



ECONOMIC ANALYSIS OF
CRITICAL HABITAT
DESIGNATION FOR THE CANADA
LYNX

Final Draft | August 24, 2006

prepared for:

Division of Economics

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

SECTION 1 FRAMEWORK FOR THE ANALYSIS 1-1

- 1.1 Approach to Estimating Economic Effects 1-2
- 1.2 Scope of the Analysis 1-5
- 1.3 Analytic Time Frame 1-11
- 1.4 Information Sources 1-11
- 1.5 Structure of Report 1-12

SECTION 2 BACKGROUND 2-1

- 2.1 Proposed Critical Habitat Designation 2-1
- 2.2 Threats to the Species and its Habitat 2-8

SECTION 3 TIMBER ACTIVITIES 3-1

- 3.1 Profiles of Regional Timber Industries 3-2
- 3.2 Changes in Timber Management Practices as a Result of Lynx Conservation Efforts 3-9
- 3.3 Pre-Designation Impacts to Timber Activities 3-12
- 3.4 Post-Designation Impacts to Timber Activities 3-13
- 3.5 Caveats 3-16

SECTION 4 DEVELOPMENT 4-1

- 4.1 Summary of Results 4-2
- 4.2 Methods and Assumptions 4-4
- 4.3 Unit by Unit Analysis 4-8

SECTION 5 RECREATION 5-1

- 5.1 Summary of Impacts to Recreation 5-1
- 5.2 Methods and Assumptions 5-5
- 5.3 Snowmobiling Scenario 2: Estimated Impacts by Unit 5-12
- 5.4 Hunting and Trapping 5-22
- 5.5 Other Recreational Projects 5-24

SECTION 6 PUBLIC LANDS MANAGEMENT AND CONSERVATION PLANNING 6-1

- 6.1 Summary of Impacts to Public Lands Management and Conservation Planning 6-1
- 6.2 Methods and Assumptions 6-7
- 6.3 Lynx Management 6-10
- 6.4 Lynx Conservation Research 6-16
- 6.5 Grazing 6-18
- 6.5 Wildlife Fire Management 6-20

SECTION 7 TRANSPORTATION, UTILITIES, AND MUNICIPAL ACTIVITIES 7-1

- 7.1 Summary of Impacts 7-1
- 7.2 Methods and Assumptions 7-6
- 7.3 Transportation Activities 7-8
- 7.4 Utility and Municipal Activities 7-12

SECTION 8 MINING OPERATIONS 8-1

- 8.1 Summary of Potential Impacts to Mining Activities 8-1
- 8.2 Methods and Assumptions 8-5
- 8.3 Economic Profile of Potentially Affected Mining Industries 8-6
- 8.4 Pre-Designation Economic Impacts on Mining Activities 8-9
- 8.5 Post-Designation Economic Impacts on Mining Activities 8-9

SECTION 9 TRIBAL ACTIVITIES 9-1

- 9.1 Introduction 9-1
- 9.2 Summary of Impacts to Tribes 9-2
- 9.3 Background and Socioeconomic Status of Potentially Affected Tribes 9-2
- 9.4 Unit 1: Maine 9-4
- 9.3 Unit 2: Minnesota 9-7

