL areas. The years one through 20 flow (TSA periods one to four) is not constrained by conifer profile. After 20 years, the A15 forecast is even-flow from the remaining non-MOSA area of FMU A15. The table's A15 coniferous and deciduous primary AACs represent the probable annual flow of fibre to the forest companies for four periods (20 years). The primary AAC is a 20-year accelerated harvest vis-à-vis the future even-flow forecast for A15.
17. Alberta SRD approved the new AAC – November 2008. The associated Spatial Harvest Sequence (SHS) was approved in September 2008.

Table 3.16: Leading Species (Primary) Conifer AAC Profile - 2008

FMU	Conifer AAC	Profile: Leading Conifer Species	%	m^3 / Yr
L1	57,407	White Spruce	48.0%	27,555
		Jack Pine	46.0%	26,407
		Black Spruce	6.0%	3,444
L2	89,861	White Spruce	72.0%	64,700
		Jack Pine	15.0%	13,479
		Black Spruce	13.0%	11,682
L3	151,973	White Spruce	69.1%	104,974
		Jack Pine	13.4%	20,291
		Black Spruce	7.1%	10,846
		Black Spruce (F/M)	10.4%	15,861
L8	28,588	White Spruce	72.0%	20,583
		Jack Pine	26.0%	7,433
		Black Spruce	2.0%	572
L11	150,953	White Spruce	28.0%	42,267
		Jack Pine	57.0%	86,043
		Black Spruce	15.0%	22,643
A14	240,101	White Spruce	46.5%	111,644
		Jack Pine	44.0%	105,718
		Black Spruce	4.1%	9,901
		Black Spruce (F/M)	5.3%	12,838
A15 MOSA	400,000	White Spruce	68.0%	272,000
		Jack Pine	29.0%	116,000
		Black Spruce	3.0%	12,000
S7	27,578	White Spruce	67.0%	18,477
		Jack Pine	26.0%	7,170
		Black Spruce	7.0%	1,930
S11	90,251	White Spruce	42.0%	37,905
		Jack Pine	56.0%	50,541
		Black Spruce	2.0%	1,805
S18	156,786	White Spruce	77.0%	120,725
		Jack Pine	17.0%	26,654
		Black Spruce	6.0%	9,407
S22	91,768	White Spruce	60.0%	55,061
		Jack Pine	37.0%	33,954
		Black Spruce	3.0%	2,753

Total	**1,485,266**			
		White Spruce	**59%**	**875,892**
		Jack Pine	**33%**	**493,690**
Note: May not add to 100% due to rounding.		**Black Spruce**	**6%**	**86,984**
		Black Spruce (F/M)	**2%**	**28,699**