Appendix I

Executive Summary on Generic Environmental Impact Statement Report Card Study

Minnesota Timber Harvesting GEIS:

An Assessment of the First 10 Years

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2. Wildlife/habitat Changes 1990-2000

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EXECUTIVE SUMMARY

GEIS Accuracy and Implementation Assessment

In response to concerns about the potential impacts of increasing timber harvest levels, a Generic Environmental Impact Statement (GEIS) on timber harvesting and forest management in Minnesota was initiated in 1989.[1] Released in 1994, the GEIS assessed the environmental and related impacts of three levels of statewide timber harvesting intensity. In addition to the assessment, recommendations were developed to mitigate the adverse impacts identified in the assessment. These recommendations included site-level responses, landscape-level responses, and forest resources research.

This study, initiated 11 years after the release of the GEIS findings and recommendations (2005), serves to assess the accuracy of the original GEIS projections for statewide timber harvesting intensity and its associated impacts, as well as the level of implementation of the various mitigation strategies. The purpose is to assess the ability to predict future forest resource conditions and to describe the status of mitigations in the form of forest management practices relative to the GEIS recommendations. A summary of the results of this study is reported below in four parts.

1. Actual and Projected Harvest and Forest Change 1990-2000

Timber Harvest. Actual timber harvests were compared with the GEIS projected harvest statewide for 1990 to 2000. The GEIS was not intended to predict harvest levels. Rather, it projected scenarios considered plausible and instructive with respect to describing and mitigating potential environmental impacts. Ultimately, the GEIS 4 million-cord level was the scenario closest to the actual harvest over this time period. The most important results were:

- **The actual harvest fell slightly short of the GEIS base scenario (4 million-cord level) (varying between 99% in 1994 and 89% in 2000).** From 1990-2001, the cumulative harvest was approximately 3.3 million cords less than projected over this period in the GEIS base scenario—an amount equivalent to nearly one year's harvest.

- **The GEIS projections of harvest proportions by species group were comparable to actual harvests except that the assumed strong substitution of hardwoods for aspen had not taken place by the year 2000.** Instead, aspen harvests remained strong and imports (largely from Canada) added to that supply.

- **Annual variation in harvest levels were attributed to catastrophic events including: extensive blowdowns in 1995 and 1999, extensive spruce-budworm damage, faltering economic conditions beginning in 2000, global consolidation within the forest products industry, level of imports, and Canadian timber trade issues.** Such factors are not

[1] Jaakko Pöyry Consulting, Inc. 1994. Final Generic Environmental Impact Statement on Timber Harvesting and Forest Management in Minnesota. Prepared for the Minnesota Environmental Quality Board. Tarrytown, NY: Jaakko Pöyry Consulting, Inc. 549 p. plus 6 appendices.

uncommon in the span of a decade, but they are almost impossible to predict as to when, where, and what extent they might arise. Consequently, predictions of harvest levels and trends over a decade and beyond are very difficult to project precisely and accurately, especially by species.

- **Importantly, the changing technology for species utilization and demand has a major effect on when and to what extent species substitution (for example hardwoods for aspen) may occur.** In particular, the projected increase in utilization of hardwoods other than aspen simply did not occur as quickly as anticipated. However, such substitution has grown rapidly since 2001.

Forest Change. Change in a forest is due largely to tree growth and mortality, natural succession, harvest, and regeneration as well as changes in forest area and area by forest type. Major findings were:

- **GEIS projected forest area for timberland appears close (after definitional and other adjustments) to the latest (2001) statewide forest inventory results.**[2] Reserved Forest and Other Forest area projections differ largely due to procedural and definitional changes in the 2001 inventory.

- **The GEIS projected forest age class distributions across all forest types are similar to FIA inventory estimates, but show the effects of the differences in harvest projections noted above, catastrophic events, faltering economic conditions, and imports.** For the 16 forest types, the 1994 projections are close for some and quite different for others. For aspen, the supply was harvest augmented by or substituted for with imports of aspen from Canada. For balsam fir, extensive spruce budworm damage and preferential partial harvesting of mixed species stands converted several hundred thousand acres to northern hardwood and birch forest types.

- **Sample size and associated sampling error is an important factor in comparisons of forest conditions.** The 2001 FIA inventory employed 6,250 field sample plots in forest categories; the 1990 inventory utilized 12,118 field sample plot locations in timberland alone. Of the 2001 sample plots, 65% were plots measured in the 1990 inventory. The effect of sampling error is small for statewide figures such as timberland area, but becomes larger and more important within breakdowns of forest type, especially by stand age or stand size class by forest type within an ecoregion.