REFERENCES R-1

APPENDIX A SECTION 7 ADMINISTRATIVE CONSULTATION COSTS *A-1*

APPENDIX B ANALYSIS OF THE ECONOMIC BENEFIT MEASURES PRESENTED IN THE DEFENDERS OF WILDLIFE STUDY (JUNE 2004) *B-1*

APPENDIX C INITIAL REGULATORY FLEXIBILITY ANALYSIS AND ENERGY INDUSTRY IMPACTS ANALYSIS *C-1*

APPENDIX D TECHNICAL APPENDIX DESCRIBING DERIVATION OF IMPACTS TO TIMBER ACTIVITIES *D-1*

APPENDIX E RECREATION BENEFITS TRANSFER DISCUSSION *E-1*

APPENDIX F DETAILED UNIT BY UNIT IMPACTS *F-1*

EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation for the United States distinct population segment of the Canada Lynx (*Lynx Canadensis*) (hereafter, "lynx"). This report was prepared by Industrial Economics, Incorporated (IEc), under contract to the U.S. Fish and Wildlife Service's (Service) Division of Economics.
2. On November 9, 2005, the U.S. Fish and Wildlife Service (Service) published a proposed critical habitat designation for the lynx, which was clarified in a subsequent notice published on February 16, 2006.¹ This proposed rule included lands proposed for designation and lands considered for exclusion from the designation (collectively referred in this analysis as the "study area"). The study area includes 18,031 square miles (46,699 square km) of land in Maine, Minnesota, Montana, Idaho and Washington.
3. The study area is subdivided into four units. Much of the landscape is remote high elevation undeveloped lands, over 80 percent of which is currently managed for timber purposes. The majority of the study area is private (73 percent); the remainder includes 11 percent Federal, 15 percent State, and one percent tribal ownership.² All of the Tribal and most of the Federal lands are proposed for exclusion. A graphical depiction of the study area is provided in Exhibits ES-7 through ES-10.
4. This analysis quantifies economic impacts of lynx conservation efforts associated with the following land uses: 1) timber activities, 2) recreation, 3) public and conservation land management, 4) transportation, 5) mining, 6) tribal activities, and 7) administrative costs associated with section 7 consultation. Additionally, this analysis provides information on the full option values of development and grazing activities in the study area.
5. The primary assumption applied in this analysis is that all landowners will manage their lands in accordance with the lynx conservation guidelines described in the Lynx Conservation Assessment Strategy (LCAS).³ This conservation strategy was developed by the Service in cooperation with Federal agencies to identify land uses that may represent a conservation threat to the lynx, and make recommendations to mitigate those threats where possible. While this strategy has not been employed by private landowners

¹ 70 FR 68294 - 68328 and 71 FR 8258 - 8264.

² 71 FR 8258.

³ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, US Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53.

in the past, this analysis assumes that it represents the best available science regarding the conservation needs of the lynx, and therefore serves as an indicator of how habitat may be managed for the benefit of the lynx in the future.

6. Exhibit ES-1 and the Key Findings highlighted below summarize the results of the economic analysis.

EXHIBIT ES-1. SUMMARY OF POST-DESIGNATION IMPACTS (2006 - 2025)

IMPACT	UNDISCOUNTED	7% DISCOUNT RATE	3% DISCOUNT RATE
<i>Areas Proposed for Designation</i>			
Total Economic Impacts	\$175 million - \$889 million	\$99.9 million - \$259 million	\$125 million - \$411 million
Annualized Impacts	-	\$9.43 million - \$24.4 million	\$8.38 million - \$27.6 million
<i>Areas Considered for Exclusion</i>			
Total Economic Impacts	\$10.2 million - \$13.2 million	\$7.87 million - \$9.11 million	\$9.02 million - \$10.7 million
Annualized Impacts	-	\$743,000 - \$860,000	\$606,000 - \$719,000

KEY FINDINGS

Total Future Impacts: The draft economic analysis forecasts future costs associated with lynx conservation efforts in areas proposed for designation to be \$175 million to \$889 million (undiscounted dollars) over the next 20 years. The present value of these impacts, applying a three percent discount rate, is \$125 million to \$411 million (\$8.38 million to \$27.6 million annualized); or \$99.9 million to \$259 million, using a seven percent discount rate (\$9.43 million to \$24.4 million annualized).

Quantified Impacts: Timber-related impacts comprise the majority, 91 percent at the high end (undiscounted dollars), of the total quantified impacts in areas proposed for critical habitat designation. Impacts to transportation comprise another six percent. The following impacts by activity are for areas proposed for designation, and do not include areas considered for exclusion from critical habitat.

