

COMPENSATION FOR TIMBER DAMAGE ON ALBERTA CROWN LANDS

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ABSTRACT

The purpose of this report is to document the calculation of the various Crown charges associated with timber damaged by industrial land users on Crown Lands.

The timber damage charges have evolved as industrial uses and land use conflicts have progressed. These charges have been developed over time as reasonable and fair compensation for losses to the Crown's forest resources by industrial land users.

This report is also to document the 1988 revision to the timber damage assessment charge and its related Forest Stand Damage Table.

EXECUTIVE SUMMARY

- The Forest Stand Damage Appraisal Table has been calculated using reforestation and replacement costs.
- The average coniferous reforestation cost for the Government and Industry has been estimated as the cost of replacing a newly established coniferous forest.
- The cost of replacing stumpage with other substitute raw materials is used to value a mature stand.
- A medium site index curve is used to estimate the stand ages at the mid-point of each height class of the Phase 3 inventory.
- The intermediate stands (between newly established and fully mature) have been estimated using an internal rate of return as generated by the reforestation value and the replacement cost of a mature stand.
- The value of stands which are less than fully stocked was calculated by prorating the fully stocked values by the Phase 3 merchantable volumes per stand class.
- The weighted average values of the Forest Stand Damage Appraisal Table are \$600.05/ha for coniferous volumes and \$214.47/ha for deciduous volumes.

- Value for the re-use of a previously cleared area is based on the value of the growth since the initial use (\$51.88/ha).
- The administrative charge is based on the costs of administering the collection of the charges associated with industrial land clearing (\$50/invoice).
- The charge for industrial clearing in the remote northern portions of the province will be \$51.88/ha (same as re-use).
- Crown royalties for timber cut or destroyed on Forest Management Agreements areas are to be paid at the royalty rate in effect for each Agreement and will be based on the Phase 3 average merchantable volume per unit for that individual Agreement.

1. INTRODUCTION

1.1 Authority for Compensation Charges

1.1.1. Timber Damage Assessment

Under the Forests Act "the Lieutenant Governor in Council may make regulations prescribing the charges to be made for damage to timber stands in the cutting of roads, lines, rights of way, or other disturbance of the forest" (Forests Act, Chapter, F-16, 1980). The Timber Management Regulation in section 85 requires the Minister to assess charges for "forest growth cut, damaged or destroyed on public land in the course of geophysical or other industrial operations ... based on the costs of reforestation and replacement." (Timber Management Regulation, Alberta Regulation 60/73). Section 85 of the Timber Management Regulations also allows the Minister to waive this charge if the clearing of timber is done by a non-profit organization which has a legal right to cut the timber.

Upon payment of the assessment, the lawfully cut timber becomes the property of the person assessed for its value. (Timber Management Regulation, Alberta Regulation 60/73). The industrial land user shall remove the decked timber and put it to some beneficial use or dispose of it by sale or gift within 60 days of clearing the land. Decked timber left for more than 60 days is forfeited to the Minister.

In the case where the timber damaged is subject to a Forest Management Agreement, the holder of the agreement is entitled to compensation. The

holder is entitled to reasonable compensation for the loss or damage to timber or any improvements created by the holder (Forests Act, Chapter F-16, 1980, Section 16, subparagraph (2)).

1.1.2. Forest Protection Levy

Under the Forest and Prairie Protection Act, the Minister shall charge a levy of \$15.55/km of seismic disturbance in the northern regions of the Province. (The Forest and Prairie Protection Regulations, Part II, AR 310/72, Section 16, subparagraph (4)).

1.1.3. Trappers Compensation Program

The Public Lands Act and the Mines and Minerals Act give the Minister the authority to charge a fee for the compensation of trappers. Under Section 14 of the Public Lands Act he has the authority to set the terms and conditions of land dispositions. The Public Lands Act also authorizes the Minister to set the conditions under which Letters of Authority are granted under Section 20.1, subparagraph 1.1. The Mines and Minerals Act has similar authority with respect to exploration approvals granted under the Exploration Regulations under Section 190, subparagraph (b). (See Appendix 1).

1.2 Purpose of the Compensation Charges

1.2.1. Timber Damage Assessment

The purpose of the timber damage assessment is to provide the Crown reasonable and fair compensation for losses to the Crown's forest resources due to industrial land use. In order to easily administer the calculation and collection of this value, the Crown has developed a Forest Stand Damage Appraisal Table and a singular charge (Timber Damage Assessment). The table provides a value per unit of area for each forest stand classification and the singular charge is the weighted average of the values in the table.

1.2.2. Forest Protection Levy

In most regions of the Province, industrial land users must undertake to reduce the forest fire hazard created by the clearing and piling of forest cover. In remote regions however, the Crown collects a levy rather than requiring the land user to undertake the fire hazard reduction activity.

1.2.3. Trapper's Compensation Program

A trapper's compensation program established in 1980 provides compensation to registered trappers for damage to cabins and trapping equipment caused by unknown parties, as well as consideration for loss of livelihood resulting from activities of the conventional oil and gas

industry. Monies for such compensation come from a fund to which the oil and gas industry contributes. This contribution is \$1.24/ha of area disturbed.

1.3. Purpose of the Report

The main purpose of this report is to have one comprehensive source document on the topic of compensation payments to the Crown from industrial land use within the Green Zone. This report will document the development of the 1988 timber damage assessment charges. The documentation will include the manner in which deciduous values have been incorporated into the charges.

2. COMPONENTS OF TIMBER DAMAGE ASSESSMENT (TDA)

2.1. Forest Stand Damage Appraisal Table

This table is the major component of the Timber Compensation Charges. This is not because most of the money is collected using this table directly. It is because the table is the basis for the flat rate compensation charge known as "Timber Damage Assessment". The table simply provides a replacement value per unit of area for each major forest stand classification.

2.2. Timber Damage Assessment

The timber damage assessment charge is the provincial weighted average

replacement value per unit of area as determined by the Forest Stand Damage Appraisal Table.

2.3. Reuse Charge

The reuse charge is a compensation payment for the use of an area that had been previously cleared of timber.

2.4. Remote Charge

In 1985 the Department implemented a reduced charge for timber clearing operations in the far northern regions of the Province. This reduction was implemented because of the large amount of exploration work being carried out in the area and the low potential for commercial development of the timber within those regions.

2.5. Administrative Charge

The administrative charge is a levy to cover the Crown's cost of administering the collection of the compensation. This charge is not intended to fund the Government's program to regulate and monitor industrial land use in general.

2.6. Forest Management Agreements

Each Forest Management Agreement holder has been conveyed the right to claim compensation from industrial land users for losses of timber, forest growth and regeneration. They also have the right to claim compensation for damage to improvements and damage to their operations.

3. FOREST STAND DAMAGE APPRAISAL TABLE

3.1. Basic Assumptions and Principles

The estimating of damage to the forest or forest stand is a problem of resource valuation. (Davis, Chapter 21, Page 471, 1966). It is essentially the same problem as estimating the value of applying some cultural measure which improves the stand. Only, the damage is a negative rather than a positive value.

Therefore, the problem is to ascertain the value of the stand before and after the damage or treatment. The difference between the before and after state is the value of the damage or treatment.

The method used to value the damage will vary according to the purpose for which the information is needed. For example, a forest manager may need to estimate the value of some damages in order to effectively manage the forest and this value may be very different than the value of the damage as would be calculated for taxation purposes.

There are three primary bases for valuation:

1. Cost value (ie. historical, replacement, or restoration)
2. Income value, and
3. Market value.

Of these three, cost values tend to be regarded as a good basis for compensation as they are definite and tangible. Of the various cost values, from the standpoint of evaluation of damage, replacement or restoration costs are often regarded as the best. (Davis, Chapter 21, Page 475, 1966).

For these reasons Alberta has attempted to derive a method for evaluating damage on a stand by stand basis using replacement costs.

3.2. Calculation of the Forest Stand Damage Appraisal Table

3.2.1. Reforestation Cost

It is easily argued that a newly established, fully stocked stand is worth the value of re-establishing the stand in terms of compensation. This assumption is one of the major premises upon which the stand damage appraisal table is built.

It is assumed that the cost of reforesting a newly established, fully stocked coniferous area is the average cost experienced by the Alberta Forest Service during the 1986/87 fiscal year. It is estimated that the average total cost to reforest cut over areas is \$520.92/ha for the Alberta Forest Service and \$351.42/ha for the Alberta Forest Industry. The difference between these two figures is a result of the forest industry using less expensive treatment regimes.

Also, these costs are for those areas which had some application made to them, and does not include those areas which are left to regenerate naturally. Of the area cut, these costs apply to only 88.1% of the Alberta Forest Service area and 72.3% of the forest industry area. Therefore the overall weighted average cost for replacing a fully stocked newly established stand is \$349.98/ha. This figure is the minimum one should pay or damaging a fully stocked, coniferous stand (see Appendix 2).

Deciduous stands tend to regenerate naturally and therefore there is little value lost by the clearing of a newly regenerated stand. The loss is limited to the loss in the growth from the inception of the stand.

