

Model Implementation Reduction Factors (MIRF) for Spectrum Modeling

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This paper provides documentation for the estimation of MIRF for the 2006 Forest Plan Amendment Draft EIS. It steps through each of the subfactors that are included in the MIRF and the descriptions reference the documentation for MIRF estimation in the 1997 FEIS (TLMP 1117, RS-H-1-c; Planning Record # JLM 520). MIRF is defined for each of the old administrative areas, the three volstrata, each of the three operability classes, and for old growth and young growth. In addition, it can be defined separately for each alternative.

MIRF Elements

Each of the nine MIRF subfactors used in the 1997 FEIS (Riparian Habitat was actually divided into two subfactors so there were 10 identified in 1997) is addressed in this paper. These subfactors are listed below and described in the following paragraphs.

- Land Selections – reduction due to the conveyance of selected lands to the State of Alaska and Native interests
- TTRA Stream Buffers – reduction due to unmapped Class I and II stream buffers
- Non-Commercial Forest – reduction due to volume class mapping errors
- Slope/Soil Hazard – reduction due to unmapped steep slopes
- Cost Efficiency – excludes stands with the lowest economic potential from the suitable base
- Riparian Habitat (Class III streams) – reduction due to unmapped Class III stream buffers
- Karst/Caves – reduction due to upgrading of the karst classification to high vulnerability on some areas
- Deer Habitat reduction due to implementation of deer habitat standards and guidelines (some 1997 alternatives included these)
- Remaining Standards & Guidelines – reduction due to unmapped raptor and murrelet nests, wolf dens, mountain goat habitat, and habitat linkages.

Land Selections

This subfactor estimates the reduction in the suitable land base as a result of conveyance of land to the State of Alaska and Native interests. In 1997, it was assumed that past land selections were representative of future land selections. It was also recognized that the subfactor may be overestimating the suitable lands lost because Native Corporations may select townsites near shore and within the 1,000-ft beach fringe.

In 1997, this subfactor was estimated by determining (with GIS) that there was 638,737 acres of encumbered lands and that 186,980 acres remained to be conveyed. This

indicated that 29% of the encumbered lands would be transferred out of Forest Service ownership. Then, the amount of encumbered suitable lands was estimated and 29% was applied to those lands, producing the estimated suitable lands likely to be conveyed. This acreage was divided by the total suitable lands to estimate MIRF for this subfactor, which was rounded to be 2%.

In 2006, the following estimates are made using GIS and other knowledge of lands remaining to be conveyed (see NA_AllOther-LUD-Suit-SDM.xls and NA_C-TB_LUD-Suit-SDM.xls):

- Total encumbered lands = 260,487 acres (not including encumbered lands in Misty Fiords)
- Current suitable (Alt 5) encumbered lands = 33,589 acres
- Remaining lands to be conveyed (40,000 State and 65,000 Native interests) = 105,000 acres
- Percent of encumbered to be conveyed ($105,000/260,487$) = 40%
- 40% of Current suitable encumbered lands = 13,436 acres
- Total current suitable = 1,044,587 acres
- MIRF subfactor ($13,436/1,044,587$) = 1%

Therefore, 1% was used for this MIRF subfactor. This percent was used for all volstrata, operabilities, and alternatives. The same 1% was used for old growth and young growth.

TTRA Stream Buffers

This subfactor estimates the reduction in the suitable land base due to unmapped Class I and II stream buffers. In 1997, it was assumed that the loss of suitable timber was proportional to its occurrence and that streams were randomly distributed across the landscape.

In 1997, this subfactor was estimated using the Forest Service response to the Irland Group report, Chatham data, Central Prince of Wales Island data, and Stikine field reviews. The following unmapped TTRA buffer MIRF estimates were made based on each of these studies:

- Irland Study (1992) – 2.50%
- Chatham (1995) – 3.91%
- Central Prince of Wales Island (1995) – 3.62%
- Stikine Field Visit – 2.32%

Based on these estimates, the 1997 MIRF for this subfactor was 2.5%.