- **Procedural and definitional change in the FIA methods between 1990 and 2001 surveys complicate comparisons and limit precision in assessing differences.** However, detailed expert inspection can identify, and in some cases account for, the differences. Differences between actual and projected stand age class by forest type acreages are in part due to simplification of the GEIS forest type classification algorithm that were necessary for

[2] The 2001 inventory was conducted over the period 1999-2003 and reported here as the midpoint of that effort, i.e., dated as 2001. However, the USDA Forest Service Forest Inventory and Analysis (FIA) program designates this as the 2003 inventory.

projections and changes in that algorithm made for the 2001 inventory. A similar problem exists with respect to stand size class x forest type acreages, which is especially important to wildlife habitat estimates.

2. Wildlife/habitat Changes 1990-2000

Forest Birds

Differences between the predicted population and observed population can be attributed to changes in the estimated density of birds within certain forest types, and/or to differences in projected area of forest types between the GEIS predictions and 2001 FIA data.

- **For 59 (43%) of 136 forest bird species, the population predictions made by the GEIS for the year 2000 were in agreement with estimated 2001 populations.** For two species, a significant increase or decrease in population was predicted, but the opposite change was observed. For three species, the GEIS predicted significant increases in population and a nonsignificant change was observed. Forty-one species have current populations at least 25% lower than they were in 1990 and were predicted to have nonsignificant changes, and 31 species increased in population by $\geq$25% from 1990 to 2000 and were projected to have nonsignificant population trends.

- **Two species of forest grouse (ruffed grouse and spruce grouse) were analyzed separately from the other forest birds.** The GEIS predicted negative but nonsignificant changes in habitat suitability for both species, which was in agreement with habitat suitability estimated from the 2001 FIA data.

- **The precision of forest bird (and mammal) estimates are likely highest for those with widespread habitat, e.g., state- or forest-wide, and less so for species found in only one or two ecoregions or counties.** The reason for such interpretation is that the FIA habitat estimates, notably those based on stand size class by forest type acreage, are increasingly imprecise as the area considered declines in size. For example, the 2001 FIA inventory noted 202 plots in the balsam fir forest type statewide. But when broken down further to the acreage within one of three stand-size classes and one of seven ecoregions, habitat estimates can be very imprecise and fluctuate from one inventory to the next. It is possible that such habitat estimates may produce artificially high fluctuations in population estimates for some species.

Mammals, Reptiles, and Amphibians

Habitat suitability predictions of the GEIS for 2000 were close to those of the actual 2001 FIA data for a large majority of species. The substantive differences that occurred for seven species can be explained by differences in forest type and age class predictions from the GEIS as compared to the FIA data for 2001.

- **For 24 of the 31 species analyzed, the GEIS predicted and the 2001 FIA-based habitat suitability indexes were within 10% of each other.** Least chipmunk, timber rattlesnake, boreal ringneck snake, eastern hognose snake, and pickerel frog each had positive changes

based on the 2001 FIA that were more than 10% above those predicted by the GEIS for 2001. Meadow vole and marten had negative changes in habitat suitability more than 10% greater in magnitude than predicted by the GEIS.

- **Except for red fox, independent population survey data for mammals from 1992 to 2002 showed a different direction and magnitude of trends than the habitat suitability index.** Actual populations for black bear, bobcat, fisher, marten, and snowshoe hare were much more positive than predicted using the habitat suitability index. These differences can be attributed to the cyclic nature of many of these species, changing availability of plants and/or prey species, hunting patterns, habitat management, and climate change.

3. Old and Old-growth Forest and Biodiversity Assessments

These characterizations are largely a function of forest area in various conditions and/or exogenous factors including windstorms and deer density.

- **The area of old forest on timberlands increased from 1.2 to 1.3 million acres between 1990 and 2001, whereas the GEIS predicted 1.75 million acres of old forest for 2000.** The majority of the 500,000 acre difference is accounted for by changes in balsam fir, paper birch and aspen, and can be explained by three factors: (1) the GEIS growth model allowed stands to continue growing older when in reality many such stands would break up or succeed to other forest types; (2) extensive spruce budworm infestation in balsam fir; and (3) major blowdown events of 1995 and 1999, which were not accounted for in the GEIS.