3.2.2. Replacement Cost

The most appropriate measure of the value lost to the Crown by damage to forest growth is the effect on the value of the allowable cut of the Province. (Davis, Chapter 21, Page 475, 1966). However, the calculation of the effect on the Province's allowable cut would be extremely tedious for each small disturbance. In addition, it is very difficult to place a value on the provincial allowable cut. Therefore, the use of the cost of re-establishing a fully stocked stand is used as the basis for the compensation to the Crown.

For those stands not newly established or not at full stocking levels; how does one estimate their replacement values? For those stands of less stocking levels, one can reduce proportionally the value based on the volume of timber in the stands.

For those stands which are older than newly established stands, one can apply an appropriate interest rate to bring the reforestation value into terms which are equivalent to the stand's approximate age.

In light of the long time frames needed for a forest stand to mature, it is critical that an appropriate interest rate be selected. There has been considerable study of the question of appropriate interest rates for

forestry and a wide range of values have been suggested as being appropriate. (Foster, 1979).

3.2.2.1. Coniferous Stumpage Replacement Value

If a replacement value could be placed on a mature stand, an internal rate of return formula would provide an appropriate interest rate. In Alberta, the pulpmills have been able to replace their cutting of coniferous stumpage from within their forest management agreement areas by purchasing woodchips generated as a by-product of sawmilling. The value the pulpmills place on these chips is very conservative, as they are in an oligopsonistic position in the market and have their stumpage to substitute in case wood chip prices move too high. This substitution effect makes the demand for woodchips very elastic (ie. small changes in price tend to make large differences in the quantity consumed). (Ferguson and Maurice, 1978).

The pulpmills are willing to pay to the sawmills on average \$14.09 per m³ of woodchips (see Appendix 2). This value is a good (albeit conservative) estimate of the market value of pulp stumpage because there are little or no direct costs assumed by the sawmill to produce these chips. This is indicated because there are several sawmills in the province who do not have a market for chips but still produce these as a by-products of the lumber manufacturing process. The purchase price of woodchips therefore represents a free market price for a very close substitute product for stumpage.

3.2.2.2. Deciduous Stumpage Replacement Value

Since there is no market for deciduous woodchips as yet in Alberta, deciduous stumpage cannot be determined in the same manner as coniferous stumpage. However, most deciduous using facilities purchase a substantial volume of wood from industrial salvage operations.

This purchase of salvage from industrial clearing can provide an estimate of a market price for stumpage. We can assume that there are little or no direct costs associated with preparing the wood for delivery to the mill because land users are required to deck all merchantable timber in cleaning up the area, regardless of whether a purchaser is available (ie. the decked wood is in essence a by-product of the industrial land use activity).

The mills have paid an average of \$19.93/m³ for the delivery of wood to their mills. Two of the mills also provide a graduated price scale for purchase of wood as the distance from the mill increases. Although this scale may not provide an allowance for the total hauling cost, it does give some indication of the cost the mill is willing to assume. This average allowance is \$4.92 for wood greater than 96 kilometres (60 miles) from the mill. Therefore, the value of wood greater than 96 kilometre from the mill is \$15.01/m³.

3.2.3. Internal Rate of Return Calculation

3.2.3.1. Mature, Fully Stocked Stand Value

As indicated previously, an appropriate interest rate can be applied to the replacement costs of a newly established stand to estimate the replacement values of older stands. This interest rate has been derived using the value of woodchips and industrial salvage and the costs of reforestation in an internal rate of return formula.

It is assumed a fully mature, fully stocked stand of timber is a "C" density class, "3" height class stand, as defined in the Phase 3 inventory (see Appendix 4). Phase 3 inventory shows an average merchantable volume of 219.5 m³/ha for a coniferous stand of "C" density and "3" height class. The corresponding volume for a deciduous stand is 136.3 m³/ha. These volumes are taken using a minimum utilization standard of 15 cm at the stump and 11 cm at the top (see Appendix 5).

These volumes per hectare, combined with the values calculated for the replacement costs, give us an estimate of the value of a mature, fully stocked stand on an area basis.

Coniferous:	219.5 m ³ /ha	X	\$14.09/m ³	=	\$3,092.76/ha
Deciduous:	132.8 m ³ /ha	X	\$15.01/m ³	=	\$1,993.33/ha

3.2.3.2. Stand Age Assumptions

In addition, we need to know the age of these stands in order to calculate the internal rate of return. Since the best correlation between

age and stand characteristics, as indicated by the Phase 3 inventory parameters, is the relationship of age and height, it is assumed that the height classification gives us a good estimate of stand age on average. Using medium site index curve, it was estimated that the following time was required to reach the midpoint of each height class (see Appendix 6):

Table 1: Age/Height Assumption

<u>Height Class</u>	<u>Height at Mid-Point m</u>	<u>Estimated Age</u>	
		<u>Coniferous*</u>	<u>Deciduous</u>
0	3	23	10
1	9	44	28
2	15	71	50
3	21	112	88
4	27	--	194
5	33	--	--

* This estimated age uses an median age for spruce and pine species.

3.2.3.3. Internal Rates of Return

The internal rate of return is calculated by finding the interest rate which will bring the future value of an item back to the original value. The formula is calculated in this manner:

$$i + 1 = (V_n/V_0)^{1/n}$$

Where: i is the internal rate of return

V_n is the future value

V_0 is the original value

n is the time period needed to reach V_n

therefore, coniferous internal rate of return is

$$i + 1 = (3,092.76/349.98)^{1/112}$$

where: i is the internal rate of return

V_n is the future value - the woodchip cost

V_0 is the original value - the reforestation cost

n is the time needed to reach V_n - Maturity

$$i + 1 = 8.8370^{1/112}$$

$$i + 1 = 1.019645$$

$$i = 1.9645\%$$

For the deciduous stands, there is no data available on the costs of reforestation. This is because the aspen which is cut primarily in Alberta regenerates readily by suckering with little or no effort by the landowner. However, the internal rate of return formula is undefined when you try to

divide the future value by the current value of zero. Therefore, a value must be placed on the reforestation cost even if it is only 1 cent.

Since the Province charges a reforestation levy of \$0.10/m³ for deciduous timber cut and a \$2.30/m³ levy for coniferous timber, this relationship has been used to derive the deciduous reforestation cost on a per unit area basis. The calculation is as follows:

$$\$0.10/\text{m}^3 \div \$2.30/\text{m}^3 = \$X/\text{ha} \div \$349.98/\text{ha}$$

$$X = \$349.98/\text{ha} \times \$0.10/\text{m}^3 \div \$2.30/\text{m}^3$$

$$X = \$15.22/\text{ha}$$

Using this value to calculate the internal rate of return gives us:

$$i + 1 = (V_n/V_0)^{1/n}$$

$$i + 1 = (1,993.33/15.22)^{1/88}$$

$$i + 1 = 130.9678^{1/88}$$

$$i + 1 = 1.05696$$

$$i = 5.696\%$$

3.2.4 Intermediate Aged Stand Values

We have now established that a newly regenerated, fully stocked stand has a value of \$349.98/ha for coniferous stands and \$15.22/ha for deciduous stands, and that a mature, fully stocked stand has a value of \$3092.76/ha for coniferous and \$1993.33/ha for deciduous.

We also have established that these values indicate a rate of return of 1.9645% for coniferous stands and 5.696% for deciduous stands.

From these values, using the age/height assumptions given previously, we can derive the following values for fully stocked, intermediate aged stands. Using the compound interest formula for the future value of a single sum, the following values are calculated (Davis, Chapter 16, Page 337, 1966):

$$V_n = V_0(1 + i)^n$$

Where V_n is the current value

V_0 is the re-establishment cost (\$349.98 coniferous/\$15.22 deciduous)

i is the interest rate (1.9645% coniferous/5.696% deciduous)

n is the period of time to reach the mid-point of each height class

ie) For the "2" height class coniferous stand the calculation is as follows:

$$V_n = V_0(1 + i)^n$$

$$V_n = 349.98(1 + 0.019645)^{71}$$

$$V_n = 349.98(3.98)$$

$$V_n = 1392.94$$

Table 2. Fully Stocked, Intermediate Aged Stand Values

Phase 3 Height Class	Height At Mid-Point m	Coniferous		Deciduous	
		Estimated Age	Estimated Value \$/ha	Estimated Age	Estimated Value \$/ha
-	0	0	349.98	0	15.22
0	3	23	547.49	10	26.49
1	9	44	823.77	28	71.79
2	15	71	1392.94	50	242.86
3	21	112	3092.76	88	1993.33
4	27	-	-	194	-
5	33	-	-	-	-

3.2.5. Over Mature or Better than Average Site Stand Values

Since the "4" and "5" height classes are not normally reached in an average stand by maturity, these stands must either be on better than average sites or must be over-mature.

In either case, the argument can be made that the value per m³ would be equivalent to the mature average stand. However, these stands would be anticipated to yield more m³ per unit of area than the average stand.