For 2006 we assumed that this percentage is reduced to 2% for old-growth stands. This is because of the amount of field survey work and the amount of updating of the streams GIS layer that has occurred in the 10-15 years since these studies were done. For young-growth stands, it was assumed that this subfactor should equal 1%, because more field work and stream delineation has taken place within these stands.

Non-Commercial Forest

This subfactor estimates the reduction in the suitable land base due to volume class mapping errors. In 1997, it was assumed that falldown due to mis-mapping is the same for all three Areas.

In 1997, J. Caouette used the Forest Inventory plot data (1970's) and the revised TIMTYPE volstrata to identify plots designated as high/medium/low that actually had < 8,000 BF/acre. This analysis indicated that 2% of the medium volstrata plots and 18% of the low volstrata plots were < 8,000 BF/acre. The reduction for the medium plots was not used because it was judged too small and would overlap with other fall-down factors. So 18% MIRF was used for this subfactor only for the low volstrata.

In 2006, we used 10% MIRF for low volstrata for this subfactor. The change is explained as follows. Based on a telephone conversation with J. Caouette, the 18% figure for the amount of low volstrata that turns out to be Non-POG is still reasonable, even with the new inventory data. However, we decided that there should be recognition of "fall-up" or the determination that areas of Unproductive Forest are POG. This is something that occurs with every timber sale. John estimated, based on his detailed experience with the inventory data, that 5-10% of the Unproductive Forest is POG (> 8,000 BF/acre). So we followed these steps:

- The Tongass has 4.22 million acres of Unproductive Forest, 4.95 million acres of POG, and 0.98 million acres of Low Volstrata POG
- If 5% of the Unproductive forest is Low Volstrata POG, then there are 0.21 million additional acres of Low Volstrata POG
- 0.21 million acres represents a 21% increase in the amount of Low Volstrata
- If the Forested Muskeg type of Unproductive Forest is not included in Unproductive Forest, then there are 3.15 million acres and 5% of 3.15 million acres is 0.16 million acres. Assuming only half of these acres are actually identified and incorporated into units, this results in 0.08 million acres represents an 8% increase in the amount of Low Volstrata.

Therefore, being conservative and using only half of the 5% of the "other" Unproductive Forest as "fallup," in 2006 we assumed an 8% "fall-up" and an 18% fall-down. Therefore, the MIRF for this subfactor is the net difference, which produces a 10% reduction in Low Volstrata. There is no reduction due to this subfactor that is assumed for young-growth stands, which are assumed to have been harvested only in productive forest land.

Slope/Soil Hazard

This subfactor estimates the reduction in the suitable land base due to unmapped steep slopes. It represents the additional acreage of steep slopes identified during project implementation that is not already mapped, divided by the mapped suitable acres.

In 1997, it was based on a draft Baranof MIRF analysis (1996), the Forest Service response to the Irland Group report (1995), Chatham data, Central Prince of Wales Island

data, and the Ketchikan cumulative effects contract study (on suitable and fall-down by project area). Based on these sources, the 1997 MIRF for this subfactor was defined as 32% for Chatham and 3.1% for the Stikine and Ketchikan Areas.

For 2006, we reviewed the slope data that was developed to produce the suitability layer for the new Tongass LSTA. This new layer (which removes slopes >72% and includes more detailed information, including LIDAR) already removes many of the steep slopes that were not accounted for in 1997. A GIS query examined the acres in steep slopes that are not in MMI4. This amounted to 6% of the suitable in the Chatham Area and 3% of the suitable in the Ketchikan and Stikine. In addition, there are two other factors that affect the MIRF for this subfactor: First, there is a certain amount of “fall-up” for areas mapped as MMI4 and areas mapped as >72% slope. These positive factors, were not factored into the 1997 MIRF. Second, there is a large amount of area removed due to being mapped as Site Index = 1 and it appears that more areas are added back in (due to “fall-up”) than are taken out due to site index. Therefore, for 2006, we reduced the Chatham MIRF for this subfactor to 26% and the Ketchikan and Stikine MIRFs to 1%.