- **Timber management:** Timber impacts are estimated for two scenarios. Under Scenario 1, impacts to silvicultural activities are \$117 million (undiscounted dollars). This includes impacts resulting from implementation of existing lynx management plans, performing project modifications (including road decommissioning or building alternative road access to avoid crossing Federal land), and developing lynx management plans. Under Scenario 2, impacts include additional costs of restricting pre-commercial thinning. Impacts under Scenario 2 are forecast to be \$808 million (undiscounted dollars) over a 20-year period.
- **Recreation:** Total costs associated with impacts to recreation activities are estimated to range from \$1.05 million to \$3.06 million over 20 years (undiscounted dollars), including reduced consumer surplus associated with increased congestion of snowmobiling trails, and costs of hunter and trapper education.
- **Public Land Management and Conservation Planning:** Costs related to lynx research and monitoring, and development of lynx management plans on public and conservation lands, total approximately \$12.8 million over 20 years (undiscounted dollars).
- **Transportation, Utilities and Municipal:** Impacts to these activities include implementing lynx conservation efforts for road and utility construction and maintenance projects, and dam relicensing activities. Impacts are estimated to range from \$35 million to \$55 million over the next 20 years (undiscounted dollars). Lynx conservation efforts include erecting wildlife crossings or fencing, monitoring, mapping and reporting, and bridge lengthening.
- **Mining:** Future mining projects in Unit 2 are forecast to implement lynx monitoring and management at an impact of \$430,000 over the next 20 years (undiscounted dollars); these impacts include relocations of stock piles and monitoring and reporting for the species.
- **Administrative Costs:** Administrative costs of section 7 consultation for all affected activities are estimated to be \$9.03 million over 20 years (undiscounted dollars).

Land Use Activities for Which Impacts are Not Quantified:

- **Residential/Commercial Development:** Impacts to development activities are not quantified in this analysis as information is not available to describe how development activities may be modified for the benefit of the lynx as described in Section 4. The analysis reports the option value for future development across the study area, \$2.23 billion.
- **Mining:** Two mines exist with planned expansions within the study area in Unit 2. The full combined resource values of these mines is \$864 million.
- **Grazing:** Cattle grazing occurs in Units 3 and 4 of the study area. The value of these cattle are estimated to be \$1.95 million.

Critical Habitat Subunit with Highest Impacts: The subunit with the largest projected impacts (high end estimate in undiscounted dollars) is private timber lands in Maine; impacts in this subunit constitute 28 percent of the total estimated impacts in the 27 subunits proposed for designation. Of the forecast impacts in this subunit, 96 percent are associated with impacts to silvicultural activities, primarily restrictions on pre-commercial thinning.

7. In addition to the impacts quantified in Exhibit ES-1, this analysis provides information on the full resource values of development, mining, and grazing in the study area absent information to estimate specific impacts to these activities associated with lynx conservation.

- The estimated option value for future residential and commercial development in the study area is \$2.16 billion to \$2.23 billion, 69 percent of which is associated with developable land in Unit 2: Minnesota. This value translates to an average per acre value of \$3,300 across the 687,000 acres considered developable within the study area. Lands considered developable across the study area are highlighted in Exhibits ES-7 through ES-10.
- Two mines exist with planned expansions within the study area in Unit 2. The full combined resource values of these mines is \$864 million. The locations of the mines are identified in Exhibit ES-8.
- Cattle grazing occurs in Units 3 and 4 of the study area. The value of these cattle are estimated to be \$1.95 million. Grazing lands within the study area are highlighted in Exhibits ES-9 and ES-10.