Therefore, if the \$14.09/m³ and \$15.01/m³ for coniferous and deciduous stands respectively, are applied to fully stocked, overmature or better than average sites, the following values are obtained:

Table 3: Overmature or Better than Average Sites Fully Stocked Stand Values

Height Class	Cover Class	Volume Per Unit Area m ³ /ha	Value \$/m ³	Stand Value \$/ha*
4	Coniferous	243.7	14.09	3432.80
	Deciduous	96.1	15.01	1442.67
5	Coniferous	241.8	14.09	3406.65
	Deciduous	166.4	15.01	2497.21

* May not multiply due to rounding

3.2.6 Less than Fully Stocked Stand Values

So far the values given are based on those stands which are considered to be fully stocked; that is, those stands which are considered to be a "C" density class under the Phase 3 inventory parameters. This is because the compensation value for replacing a newly established stand was calculated as the average costs experienced in the province to re-establish a fully stocked stand.

For those stands less than fully stocked for each species, the values have been calculated by prorating the fully stocked values by the

merchantable volumes of each species in each stand. However, "0" height class stands do not have any measurable merchantable volumes. Therefore, the average "1" height class volumes per unit area were used to estimate these values.

This prorationing of the values to each stand class type in the Phase 3 inventory results in the Forest Stand Damage Appraisal Table.

TABLE 4: Forest Stand Damage Appraisal Table
 (\$/ha)
 Phase 3 Inventory Stand Classification

Height Class	0				1				2				3				4				5			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Cover Group																								
S Coni Deci	292 1	345 1	547 2	889 3	439 2	519 4	824 6	1,337 8	679 18	972 21	1,393 29	1,785 19	1,640 138	2,393 214	3,093 318	3,748 226	2,194 240	2,731 270	3,433 433	4,342 420	1,919 212	2,509 274	3,407 513	3,266 843
SH Coni Deci	79 2	143 9	285 27	348 32	119 6	215 25	429 73	523 86	549 34	761 69	1,055 120	1,100 93	1,560 408	1,888 647	2,429 895	2,844 1,093	1,610 595	2,051 709	2,442 967	2,905 991	1,498 449	1,935 705	2,234 955	3,030 1,118
HS Coni Deci	208 4	159 4	231 11	209 9	312 12	240 11	347 30	315 25	502 57	564 71	611 138	629 150	1,089 674	1,293 929	1,665 1,476	1,722 2,022	884 532	1,120 886	1,778 1,308	2,724 1,839	461 374	905 1,073	1,861 1,587	
H Coni Deci	60 6	77 9	164 26	75 40	90 16	115 25	247 72	113 107	144 77	236 111	270 243	155 270	756 786	583 1,272	703 1,993	675 2,397	839 693	760 1,008	823 1,443	754 1,852	923 1,466	719 752	547 2,497	

3.3 Weighted Average Compensation Value

A large amount of the industrial land use that takes place in the province is either quite small in area or is linear in shape. Therefore, it becomes very difficult to directly apply values taken from the table to these areas. This is because; 1) the table values are based on inventory data and site specific conditions may vary somewhat from the forest cover type maps; and 2) the clearings may involve large numbers of stand types, with very small amounts of clearing in each.

Therefore, the weighted average value of the table has been calculated and this average has been applied to clearings of less than 16 hectares and /or clearings which are linear in configuration. This weighted average value has become known as Timber Damage Assessment.

3.3.1. Calculation of the Weighted Average Compensation Value

The average values of the table have been calculated by taking the value per unit area for each stand class type and multiplying it by the area for each stand class type. This gives a total value for the area included in the table. This is divided by the total area included in the table to give us an average value for each species group for the Province.

The total value of the forested area is:

Coniferous	\$15,933,099,000
Deciduous	<u>\$ 5,694,970,000</u>
Total	\$21,628,069,000

The total area* on which value is based is: 26,553,147/ha.

The value per unit area is:

Coniferous	\$600.05/ha
Deciduous	<u>\$214.47/ha</u>
Total	\$814.52/ha

3.4 Reuse Charge

It has been the policy of Alberta to require geophysical and other land use operations to use areas that had been previously cleared wherever practical. In order to be fair and to provide a financial incentive for landusers to re-use previously cleared areas, a reduced charge has been calculated for the re-use of clearings.

*Excludes FMA areas, Remote Zone, and White Zone - see Appendix 3 for complete description.

It has been suggested in geophysical operating guidelines (Peace River Region Geophysical Operating Guidelines, 1985) that forest clearings which have not regrown to a 2 metre height should be considered an existing clearing. Using this as the basis of our calculations it is estimated that it takes 10 years for deciduous timber to reach 2 metres and 17 years for coniferous timber.

This time frame is again calculated using a medium site index curve. However, this time frame is from the time the seedlings start to grow. It is estimated that it takes about 3 years for the seedlings to get established for coniferous timber and 1 year for deciduous timber. Therefore, the total time required is 20 years for coniferous and 11 years for deciduous to grow to a 2 metre height.

If the area had been cleared recently, we can assume that the full replacement cost was captured at that time. Therefore the further cost incurred by the Province as a result of the second clearing is the growth in value of the stand from the time of the first clearing.

Therefore the cost to the Province is the value as calculated using the future value formula, used previously, less the current value.

$$V_r = V_n - V_0$$

Where, V_r is the reuse charge

V_n is the current value of the stand

V_0 is the re-establishment cost

$$V_n = V_0 (1 + i)^n$$

Where, V_n is the current value

V_0 is the re-establishment cost

i is the internal rate of return

n is the time to grow to current state

Since, the re-use can take place up at any time up to the point at which the stand is equal to or greater than 2 metres, the mid-points of these time frames have been used (ie. coniferous $20 \div 2 = 10$ years, and deciduous $\div 2 = 5.5$ years).

The coniferous re-use value is therefore:

$$V_r = V_n - V_0$$

$$V_r = V_0 (1 + i)^n - V_0$$

$$V_r = 349.98 (1 + 0.0196)^{10} - 349.98$$

$$V_r = (349.99 * 1.2148) - 349.98$$

$$V_r = 425.14 - 349.98$$

$$V_r = \$75.16/ha$$

The deciduous re-use value is therefore:

$$V_r = V_n - V_0$$

$$V_r = V_0 (1 + i)^n - V_0$$

$$V_r = 15.22 (1 + 0.05696)^{5.5} - 15.22$$

$$V_r = (15.22 * 1.3562) - 15.22$$

$$V_r = 20.64 - 15.22$$

$$V_r = \$5.42/\text{ha}$$

Prorating these two values by the total volume for each species group on the area covered by the table, we get a figure of:

$$\text{Re-use Charge} = \frac{(75.16 \times 1,133,407,520) + (5.42 \times 568,090,175)}{(1,133,407,520 + 568,090,175)}$$

$$\text{Re-use Charge} = \$51.88/\text{ha}$$

3.5. Remote Charge

In the northern regions of the Province, the potential for development of the timber resources is substantially less than in the rest of the province. Primarily the area consists of less productive land and therefore the volume of timber in the area is less and the timber is slower growing. Secondly, access in some regions in the far north is not conducive to resource development. As a consequence, the value damage to timber in that area is not equivalent to the remaining area of the Province.

Since the value of the damage cannot be determined by the value of a substitute product, we have assumed that as a minimum the damage would be equivalent to the re-use charge. Therefore, the Province will charge \$51.88 /ha for the areas shown in Figure 4 as the remote zone.

3.6. Administrative Charge

The Province also incurs a cost as a result of timber damage in that the Province has to invoice the industrial land user for the damage. Involved with this invoicing is the calculation, preparation, and mailing of the invoice and some collection activities.

The Province has estimated that 1.25 man-years is needed to administer the current level of activity. This level of man-power costs approximately 36,000.00 per man-year. The number of invoices handled is 860 and therefore the cost per invoice is \$52.33, or approximately \$50.

The administrative charge is only intended to collect sufficient funds to compensate the Province for the additional work incurred in collecting these monies. It is not intended as a user fee to cover all the costs incurred by the Province as a result of industrial activity in the forested areas of the Province.

4. Forest Management Agreement Holder (FMA) Compensation

The Forest Management Agreement (FMA) Holders in Alberta have the right to be compensated for damages to the forest land base or their operations in general. An example of the wording of a newer forest management agreement is as follows: (The Alberta Gazette, December 31, 1985)

"In keeping with the policy for multiple use of the public land, the Minister reserves all land rights on the forest management area not specifically given hereby to the Company in this Agreement, including by way of example, but without limiting the generality of the foregoing: . . . (b) the rights to authorize any person to conduct any work in connection with or incidental to geological or geophysical exploration pursuant to the Mines and Minerals act, or the Exploration Regulation; provided that the company shall be entitled to reasonable compensation, from the person conducting the exploration, for any loss or damage suffered by the Company and resulting from such exploration including by way of example but without limitation, for any damage to timber (or deciduous timber or coniferous timber), forest growth, regeneration, improvements or to any of its operations on the forest management area; and providing that the company shall not be entitled to compensation to coniferous or deciduous timber or forest growth caused by any such geological or geophysical exploration on areas placed under timber license or permit."