Because past harvest generally avoided oversteepened slopes (relative to their existence on the landscape), we reduced the Chatham MIRF for this subfactor to 10% for young growth; however, the Ketchikan and Stikine MIRFs were maintained at 1% in young growth for this subfactor.

Cost Efficiency

This subfactor excludes the stands with the lowest economic potential from the suitable land base. In 1997, 36 CFR 219.14[c][3] was applied and it was assumed that future economic potential could be estimated using past harvest experience.

In 1997, the subfactor was estimated using the best professional judgement of Bill Wilson and Don Golnick. They assumed that no harvest would be conducted in Low Volstrata if it was in the Difficult or Isolated Operability Class. In addition, they assumed the same for Medium Volstrata in the Isolated Operability Class. Therefore, these cells had a 100% MIRF for this subfactor.

In 2006, it was decided that economics should be factored in differently because the Spectrum modeling extends over a 150-year period. It was decided to make the MIRF for this subfactor equal to 25% for Difficult/Low Volume and Isolated/Medium Volume and 50% for Isolated/Low Volume. These subfactors are additive with the other subfactors; therefore, the combined MIRF for these low economic categories ranges from 44 to 79% in Ketchikan, 38 to 73% in the Stikine, and 64 to 99% in the Chatham Area (see attached Excel file).

In the case of young growth, the subfactor was assumed to equal 0%, because past logging did not harvest areas with the lowest economic potential.

Riparian Habitat (Class III Streams)

This subfactor estimates the reduction in the suitable land base due to unmapped Class III stream buffers. In 1997, it was assumed that 50% of the Class III streams would need to be buffered and that 50% of the Class III streams were unmapped.

In 1997, the subfactor was estimated to be 14% based on estimating 50% of unmapped Class III stream acreage and then relating it to the suitable. It appears that the amount of suitable used in the calculation was incorrect, making the percentage higher than it should have been.

In 2006, it was decided to be more conservative (although a lower MIRF was estimated). The MIRF for this subfactor was calculated as follows:

- It was calculated by GIS that there were 7,557 miles of Class III streams in the Development LUDs of the No Action alternative.
- Since 29% of these Development LUDs represent suitable forest land, it was estimated that there are 2,191 miles on suitable forest land
- Assuming all are buffered and the buffers are 100 ft on each side, these stream miles would produce 53,114 acres of buffers.
- Assuming an equal amount will be established in the future: 53,114 divided by 1,044,588 gives a MIRF of 7.6%
- To be conservative, we rounded this MIRF to 8% for old growth.
- For young growth, this subfactor was assumed to be 4%, because a much higher percentage of Class III streams have been mapped in harvested stands.

Karst/Caves

This subfactor estimates the reduction in the suitable land base due to a change in karst classification from low or moderate to high vulnerability. In 1997, it was assumed (based on the professional judgement of J. Baichtal (1996) and others) that 30% of low-moderate lands in Ketchikan should be high vulnerability; similarly, the percentages for the Stikine and Chatham are 10% and 20%.

In 1997, the subfactor was estimated based on professional judgement and GIS queries. For Alternative 11, the MIRF values for this subfactor were: 0.5% for the Chatham Area, 0.3% for the Stikine Area, and 5.9% for the Ketchikan Area.

In 2006, GIS queries were made again, using the new karst rock layer (tkarst06). The MIRF for this subfactor were calculated as follows:

- It was determined there are 100,743 acres of karst rock on suitable lands on the Forest
- These were apportioned among the Admin Areas as follows: 18.5% (18,637 acres) to the Chatham; 5.2% (5,239 acres) to the Stikine; and 76.3% (76,867 acres) to Ketchikan.
- Applying the 30%, 10%, and 20% factors defined in 1997 for the Admin. Areas produces the following: 3,727 acres of upgrading to high vulnerability (falldown)

for the Chatham, 524 acres for the Stikine, and 23,060 acres for the Ketchikan Areas.