8. Exhibits ES-2 and ES-3 highlight post-designation impacts by activity.

EXHIBIT ES-2 POST-DESIGNATION IMPACT BY ACTIVITY (LOW END UNDISCOUNTED COST ESTIMATE)

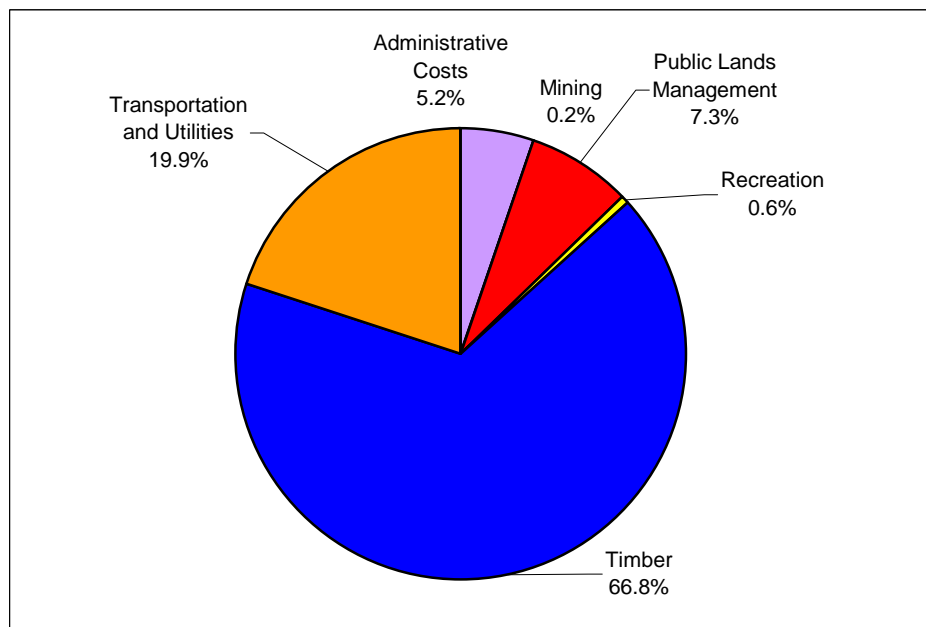
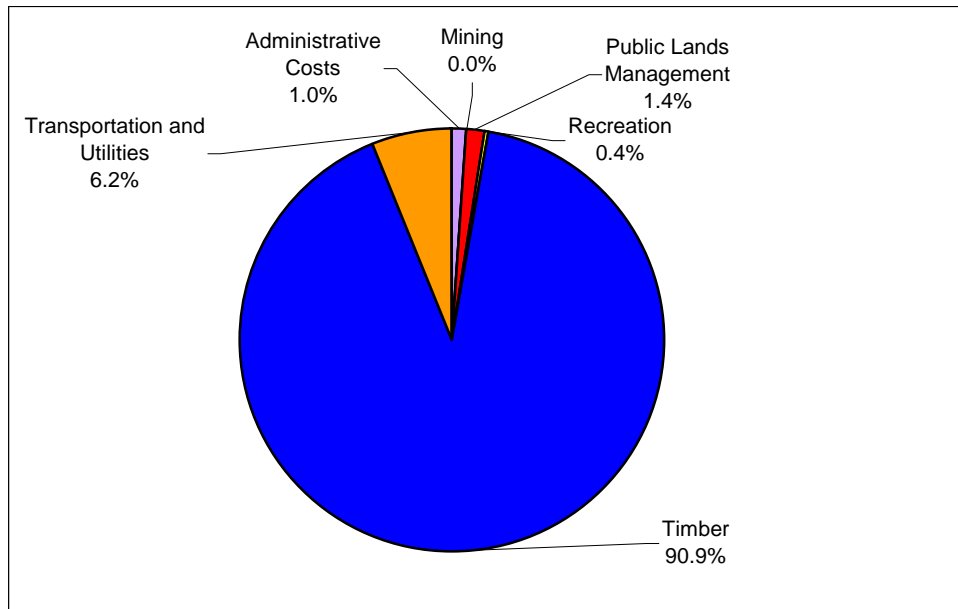


EXHIBIT ES-3. POST-DESIGNATION IMPACT BY ACTIVITY (HIGH END UNDISCOUNTED COST ESTIMATE)



16. Exhibits ES-4 and ES-5 rank the subunits proposed for critical habitat designation in order of level of expected impact. Information describing the economic impacts by subunit is provided in Exhibit ES-6. More detailed information describing estimated impacts by subunit and activity is provided in Appendix F.