4.1. Application of Forest Stand Damage Appraisal Table to FMA's

4.1.1. Background

In 1966, the Department prepared a Forest Stand Damage Appraisal Table to assist Forest Management Agreement holders in assessing appropriate compensation. It appears this table was based on the estimated average stand volume per acre and the timber dues in effect at the time. This table and its revisions were well accepted and were used by the Forest Management Agreement holders, industrial land users, and the Crown. This table was updated to reflect changes in the dues charges until 1968. No further changes were made to the table until 1978.

In 1978, the Forest Management Agreement holders submitted that the 1968 table did not adequately compensate for timber losses. At the same time, representatives of the Independent Petroleum Association expressed concerns about the Forest Management Agreement holders "Consent for Withdrawal" forms.

The Department undertook a review of the consent forms and the forest stand damage table. On November 29, 1979 the Department presented revisions to both documents at a joint meeting of forest Management Agreement holders. Independent Petroleum Association representatives, Canadian Petroleum

Association representatives, and the Alberta Forest Service representatives. Minor revision were made and the consent form and table were distributed on February 13, 1980 for implementation. This table was updated in 1981 to account for inflationary factors and to convert to metric units of measure.

4.1.2. Authority for the Use of the Forest Stand Damage Appraisal Table

Although, the Forest Management Agreement holders and the representatives of the oil and gas industry agreed to use the table as prepared by the Province for compensation calculations, there is no formal legal requirement for this table to be the definitive method for valuation. However, since the Forest Management Agreement holders were the party which requested that some common basis for this valuation be derived, it is strongly suggested that this table be regarded as the best source for the valuation of damage.

4.1.3. Other Compensation Charges by FMA Holders

The Forest Stand Damage Appraisal Table is based on the value to replace the forest growth on the land area cleared, therefore, there is no need to charge additional values for future loss of growth, crown royalties, or any other timber related charge.

The only compensation charges which would be appropriate would be charges for damage to other property or improvements, or damage to their operations. For example, charges for damage to equipment, roads, bridges,

research plots or stations, or having to re-adjust operating plans on ongoing operations, etc. would be justified.

Since the Forest Management Agreement holders only has land rights with regard to the growth, management and harvesting of timber, and they are compensated for these rights under the Forest Stand Damage Appraisal Table, they cannot justifiably charge for loss of land or land rights over and above the values of the table.

4.1.4. Provincial Charges on Forest Management Agreement Areas

In certain Forest Management Agreements the Province has conveyed the rights to grow, manage and harvest specific species or groups of species of timber. Therefore, the Province retains the right to be compensated for timber damage to those species which are not included under the Forest Management Agreement.

In addition, certain areas within Forest Management Agreements may be held under license or permit by other parties for the species for which the agreement holders are managing the area. Therefore, the Province, rather than the Agreement holder, is to be compensated in these license or permit areas within the Agreement area.

5. Application of Compensation Values

5.1. Compensation Zones

The values in the table and its average values are to be applied to various zones in varying manners throughout the Province.

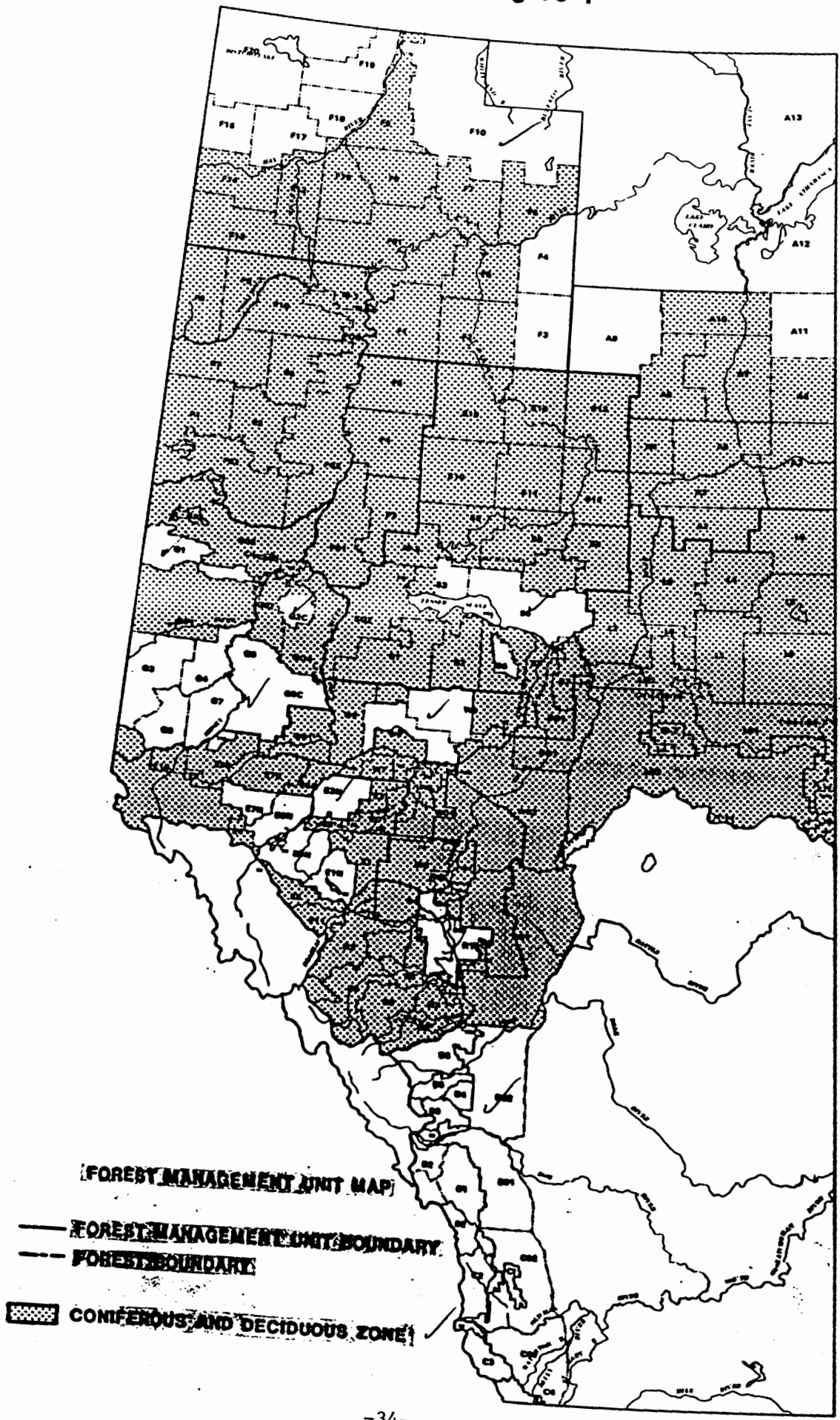
5.1.1. Coniferous and Deciduous Zone

The current ongoing push for development of Alberta's forest resources has required this full review of the timber compensation policies of Alberta. Technological development and resource scarcity in other regions of North America have dramatically changed the outlook for the development of Alberta's forest industry.

One of the major changes is the outlook of the potential for deciduous timber utilization. The development of new technologies has made the utilization of Aspen in particular very attractive. This can be seen by the number of facilities operating or under construction which will use Aspen as a primary wood fibre.

As a result, deciduous timber values have been added to the Forest Stand Damage Appraisal Table. These values are to be applied along with coniferous values in the area of the Province shown in Figure 1.