- Dividing these by the amount of suitable for these areas (277,016, 354,362, and 413,210, respectively) produces the final MIRFs for this subfactor:
 - Chatham = 1.3%; rounded to 1% for old growth and young growth
 - Stikine = 0.1%; rounded to 0% for old growth and young growth
 - Ketchikan = 5.6%; rounded to 6% for old growth and 3% for young growth (because of better karst knowledge in areas of past harvest)

Deer Habitat

This subfactor estimates the reduction in the suitable land base due to implementation of the deer standards and guidelines. In 1997, these applied to the high and medium Volstrata for Alternatives 3, 4, 5, and 6 of the 1997 FEIS.

In 2006, this subfactor is not used, because none of the 2006 alternatives include these deer habitat standards and guidelines.

Remaining Standards & Guidelines

This subfactor estimates the reduction in the suitable land base due to unmapped eagle/osprey nests, goshawk nests, murrelet nests, wolf dens, goat habitat, and 600-ft. habitat linkages. In 1997, this subfactor was estimated at 1% based on the best professional judgement of Bill Wilson and Don Golnick.

In 2006, it was decided to maintain the MIRF of 1% for this subfactor in both old growth and young growth.

Overall Results

The sum of these subfactors produces the overall MIRF for each category (administrative area, volstratum, and operability class). The range of values within each administrative area and volstratum for old growth, and by administrative area for young growth, are summarized in Table 1. Table 2 presents the overall average MIRF values for each of the Draft EIS alternatives (based on the weighting of suitable lands in each alternative according to administrative area, volstrata, operability class, and old growth vs. young growth). Table 2 also includes the removals associated with the Legacy Standard & Guideline in Alternatives 1, 2, 3, and 6 and the Goshawk & Marten Standard & Guideline in Alternative 5. These are computed in a manner consistent with the prescriptions in the standard and guideline (e.g., VCU harvest levels, biogeographic province, etc.). It should be noted that the values presented in Table 2 are based on the total suitable acres, not the actual acres removed during the Spectrum modeling (which may vary slightly).

Detailed MIRF values for each subfactor are presented by administrative area, volstrata, and operability class for old growth in Table 3. Young growth values are presented in Table 4; these are presented only by administrative area and operability class, since the volstrata classification is for old growth only.

Table 1. Summary of 2006 MIRF Values				
Admin. Area	Old Growth Low Volstratum	Old Growth Medium Volstratum	Old Growth High Volstratum	Young Growth
Chatham	49% – 99%	39% – 64%	39%	18%
Stikine	23% – 73%	13% – 38%	13%	11%
Ketchikan	29% – 79%	19% – 44%	19%	8%

Table 2. Average MIRF Values for each Draft EIS Alternative				
Alternative	Basic MIRF^{1/}	Additional MIRF due to Legacy S&G^{2/}	Additional MIRF due to Goshawk & Marten S&G^{2/}	Overall Average MIRF
1	17.4%	1.5%	0.0%	19.0%
2	19.7%	1.5%	0.0%	21.2%
3	20.8%	1.4%	0.0%	22.2%
4	23.6%	0.0%	0.0%	23.6%
5	22.5%	0.0%	4.5%	27.0%
6	22.4%	1.3%	0.0%	23.7%
7	23.5%	0.0%	0.0%	23.5%

^{1/} Basic MIRF refers to the sum of the MIRF subfactors described in this document.

^{2/} These factors are computed based on the estimated percent retention for each VCU, as prescribed by the standard & guideline after other standards & guidelines are applied.