EXHIBIT ES-4. SUBUNITS RANKED BY LEVEL OF IMPACT (LOW END, UNDISCOUNTED)

SUBUNIT	ESTIMATED LOW END IMPACTS (UNDISCOUNTED)	PERCENT OF TOTAL LOW END IMPACTS (UNDISCOUNTED)
Unit 3: Northern Rocky Mountains - Montana Dept. of Natural Resources	\$44,100,000	25.18%
Unit 1: Maine - Private Timber Lands	\$36,500,000	20.83%
Unit 4: North Cascades - Washington Dept of Natural Resources	\$21,000,000	12.00%
Unit 1: Maine - Unknown Landowner	\$15,600,000	8.89%
Unit 2: Minnesota - Unknown Landowner	\$13,600,000	7.79%
Unit 2: Minnesota - Superior National Forest	\$10,000,000	5.71%
Unit 3: Northern Rocky Mountains - Unknown landowner	\$8,870,000	5.06%
Unit 1: Maine - Conservation NGO	\$6,780,000	3.87%
Unit 2: Minnesota - Minnesota Dept. of Natural Resources	\$6,450,000	3.68%
Unit 3: Northern Rocky Mountains - Private Timber Lands	\$3,050,000	1.74%
Unit 3: Northern Rocky Mountains - Montana Fish, Wildlife, and Parks	\$2,650,000	1.51%
Unit 1: Maine - Maine Dept of Conservation	\$2,220,000	1.26%
Unit 1: Maine - Baxter State Park Authority	\$1,400,000	0.80%
Unit 3: Northern Rocky Mountains - Montana University System	\$724,000	0.41%
Unit 3: Northern Rocky Mountains - Conservation NGO	\$547,000	0.31%
Unit 2: Minnesota - Private Timber Lands	\$333,000	0.19%
Unit 1: Maine - National Park Service	\$303,000	0.17%
Unit 3: Northern Rocky Mountains - U.S. Fish and Wildlife Service	\$287,000	0.16%
Unit 3: Northern Rocky Mountains - U.S. Bureau of Land Management	\$256,000	0.15%
Unit 1: Maine - Maine Dept. of Inland Fish & Wildlife	\$255,000	0.15%
Unit 3: Northern Rocky Mountains - Idaho Dept. of Land	\$230,000	0.13%
Unit 2: Minnesota - Private Mining Lands	\$29,000	0.02%
Unit 4: North Cascades - Washington Dept of Fish and Wildlife	\$20,000	0.01%
Unit 1: Maine - U.S. Fish and Wildlife Service	\$0	0.00%
Unit 3: Northern Rocky Mountains - U.S. Bureau of Reclamation	\$0	0.00%
Unit 3: Northern Rocky Mountains - Municipal/City Government	\$0	0.00%
Unit 4: North Cascades - Unknown Private Landowners	\$0	0.00%