Figure 1



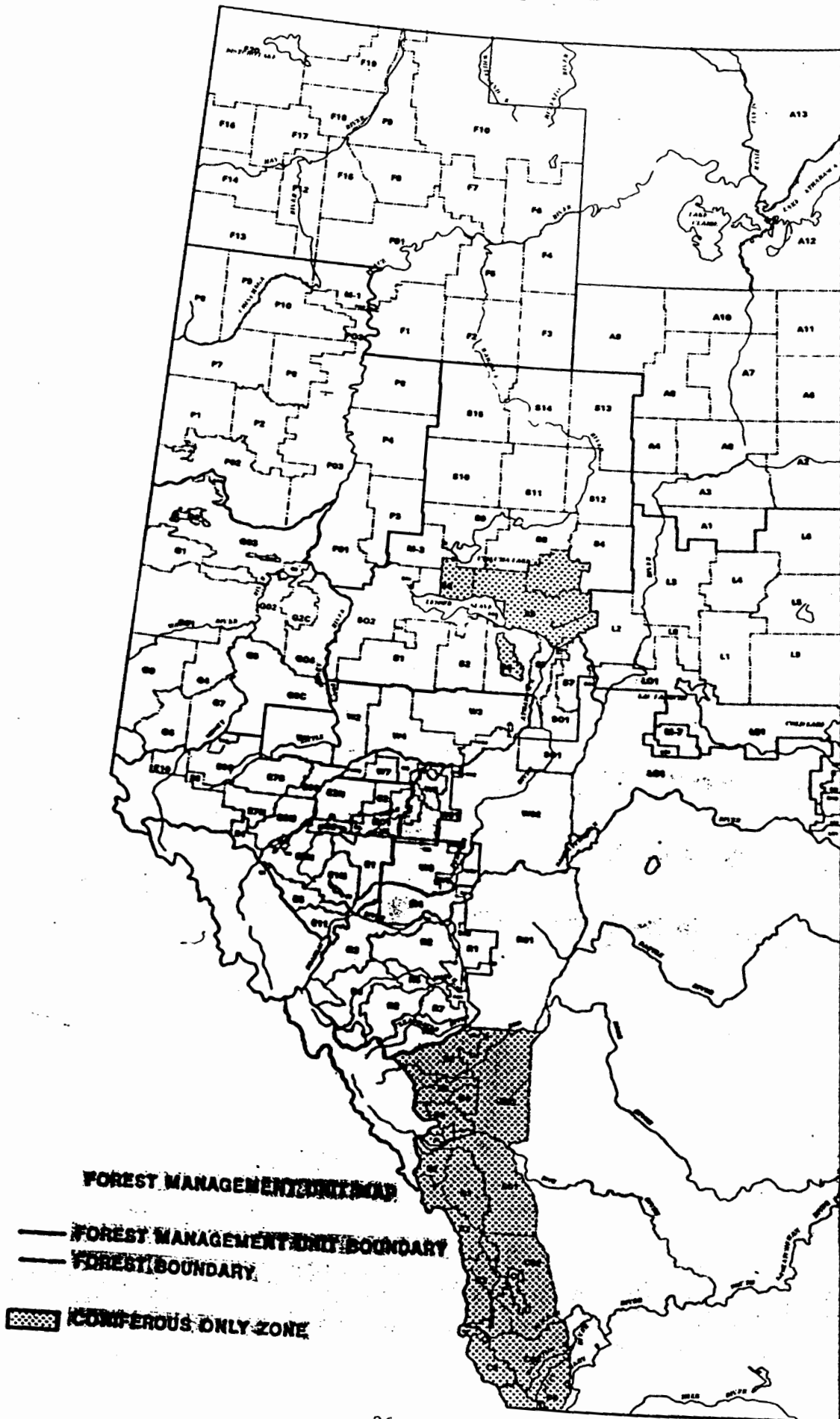
5.1.2. Coniferous Zone

Figure 2 shows the area in which only coniferous values are to be applied from the Forest Stand Damage Appraisal Table and its average values. Deciduous values are not to be included in these two locations. This is because: 1. in the Bow/Crow Forest along the southern east slopes of the Rockies there is insufficient volume of deciduous timber for any major development based on deciduous timber, and 2. in the Weldwood Forest Management Agreement Area, the Agreement holder has the right to compensation for deciduous timber but the Province retains the right to coniferous compensation.

5.1.3. Deciduous Zone

Figure 3 shows the area in which only deciduous values are to be applied from the Forest Stand Damage Appraisal Table and its average values. Coniferous values are not to be included in this location because the Alberta Energy Company Forest Management Agreement provides Alberta Energy Company with the right to be compensated for the coniferous timber. The Province retains the right to deciduous compensation.

Figure 2



5.1.4. Remote Zone

Figure 4 shows the area where the remote zone charge is to be applied. This value is charged in place of the full assessment as this region of the Province has little potential for timber resource development because of its small timber resource base and its relative isolation.

5.1.5. Relaxed Cleanup Zone

Figure 5 shows the area where the Forest Protection levy is to be applied. This levy is charged in lieu of extensive cleanup of cleared material.

6.0. Implementation

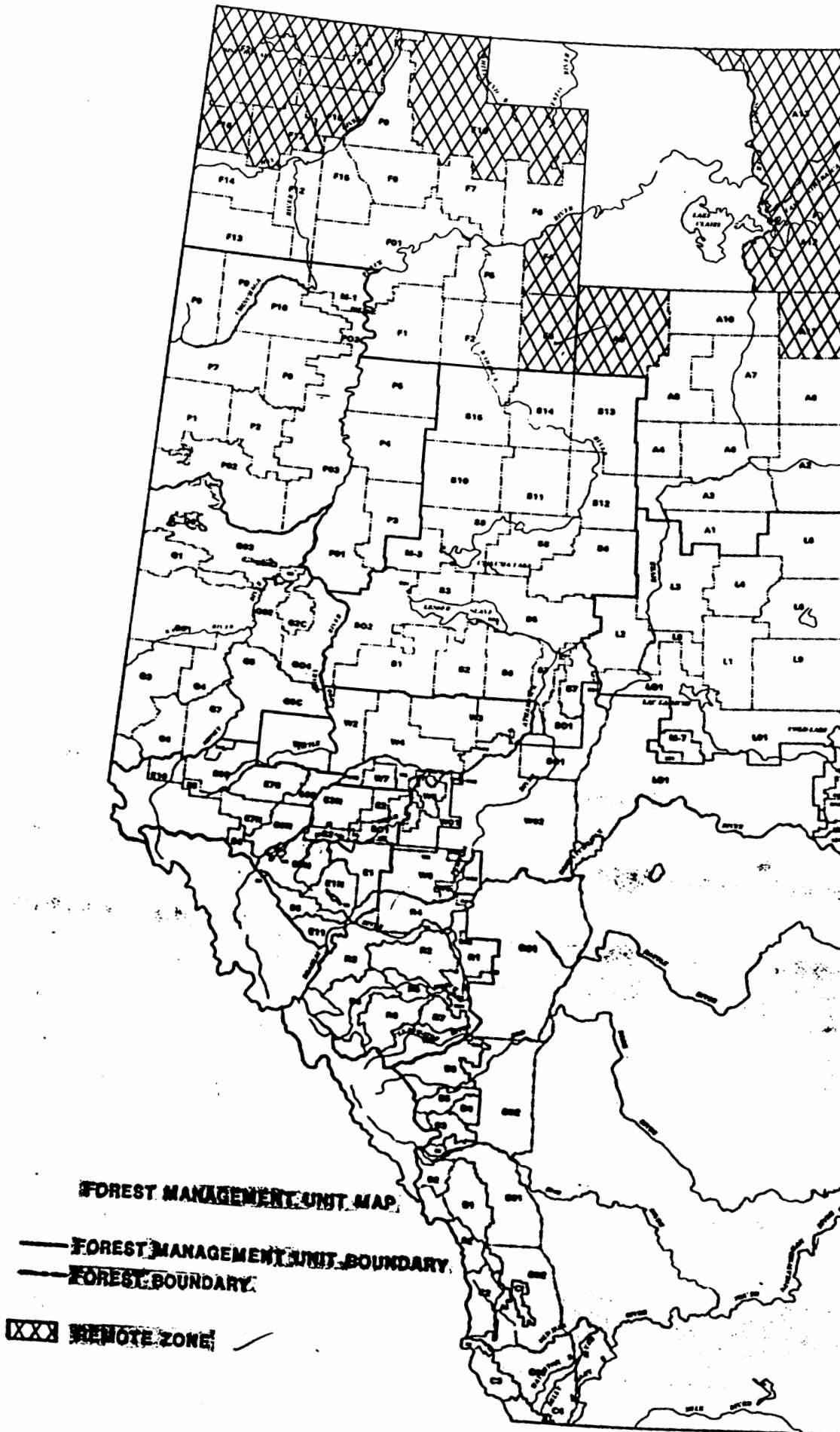
6.1. Time of Implementation

The revision to the Forest Stand Damage Appraisal Table and related charges will be implemented August 1, 1988.

6.2. Revisions to Zones

As Forest Management Agreements are signed, those species placed under management in the Agreements will be withdrawn from the appropriate zone (or zones). Damage to those species under management will then be charged for by the Agreement holder.

Figure 4



6.3. Revisions to the Timber Damage Assessment

Revisions will not be made to the average values for a period of two years. Therefore, changes to the weighted average values as a result of zone revisions will not be incorporated until August 1, 1990.

6.4. Revisions to the Forest Stand Damage Appraisal Table

Revisions to the Forest Stand Damage Table will not be made for a period of two years. At that time, changes to the cost of reforestation; the value of stumpage substitute products; the internal rate of return; and the Phase 3 inventory values will be made.

It is not anticipated that any further changes to methodologies will have to be made.

7. Industrial Land User and FMA Holder Disputes

The Province does not intend to prejudice the rights of either party to pursue all legal avenues to obtain fair valuation of damages. However, the Director of Timber Management Branch will offer his services as an arbitrator, if both parties agree to be bound by his ruling. The Director will base his valuation of timber damage based on the methodologies described in this paper.

8.0. Summary of Charges

8.1 Clearings Greater than 16 ha and Not Linear in Configuration

- ° Coniferous and Deciduous values as per the Forest Stand Damage Appraisal Table.
- ° Coniferous values as per the Forest Stand Damage Appraisal Table.
- ° Remote Zone charge is \$51.88/ha.
- ° The re-use charge is 51.88/ha.
- ° Trapper's Compensation is \$1.24/ha
- ° An administrative charge is \$50/invoice.

8.2. Clearings less than 16 ha or Linear in Configuration

- ° The weighted average Forest Stand Damage Appraisal Table values for coniferous and deciduous stands is \$814.52/ha.
- ° The weighted average coniferous stand value is \$600.05/ha.
- ° The weighted average deciduous stand value is \$214.47/ha.
- ° The remote zone charge is \$51.88/ha.
- ° The re-use charge is \$51.88/ha
- ° In the forest protection zone the levy is \$15.55/km.
- ° The trapper's compensation charge is \$1.24/ha
- ° The administrative charge is \$50/invoice.