- **The GEIS harvesting models assumed that 50,000 acres of old growth would be found and reserved, and, therefore, did not project any specific impacts on old growth.** Since the GEIS, The Minnesota Department of Natural Resources (MN DNR) has inventoried and set aside 44,800 acres of old growth and future old growth forest on state-owned lands. Invasive species of plants and animals (especially European earthworms), diseases, and pests have become a major issue for maintenance of biodiversity and forest productivity. The GEIS did not predict the degree to which invasive species are now disrupting native forest plant communities, including tree reproduction.

- **The GEIS did not predict the degree to which deer grazing became a significant negative factor in maintenance of biodiversity and forest productivity over the last decade**. There is now a widespread consensus that high deer populations are causing damage to tree regeneration and causing extirpation of native plants over large landscapes.

- **Invasive species and deer grazing have more direct impact on biodiversity than harvesting**. Harvesting impacts are mostly indirect by creating a mosaic of forest types and ages across the landscape.

- **The MN DNR has recently developed a new classification system and ranking of rarity for plant communities.** The list of rare communities differs substantially from that available at the time the GEIS was written.

4. GEIS Mitigation Assessment

Two surveys were developed to assess the implementation of the GEIS mitigation strategies. One was sent to the state's largest forest land managers to gather information regarding the level of knowledge and implementation of the site-level mitigation recommendations. The survey also asked these managers to rate their participation and the perceived usefulness of the landscape-level mitigation strategies implemented by the Minnesota Forest Resource Council (MFRC). The second survey was sent to the MFRC to assess its efforts in implementing the GEIS site-level mitigations, landscape-level mitigations, and the research recommendations. All organizations with active forest management and timber harvesting programs (16 public organizations, seven private companies, and one tribal council which collectively manage nearly 10 million acres of forest land) returned completed surveys, as did the MFRC.

A comparison of the survey results to state guideline implementation monitoring data was attempted to assess the consistency between self-reported and empirical data. This assessment concluded few comparisons were possible due to a lack of consistency between the two data sets with respect to site-level practice information collected and reporting results by ownership group. The survey did not include nonindustrial private forest (NIPF) owners, who collectively manage nearly 40% of the state's forest land. The results of the survey are summarized in the following
tables.

Important findings from the mitigation assessment include:

Guideline Implementation

- **In 1994, timber harvesting practices were reported to be largely consistent with the guidelines.** Organizations representing 71% of the forest land area indicated that in 1994 their timber harvesting practices were consistent with or exceeded the practices recommended in the guidelines.

- **Current timber harvesting practices are reported to be consistent with or exceed the guidelines.** Today, all surveyed organizations indicate their timber harvesting practices are equal to or exceed those recommended in the guidelines.

- **Guidelines have impacted an organization's timber harvesting practices.** All of the responding organizations stated at least a few changes in practices had been made as a result of the guidelines, with a majority indicating the guidelines have resulted in a moderate level of change in their organization's practices. All organizations that characterized their practices as often being less than consistent with the guidelines in 1994 now describe them as either consistent with or often exceeding the guidelines.

Table I. Timber harvesting and forest management practices reported by 26 of Minnesota's largest public and corporate forest management organizations, 1994 and 2005.

	Commitment to guidelines through formal policy	**Forest land subject to practices consistent with MFRC guidelines: 1994**	**Forest land subject to practices consistent with MFRC guidelines: today**
	- - - - - Percentage of affected acres - - - - -		
Timber harvesting /forest management practices in general	96	71	100
Specific practices Management of riparian zones	94	71	100
Retention of snags and cavity trees	91	74	100
Retention of leave trees	93	74	100
Visual management	95	68	100
Retention of slash	93	61	93
		Forest land subject to practice: 1994	**Forest land subject to practice: current**
Harvesting on frozen soils	75	64	64
Uneven-aged management	34	7	12
Site regeneration	94	84	87
Species-site matching	42	92	95
Reduction of pest damage	50	23	24
Utilization standards	87		11*
Protection of sensitive wildlife sites	93	86	92

***** Number of organizations that have increased utilization standards for at least one product group and/or size class since 1994

Table II. Organizational involvement and perceptions of usefulness: MFRC landscape planning process.