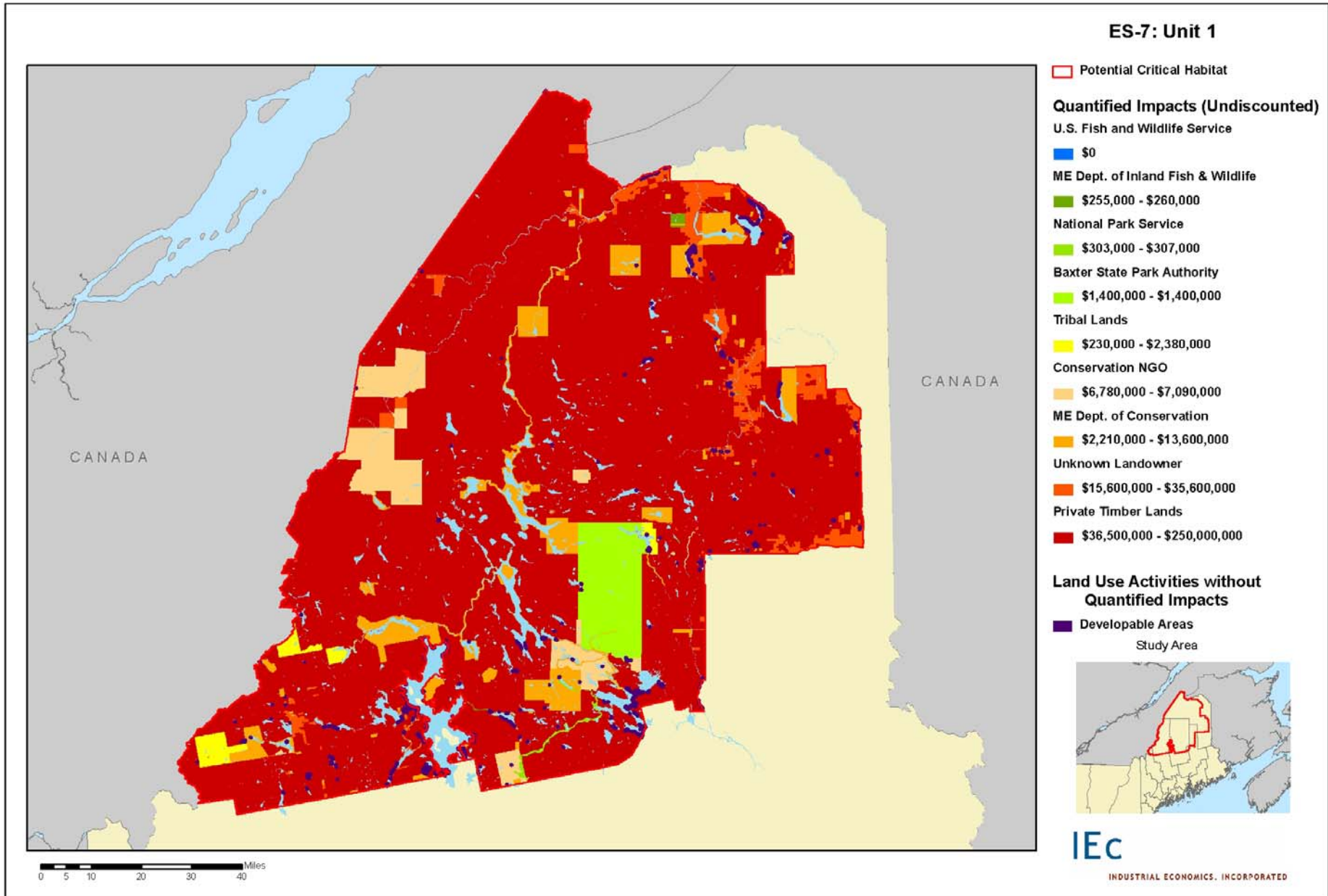
EXHIBIT ES-5. SUBUNITS RANKED BY LEVEL OF IMPACT (HIGH END, UNDISCOUNTED)