9.0 FMA Timber Royalties

Although, the timber royalties payable to the Province as a result of industrial land use on Forest Management Agreement areas is not formally part of the general discussion of compensation for timber damages, it has been included in this document because:

1. traditionally, these charges have been considered part of the damage appraisal system,
2. these royalties are paid on a per unit area basis, rather than a volume basis, and
3. these royalties are calculated based on the industrial clearing area and are administrated based on the documentation provided by the industrial land user.

9.1 Authority

The Timber Management Regulation, 1973 under section 83 (Alberta Regulation, 297,87) requires that the Forest Management Agreement holder pay royalties to the Province for all merchantable timber cut or destroyed in the area.

9.2 Calculation of Royalties

Although the Timber Management Regulation places the onus on the Forest Management Agreement holder to document all merchantable timber cut or destroyed on the agreement area, it is not practical for the Province to require the Agreement holder to itemize all timber cut by others. (Timber Management Regulation, Alberta Regulation 60/73, 297/87, section 83). The Province has taken a similar approach for Timber Management Agreement areas as it has for seismic or other linear disturbances. The Agreement holder will be charged the appropriate royalty rate per m^3 based on an average m^3 per unit of area within the Agreement area.

Again, where the areas disturbed are large and are not linear in configuration, the Province will estimate the merchantable volume cut under the Phase 3 inventory and apply the appropriate royalty rate.

Table 5 shows the royalty rates to be charged for the existing Agreements.

Table 5. Fully Stocked Intermediate Aged Stand Values

Forest Management Agreement Timber Royalty Charges

	Timber Volume m ³ /ha	Timber \$/m ³	Royalty \$/ha	Royalty Payable	
				\$/ha	\$/m ³
Alberta Energy Company					
Coniferous	101.3	0.52	52.65	52.65	0.52
Deciduous	29.1	0.25	7.27	0.00	0.00
Total	130.3		59.92	52.65	
Canadian Forest Products					
Coniferous	97.1	0.70	67.98	67.98	0.70
Deciduous	45.6	0.25	11.39	11.39	0.25
Total	142.7		79.37	79.37	
Champion Forest Products					
Coniferous	100.7	1.44	144.97	144.97	1.44
Deciduous	14.0	0.65	9.09	9.09	0.65
Total			154.05	154.05	
Pelican Spruce Mills					
Coniferous	67.2	0.70	47.05	47.05	0.70
Deciduous	34.2	0.25	8.56	8.56	0.25
Total	101.5		55.61	55.61	
Procter and Gamble					
Coniferous	84.2	1.68	141.46	141.46	1.68
Deciduous	39.7	0.71	28.19	28.19	0.71
Total	124.0		169.65	169.65	
Weldwood of Canada					
Coniferous	45.0	0.70	31.05	0.00	0.00
Deciduous	33.8	0.25	8.45	8.45	0.25
Total	78.8		39.95	8.45	

9.3 Implementation

These rates will become effective August 1, 1988 and will be revised as the regulation rate of Crown Dues is revised or as the individual Agreement rates are revised or updated. For example, several Agreements provide for annual indexing of royalty rates and these rates will be updated on the anniversary of the Agreement. These rates will apply to all industrial clearings created within an Agreement area after August 1, 1988.

The volume of merchantable timber per unit area will be revised every two years in connection with the general update of the Forest Stand Damage Appraisal Table.

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APPENDICES

1. Trapper's Compensation Program - Authority
2. Calculation of the Provincial Average Cost of Reforestation
3. Weighted Average Woodchip Price
4. Phase 3 Forest Stand Type Legend
5. Phase 3 Data
6. Medium Site Index Curve

ENERGY AND
NATURAL RESOURCES

FROM F.W. McDougall
Deputy Minister
Renewable Resources

OUR FILE REFERENCE

YOUR FILE REFERENCE

TO C.E. Paquin
A.J. Facco
J.A. Brennan
J.E. Benson
M.E. Phalmepin

DATE January 20, 1981

TELEPHONE 427-3552

SUBJECT

TRAPPER COMPENSATION PROGRAM ASSESSMENT

Assessments under the Trapper Compensation Program are to commence on February 1, 1981. These are to be assessed to the conventional oil and gas industry.

These are being established without passing additional regulations. The assessment will be made under the authority of Section 20 (3) of the Public Lands Act and 190 (b) of the Mines and Minerals Act as outlined in the attached memorandum from Legal Services.

The assessment rate is \$1.00 per acre for well sites, roadways and other permanent disturbances and .50¢ per acre for seismic programs. These are to be assessed on the same basis and at the same time as timber damage charges. Both charges are to appear on the same invoice. The revenues collected are to be paid into General Revenue Input Code A/C 2300-13200.

Public Land Dispositions will be responsible for putting the assessment mechanism in place for disturbances covered by their dispositions. The Alberta Forest Service will be responsible for collecting seismic damages and confirming disturbed acreages. Revenue collection for seismic will be on a semi annual basis.

On the basis of discussions between our Mr. Campbell and Mr. Goodkey of Budget Bureau the following is the agreed description for this program.

New Element - Trapper Compensation for losses
Caused by Industrial Activity, User A23A
Element Input Code F 5600
Expanded (06-05-06)

This code is to be in place for our 1981/82 budget. Mr Phalmepin will complete an AFIS P701 for submission to the Deputy Provincial Treasurer.


F.W. McDougall



ENERGY AND
NATURAL RESOURCES

FROM T. Freedman
Solicitor
Legal Services

OUR FILE REFERENCE
YOUR FILE REFERENCE

TO F. McDougall
Deputy Minister
Renewable Resources

DATE January 14th, 1981
TELEPHONE 7 - 7426

SUBJECT Trappers Compensation Program

I have discussed this program with Peter Schmidt, Registrar of Regulations, Legislative Counsel Office and the following mechanism was agreed to.

The Associate Minister of Public Lands and Wildlife, under section 14.1 of The Public Lands Act has the authority to require a disposition holder to pay a sum of money to the Crown for future damage to trapline capacities. Section 20(3) can be relied on in the case of Letters of Authority.

Section 14.1 reads as follows:

The Minister may, in a disposition prescribe terms and conditions to which the disposition is subject.

Section 20(3) reads as follows:

The Minister may impose such conditions as he considers necessary on any authorization granted by him pursuant to subsection (1).

The Minister of Energy and Natural Resources, under section 190(b) of The Mines and Minerals Act, has similar authority with respect to exploration approvals granted under the Exploration Regulations (A.R. 423/78).

...2/

Section 122(b) reads as follows:

The Minister may make an exploration approval, license or permit subject to any conditions he may prescribe.

The monies collected will be paid into General Revenue.

The authority to compensate trappers will be granted under the authority of a supply vote as that term is used in The Financial Administration Act, 1977. I spoke with A.G. Heisler, Assistant Controller, Treasury on this matter and he said that the auditors will not question expenditures under the program provided that a sufficient description is provided in the Estimates. Mr. Heisler felt that the inclusion of the expenditure in the category Fur Resource Management would not be sufficient.

The following description is suggested:

Trapper Compensation for losses caused by
Industrial Activity.

Peter Hogg, in his text entitled Liability Of The Crown (1971 The Law Book Company Limited) indicates that the Crown may not expend money unless the Legislature has appropriated money for the purpose for which the expenditure is proposed.

It is submitted that the phrase "Fur Resource Management" does not encompass such a concept as the Trappers Compensation Program.

Tom Freedman
T. Freedman

c.c. G. Kerr
G. Campbell

Appendix 2

1988 CALCULATION OF REFORESTATION COSTS IN ALBERTA

TREATMENT COMBINATIONS	TREATMENT COST (\$/ha)	INITIAL TREATMENT AREA				TOTAL INITIAL TREATMENT COST		
		FOREST	SERVICE	INDUSTRY		FOREST SERVICE	INDUSTRY	TOTAL
		(ha)	%	(ha)	%	(\$)	(\$)	(\$)
scarify	375.71	9,682	15.0%	18,525	23.5	3,637,587	6,959,870	10,597,457
scarify & seed	379.80	12,845	19.9%	18,603	23.6	4,878,400	7,065,574	11,943,974
scarify & plant	742.06	18,718	29.0	5,124	6.5	13,890,131	3,802,182	17,692,313
seed	3.09	129	0.2	3,705	4.7	399	11,448	11,847
plant	365.35	8,907	13.8	4,020	5.1	3,254,300	1,468,790	4,723,090
natural	0.00	14,265	22.1	28,851	36.6	0	0	0