	----------Program elements----------					**Program effectiveness**	**Program influence**
	Assessment of conditions	**Desired future conditions**	**Strategies to achieve future conditions**	**Coordination of land management activities**	**Evaluation of implementation strategies**	**Identify / address landscape forest resource issues**	**Program has changed how forests are managed**
Number of respondents	17	17	16	14	12	18	21
Level of involvement*	3.1	3.5	3.7	3.4	3.2	NA	NA
Level of usefulness / effectiveness / change	2.9**	2.7**	2.8**	2.6**	2.6**	2.7***	2.8****

***** Number represents the mean of responses using the following scale (5=extensive involvement, 4=moderate involvement, 3=modest involvement, 2=minimal involvement, and 1= no involvement).

** Number represents the mean of responses using the following scale (4=extremely useful, 3=moderately useful, 2=minimally useful, and 1=not useful).

*** Number represents the mean of responses using the following scale (4=extremely effective, 3=moderately effective, 2=minimally effective, and 1=not effective).

****Number represents the mean of responses using the following scale (5=extensive change, 4=considerable change, 3=some change, 2=few changes, and 1=no change).

- **Organizations routinely require the guidelines.** Ninety-six percent of the responding organizations representing 97% of the forest land area surveyed stated they require the guidelines when conducting timber harvesting and forest management activities on their land.

- **The MFRC guidelines are only one factor affecting changes in forest management in Minnesota.** New technology, third-party certification, national policies, federal and state laws, and court settlements were cited as important drivers of change in an organization's timber harvesting and forest management practices.

Guideline Policy

- **The majority of organizations have a formal policy governing use of the guidelines.** Seventeen of the 26 responding organizations representing more than 9.2 million acres (98% of the forest land area surveyed) indicated their organization has adopted a formal policy for incorporating guidelines.

- **Policies and practices vary between public and private organizations.** Public organizations are more likely to have an official policy regarding the use of specific practices recommended in the guidelines. These organizations were also more likely to have applied practices that were minimally consistent with the guideline recommendations in 1994. Private organizations are more likely to have changed their policy since 1994 and currently more likely to apply practices that exceed guideline recommendations.

- **Most organizations reference the guidelines in their timber sale contracts.** Fifteen organizations (65% of all responding organizations representing 92% of the forest land) indicated the guidelines are currently referenced in all of the organization's timber sales.

Guideline Knowledge and Training

- **Most organizations consider their staff to be knowledgeable of the guidelines.** The majority of organizations characterized their staff's knowledge of the guidelines to be considerable—59% of the organizations representing 82% of the forest land indicated so. All felt their staff has at least a moderate level of familiarity with and understanding of the guidelines.

- **The majority of organizations have had staff participate in formal guideline training sessions.** Sixty-three percent of the organizations surveyed have sent all of their staff to guideline training sessions, and an additional 30% have had many of their staff attend guideline training.

MFRC Landscape Planning/Coordination Program

- **Organizational involvement in the MFRC landscape planning program has varied.** Organizations were modestly to moderately involved in the MFRC's landscape planning process. The greatest level of organizational involvement was in the planning of strategies to achieve future forest conditions, while involvement was the least in the assessment of regional conditions.

- **Perceptions of the MFRC's landscape program effectiveness vary.** While 32% of the forest land is managed by organizations that perceive the program to be extremely effective in identifying and addressing landscape-level forest resource issues and coordinating forest management activities across large landscapes and multiple ownerships, 38% is managed by organizations that believe the program to be minimally or not effective in addressing landscape-level issues and facilitating coordination. Public organizations generally find the program to be more effective than do private organizations. It is important to note that the surveyed participants represent the largest public and private organizations but do not include NIPF or community participants.

- **The MFRC landscape program has modestly influenced forest management activities.** Thirteen of the 21 responding organizations (62%) indicated they have made some to extensive change in their management practices as a result of the landscape program, while eight (38%) stated the program has resulted in few to no changes.

- **Landscape plans have been completed and approved by the MFRC in the following landscapes: East Central, Northeast, North Central, West Central, Northern, and Southeast.** Development of a plan for the Metro landscape has been deferred for the time being. The MFRC has decided not to develop a landscape plan for the Prairie landscape.

- **The North, Northeast, North Central, Southeast, East Central and West Central landscapes all have coordination groups meeting on a regular basis to discuss and plan coordination activities.**

MFRC Research Initiatives

- **MFRC's research program has addressed a portion of the information needs identified in the GEIS.** While several important information needs identified in the GEIS have been addressed through the MFRC and its Research Advisory Committee, several remain. One example is a need to understand better the linkages and interactions between forest management and forest-based tourism industries.