Table 3. 2006 MIRF Values for Old Growth

Land Selections	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High		1%	1%	1%	High	1%	1%	1%	High	1%	1%
Medium		1%	1%	1%	Medium	1%	1%	1%	Medium	1%	1%	1%
Low		1%	1%	1%	Low	1%	1%	1%	Low	1%	1%	1%
TTRA Buffers	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High		2%	2%	2%	High	2%	2%	2%	High	2%	2%
Medium		2%	2%	2%	Medium	2%	2%	2%	Medium	2%	2%	2%
Low		2%	2%	2%	Low	2%	2%	2%	Low	2%	2%	2%
Non-Commercial Forest	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High		0%	0%	0%	High	0%	0%	0%	High	0%	0%
Medium		0%	0%	0%	Medium	0%	0%	0%	Medium	0%	0%	0%
Low		10%	10%	10%	Low	10%	10%	10%	Low	10%	10%	10%
Slope/Soil Hazard	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High		26%	26%	26%	High	1%	1%	1%	High	1%	1%
Medium		26%	26%	26%	Medium	1%	1%	1%	Medium	1%	1%	1%
Low		26%	26%	26%	Low	1%	1%	1%	Low	1%	1%	1%
Cost Efficiency	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High		0%	0%	0%	High	0%	0%	0%	High	0%	0%
Medium		0%	0%	25%	Medium	0%	0%	25%	Medium	0%	0%	25%
Low		0%	25%	50%	Low	0%	25%	50%	Low	0%	25%	50%

Table 3. 2006 MIRF Values for Old Growth (cont.)

Riparian (Class III buffers)	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High	8%	8%	8%	High	8%	8%	8%	High	8%	8%	8%
	Medium	8%	8%	8%	Medium	8%	8%	8%	Medium	8%	8%	8%
	Low	8%	8%	8%	Low	8%	8%	8%	Low	8%	8%	8%
Karst/Caves	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High	1%	1%	1%	High	6%	6%	6%	High	0%	0%	0%
	Medium	1%	1%	1%	Medium	6%	6%	6%	Medium	0%	0%	0%
	Low	1%	1%	1%	Low	6%	6%	6%	Low	0%	0%	0%
Remaining S&Gs	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
	High	1%	1%	1%	High	1%	1%	1%	High	1%	1%	1%
	Medium	1%	1%	1%	Medium	1%	1%	1%	Medium	1%	1%	1%
	Low	1%	1%	1%	Low	1%	1%	1%	Low	1%	1%	1%
TOTAL	Chatham	Normal	Difficult	Isolated	Ketchikan	Normal	Difficult	Isolated	Stikine	Normal	Difficult	Isolated
	High	39%	39%	39%	High	19%	19%	19%	High	13%	13%	13%
	Medium	39%	39%	64%	Medium	19%	19%	44%	Medium	13%	13%	38%
	Low	49%	74%	99%	Low	29%	54%	79%	Low	23%	48%	73%

Table 4. 2006 MIRF Values for Young Growth

Land Selections	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		1%	1%	1%		1%	1%	1%		1%	1%	1%
TTRA Buffers	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		1%	1%	1%		1%	1%	1%		1%	1%	1%
Non-Commercial Forest	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		0%	0%	0%		0%	0%	0%		0%	0%	0%
Slope/Soil Hazard	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		10%	10%	10%		1%	1%	1%		1%	1%	1%
Cost Efficiency	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		0%	0%	0%		0%	0%	0%		0%	0%	0%
Riparian (Class III buffers)	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		4%	4%	4%		4%	4%	4%		4%	4%	4%
Karst/Caves	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		1%	1%	1%		3%	3%	3%		0%	0%	0%
Remaining S&Gs	Chatham Area	Normal	Difficult	Isolated	Ketchikan Area	Normal	Difficult	Isolated	Stikine Area	Normal	Difficult	Isolated
		1%	1%	1%		1%	1%	1%		1%	1%	1%
TOTAL	Chatham	Normal	Difficult	Isolated	Ketchikan	Normal	Difficult	Isolated	Stikine	Normal	Difficult	Isolated
		18%	18%	18%		11%	11%	11%		8%	8%	8%