TREATMENT COMBINATIONS	TREATMENT COST (\$/ha)	RE-TREATMENT AREA		TOTAL RE-TREATMENT COSTS		
		FOREST SERVICE (ha)	INDUSTRY (ha)	FOREST SERVICE (\$)	INDUSTRY (\$)	TOTAL (\$)
scarify	375.71	154	340	57,859	127,741	185,601
scarify & seed	379.80	850	1141	322,830	433,352	756,182
scarify & plant	742.06	818	839	607,005	622,588	1,229,593
seed	3.09	490	580	1,514	1,792	3,306
plant	365.35	4274	4031	1,561,506	1,472,726	3,034,232
Total/Average		6586	6931	2,550,714	2,658,200	5,208,914

Weighted average cost per initial treatment (\$/ha) 313.65
 Weighted average re-treatment cost for initial treatment area (\$/ha) 36.33
 Weighted average total treatment cost for initial treatment area (\$/ha) 349.98

APPENDIX 3

1988 RESIDUAL WOODCHIP PRICES

	1987 PURCHASE VOLUME (BDU)	1988 PRICE fob MILL (\$/BDU)
<u>Procter and Gamble Inc.</u>		
Canfor-GP-sawmill	53,802	48.89
Canfor-GP-plywood mill	13,852	48.89
Canfor-HC-sawmill	22,753	42.09
Canfor-HL-sawmill	104,500	31.18
Buchanan-High Prairie	24,630	41.58
Blue Ridge Lumber	67,051	33.00
Mostowich - Fox Creek	12,176	41.58
	298,764	37.71
 <u>Champion Forest Products</u>		
A & V Logging - Peers	4,402	46.83
Erith Tie - Erith	3,507	46.83
Millar Western - Whitecourt	65,812	38.85
B.C.F.P. - Grande Cache	91,430	46.83
Blue Ridge Lumber	8,056	46.83
	173,207	43.80
 <u>Summary</u>		
Procter and Gamble Inc.	298,764	37.71
Champion Forest Products	173,207	43.80
	471,971	39.94
conversion factor (m ³ /BDU)		2.832
Weighted Average in \$/m ³		14.10

FOREST TYPE MAP INFORMATION FOR LICENSEES, PERMITTEES AND SUB-CONTRACTORS
(Scale 1:15,000 which is a representative factor of 1 mile = 4,225 inches)

PURPOSE - To aid timber operators in their planning. The map is prepared from aerial photography and may be subject to correction.

NUMBER ISSUED -

Timber Licence or Commercial Timber Permit - one completed coloured map and three unfinished copies. The copies are made available for completion and distribution by the Licensee to the sub-contractors or foreman.

FOREST COVER MAPPING LEGEND

(1) Stand Symbols for Productive Stocked Forest Land.

(a) **DENSITY**

All stands except Height Class 0 with some coniferous content

Coniferous and mixed wood stands in Height Class 0

CROWN DENSITY

A	6-30%
B	31-50%
C	51-70%
D	71-100%

CONIFEROUS REGENERATION STOCKING

A	6-19%
B	20-39%
C	40-59%
D	60+%

(b) **Height - average height of dominant and co-dominant trees**

CODE	STAND HEIGHT
0	0- 6.0 m (1 ft.-20 ft.)
1	6.1-12.0 m (21 ft.-40 ft.)
2	12.1-18.0 m (41 ft.-60 ft.)
3	18.1-24.0 m (61 ft.-80 ft.)
4	24.1-30.0 m (81 ft.-100 ft.)
5	30.0+ m (101 ft.+)

EXAMPLES:

B3 SWA - L - denotes 31-50% crown density, 3 height class of 18.1-24.0 m (61 ft. to 80 ft.), and with major white spruce and minor deciduous content. L - Lumber commercialism.

C4 PA - L - denotes 51-70% crown density, 4 height class of 24.1-30.0 m (81 ft. to 100 ft.), and with major pine and minor deciduous content. L - Lumber commercialism.

(c) **Abbreviations for Tree Species:**

SOFTWOOD (coniferous)

- Sv - white spruce
- Sb - black spruce
- Fb - balsam (alpine) fir
- P - lodgepole or jackpine
- Lt - larch (tamarack)

HARDWOOD (deciduous)

- Aw - aspen (trembling)
- Pb - balsam poplar
- Bw - white birch

A or

Stand composition is a listing of species in order of decreasing volume content. Species up to 10% are ignored. Species 11-20% are in brackets e.g. SWA (Sb).

(d) **Commercialism** (coniferous)

- L - Lumber - 50 m³/ha (700 cu. ft./ac.) + gross coniferous sawlog 20+ / 13 cm (8 inches S.D.O.B. to 5 inch top D.I.B. utilization).
- R - Roundwood - 50 m³/ha (700 cu. ft./ac.) + gross coniferous roundwood 13+ / 7 cm (5 inch S.D.O.B. to 3 inch top D.I.B. utilization).
- H - High Uncommercial - 50 m³/ha (700 cu. ft./ac.) + gross roundwood all species 13+ / 7 cm (5 inch S.D.O.B. to 3 inch top D.I.B. utilization).
- U - Low Uncommercial - Less than 50 m³/ha (700 cu. ft./ac.) gross roundwood all species 13+ / 7 cm (5 inch S.D.O.B. to 3 inch top D.I.B. utilization).

(e) **Origin** - 3 examples of the 10 year age class system follows:

- 97 - 1970-79
- 96 - 1960-69
- 95 - 1950-59

(f) **Site** - 3 classes provided:

- G - Good
- M - Medium
- F - Fair

(g) **Steep Slope** (percent) - Recorded as 45% or greater following the site classification e.g. (86-M-45).

(h) **Disturbance:**

FACTOR	Severity & LOSS
V - Various	1 - Light 1 - 25%
W - Windfall	2 - Moderate 26 - 50%
X - Clearcut	3 - Heavy 51 - 75%
Y - Burn	4 - Severe 76 - 100%
Z - Insect and disease	

(i) **Conditions:**

- A - Site improved
- B - Seedbed prepared
- C - Planted and/or seeded
- D - Thinned
- S - Stagnant
- T - Terminating

(j) **Understory** - Each part of a two story stand is given an independent description and is recognized only when each component is two or more height classes different.

- e.g. B1A - H overstory
- 90-M
- B1SW - U understory
- 94-G

Stand Symbols for Non-Stocked Potentially Productive Forest Land.

(a) **Non-Stocked Land** - (Crown density of commercial species 0-5%)

- C.C. - Clear cut
- Burn - Burn
- W.F. - Windfall
- Brush - Brush

(b) **Non-Productive Forest Land**

- Scrub (coniferous) ↑
- Scrub (deciduous) ↻
- Open muskeg, Bog, Marsh ↑
- Treed muskeg ↑
- Grassland ↻
- Cutbank, sand, silt or gravel ↻

- Rock barren ↻
- Barren beyond treeline ↻
- Water ↻
- Cleared land ↻
- Cultivated ↻
- Slump or slide area ↻

- ↻
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(3) **General Symbols.**

- Legal boundary (in red)
- Surveyed line, township or section
- Unsurveyed line, township or section
- Quarter section line
- Intermittent Creek
- River over 20 m (1 chain) wide

- Watershed height of land
- Forest Stand Boundary
- Trail or seismic line
- Millsite
- Sawdust pile

Color references: Softwood over 18 m (60 feet) - dark green
Mixed wood over 18 m (60 feet) - dark brown

Further information is available from Forest Officers and Forestry Offices.
Each phase of Forest Inventory has a slightly different set of Specifications.

APPENDIX 5

PROVINCIAL STAND DAMAGE APPRAISAL TABLE

The land base used for the provincial stand damage appraisal table was as follows:

- green zone only
- managed Forest Management Units (FMU's) only, no outside units ('0') were included
- lands not managed by the Alberta Forest Service were excluded such as parks, wilderness areas, Metis colonies, indian lands, private land, federal land, and townsites
- Forest Management Units (FMU's) A9, A11, A12, A13, F3, F4, F10, F16, F17, F18, F19, and F20 were excluded from the land base
- Forest Management Agreement areas (FMA's) were excluded except as indicated under volumes below
- stand overstories only, no understories were included

The volumes used in the provincial stand damage table were as follows:

- all volumes were 15+/11 cm utilization standard, gross volume
- coniferous volumes were included from all stands within Weldwood's FMA area
- deciduous volumes included aspen (AW) and birch (BW) only, balsam poplar volumes were excluded
- deciduous volumes were included from all stands within Alberta Energy Company's FMA area
- deciduous volumes were excluded from all stands within the Bow/Crow Forest

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ALBERTA FOREST INVENTORY - PHASE 3
 TIMBER MANAGEMENT BRANCH
 PROVINCIAL STAND DAMAGE APPRAISAL
 PROVINCIAL EXCLUDING FMA'S: A9, A11, A12, A13,
 F3, F4, F10, F16, F17, F18, F19, F20

HEIGHT	DENSITY	CODED COVER GROUP	CONIFEROUS VOLUME 15/71	DECIDUOUS VOLUME 15/71	AREA (HA)	CONIFEROUS VOLUME/HA	DECIDUOUS VOLUME/HA
		5	.0	.0	1,390,032.9	.0	.0
		6	.0	.0	6,812,880.0	.0	.0
		7	.0	.0	1,673,876.9	.0	.0
		8	.0	.0	845,837.1	.0	.0
		9	.0	.0	99,055.8	.0	.0
	*TOTAL HEIGHT		.0	.0	10,821,682.7	.0	.0
0	A	1	.0	.0	24,850.9	.0	.0
		2	.0	.0	6,971.0	.0	.0
		3	.0	.0	1,675.1	.0	.0
		4	.0	.0	5,858.2	.0	.0
	B	1	.0	.0	63,348.4	.0	.0
		2	.0	.0	6,958.8	.0	.0
		3	.0	.0	10,308.5	.0	.0
		4	.0	.0	28,172.8	.0	.0
	C	1	.0	.0	453,944.8	.0	.0
		2	.0	.0	59,639.1	.0	.0
		3	.0	.0	51,753.6	.0	.0
		4	.0	.0	134,576.2	.0	.0
	D	1	.0	.0	375,722.8	.0	.0
		2	.0	.0	38,676.7	.0	.0
		3	.0	.0	39,747.2	.0	.0
		4	.0	.0	84,098.7	.0	.0
	*TOTAL HEIGHT 0		.0	.0	1,386,302.8	.0	.0
1	A	1	1,936,215.4	55,290.4	98,081.3	19.7	.6
		2	65,066.6	22,005.5	12,208.6	5.3	1.8
		3	216,231.9	50,512.7	15,409.5	14.0	3.3
		4	134,002.0	151,827.0	33,141.3	4.0	4.6
	B	1	6,758,391.7	299,954.0	289,827.2	23.3	1.0
		2	413,023.3	300,130.0	42,701.6	9.7	7.0
		3	661,081.4	198,639.4	61,314.8	10.8	3.2
		4	800,480.3	1,082,479.8	154,318.0	5.2	7.0
	C	1	46,438,007.6	2,144,766.7	1,254,645.1	37.0	1.7
		2	3,371,026.7	3,601,727.0	175,000.2	19.3	20.6
		3	3,989,491.5	2,170,645.3	255,543.1	15.6	8.5
		4	11,628,816.4	21,276,990.2	1,048,330.8	11.1	20.3
	D	1	37,446,835.5	1,495,944.0	623,398.0	60.1	2.4

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ALBERTA FOREST INVENTORY - PHASE 3
 TIMBER MANAGEMENT BRANCH
 PROVINCIAL STAND DAMAGE APPRAISAL
 PROVINCIAL EXCLUDING PHASES A1, A2, A13,
 F3, F4, F10, F16, F17, F18, F19, F20

HEIGHT	DENSITY	CODED COVER GROUP	CONIFEROUS VOLUME 15+/11	DECIDUOUS VOLUME 15+/11	AREA (HA)	CONIFEROUS VOLUME/HA	DECIDUOUS VOLUME/HA
1	D	2	890,082.2	915,607.5	37,878.0	23.5	24.2
		3	733,296.0	368,127.1	51,797.7	14.2	7.1
		4	2,501,258.8	14,865,496.4	490,843.9	5.1	30.3
		*TOTAL HEIGHT 1	117,983,307.3	49,000,143.0	4,644,439.1	25.4	10.6
2	A	1	8,556,736.1	655,214.9	124,090.9	69.0	5.3
		2	1,587,252.3	285,711.9	28,483.2	55.7	10.0
		3	1,404,447.9	473,139.8	27,533.7	51.0	17.2
		4	881,318.8	1,387,378.4	60,278.9	14.6	23.0
	B	1	32,422,048.3	2,042,240.0	328,555.1	98.7	6.2
		2	4,546,706.7	1,210,462.8	58,856.5	77.3	20.6
		3	3,847,720.0	1,421,882.2	67,181.4	57.3	21.2
		4	5,110,426.6	7,092,660.1	213,292.3	24.0	33.3
	C	1	138,953,460.1	8,455,225.1	982,477.7	141.4	8.6
		2	19,160,108.1	6,413,090.7	178,893.9	107.1	35.8
		3	13,637,218.9	9,095,031.8	219,739.3	62.1	41.4
		4	37,560,565.8	99,612,301.2	1,371,097.6	27.4	72.7
	D	1	114,505,021.6	3,678,421.0	631,920.7	181.2	5.8
		2	4,499,854.1	1,124,041.7	40,294.7	111.7	27.9
		3	3,351,800.8	2,352,746.3	52,476.5	63.9	44.8
		4	9,797,600.9	50,332,001.7	622,222.1	15.7	80.9
*TOTAL HEIGHT 2		399,822,287.0	195,631,549.6	5,007,394.5	79.8	39.1	
3	A	1	13,248,399.3	1,046,247.4	113,842.3	116.4	9.2
		2	4,681,420.3	1,147,984.5	42,267.3	110.8	27.2
		3	3,581,398.6	2,080,950.6	46,321.1	77.3	44.9
		4	5,174,468.4	5,046,007.0	96,407.0	53.7	52.3
	B	1	46,591,533.9	3,903,185.9	274,345.8	169.8	14.2
		2	15,939,074.9	5,210,598.0	120,889.1	131.8	43.1
		3	8,950,449.9	6,039,237.8	97,517.5	91.8	61.9
		4	9,805,715.2	20,076,439.5	236,861.3	41.4	84.8
	C	1	143,898,012.6	13,880,228.8	655,492.0	219.5	21.2
		2	71,149,218.0	24,625,403.8	412,750.2	172.4	59.7
		3	35,861,230.4	29,858,467.8	303,505.3	118.2	98.4
		4	40,387,656.2	107,489,615.2	809,279.4	49.9	132.8
	D	1	54,112,508.4	3,059,561.8	203,396.9	266.0	15.0
		2	11,515,957.3	4,156,080.3	57,056.2	201.8	72.8
		3	5,208,463.2	5,743,334.0	42,621.0	122.2	134.8

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ALBERTA FOREST INVENTORY - PHASE 3
 TIMBER MANAGEMENT BRANCH
 PROVINCIAL STAND DAMAGE APPRAISAL
 PROVINCIAL EXCLUDING FMA'S, A9, A11, A12, A13,
 F3, F4, F10, F16, F17, F18, F19, F20

HEIGHT	DENSITY	CODED COVER GROUP	CONIFEROUS VOLUME 15/711	DECIDUOUS VOLUME 15/711	AREA (HA)	CONIFEROUS VOLUME/HA	DECIDUOUS VOLUME/HA
3	D	4	10,109,161.6	33,682,609.0	210,876.0	47.9	159.7
*TOTAL HEIGHT 3			480,214,668.2	267,045,951.4	3,723,428.4	129.0	71.7
4	A	1	2,857,033.2	293,141.6	18,343.3	155.8	16.0
		2	907,126.3	314,971.8	7,939.1	114.3	39.7
		3	1,075,763.1	608,076.8	17,142.5	62.8	35.5
		4	2,840,558.0	2,202,986.6	47,705.1	59.5	46.2
	B	1	17,228,263.1	1,597,853.0	88,859.3	193.9	18.0
		2	8,190,116.2	2,658,366.0	56,247.6	145.6	47.3
		3	3,623,295.5	2,690,047.7	45,589.0	79.5	59.0
		4	5,327,892.6	6,630,076.8	98,752.0	54.0	67.1
	C	1	37,286,386.9	4,415,916.1	153,024.4	243.7	28.9
		2	28,003,302.2	10,408,991.9	161,576.4	173.3	64.4
		3	10,809,828.9	7,464,293.3	85,641.5	126.2	87.2
		4	8,298,311.8	13,658,930.8	142,088.7	58.4	96.1
	D	1	3,137,769.7	284,670.3	10,182.0	308.2	28.0
		2	2,682,169.7	858,306.1	13,001.2	206.3	66.0
		3	1,362,082.8	863,279.7	7,044.1	193.4	122.6
		4	519,213.1	1,197,025.1	9,700.6	53.5	123.4
*TOTAL HEIGHT 4			134,149,113.1	56,146,933.6	962,836.8	139.3	58.3
5	A	1	108,860.6	11,296.2	799.2	136.2	14.1
		2	10,578.8	3,059.1	102.2	103.5	29.9
		3	611.5	465.6	18.7	32.7	24.9
		4	1,866.4	2,783.8	28.5	65.5	97.7
	B	1	360,039.1	36,902.3	2,021.8	178.1	18.3
		2	96,319.4	32,950.2	701.3	137.3	47.0
		3	5,485.6	6,106.0	85.4	64.2	71.5
		4	8,645.8	8,482.8	169.3	51.1	50.1
	C	1	480,638.9	68,002.2	1,987.7	241.8	34.2
		2	117,842.1	47,306.8	743.1	158.6	63.7
		3	25,800.2	20,649.9	195.3	132.1	105.7
		4	5,378.3	23,062.5	138.6	38.8	166.4
	D	1	9,990.7	2,422.2	43.1	231.8	56.2
		2	6,087.3	2,108.3	28.3	215.1	74.5
*TOTAL HEIGHT 5			1,238,144.7	265,597.9	7,062.5	175.3	37.6
TOTAL			1,133,407,520.3	568,090,175.5	26,553,146.8	42.7	21.4

SITE INDEX CURVES

Medium Site