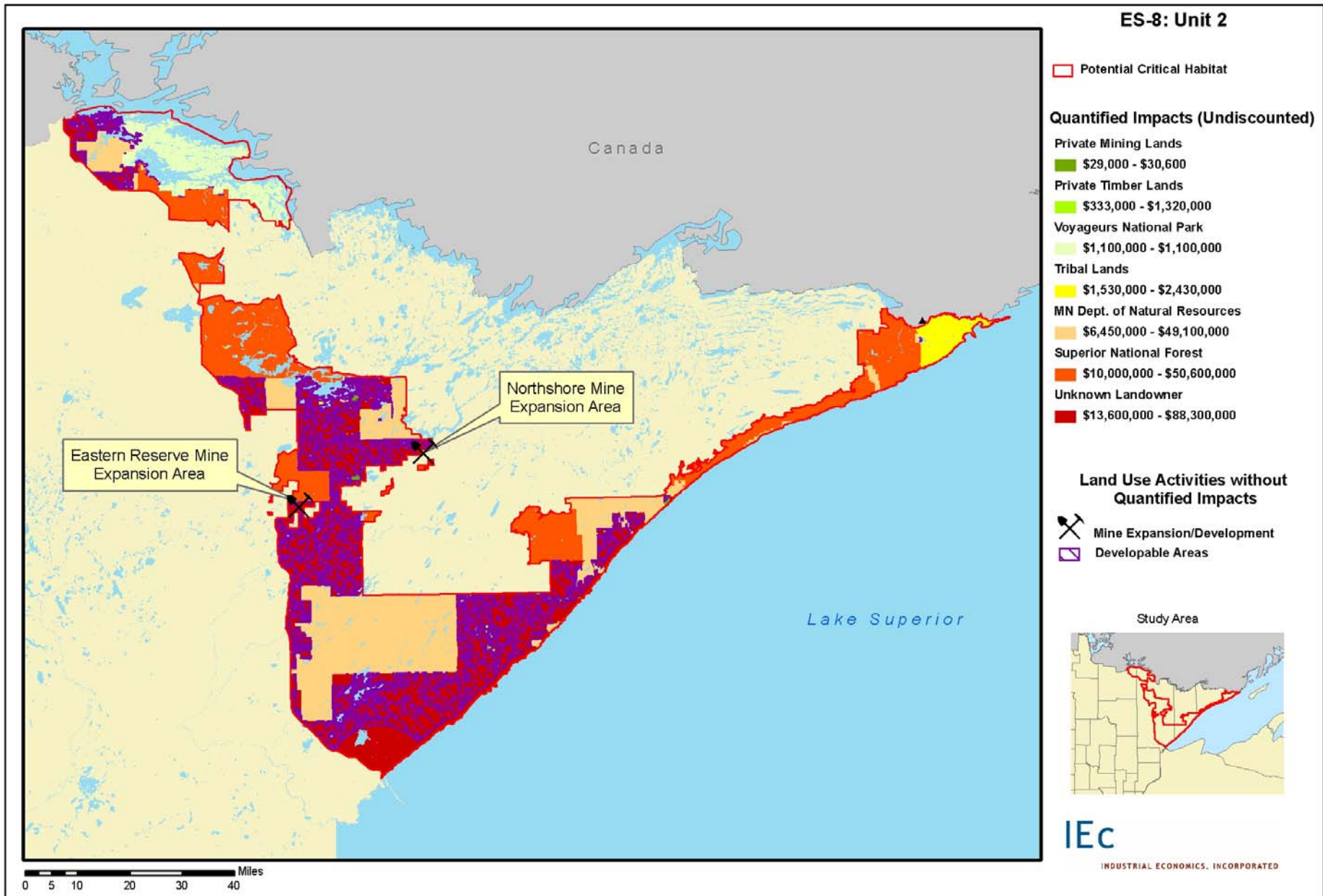
SUBUNIT	ESTIMATED HIGH END IMPACTS (UNDISCOUNTED)	PERCENT OF TOTAL LOW END IMPACTS (UNDISCOUNTED)
Unit 1: Maine - Private Timber Lands	\$250,000,000	28.12%
Unit 3: Northern Rocky Mountains - Unknown landowner	\$191,000,000	21.54%
Unit 3: Northern Rocky Mountains - Private Timber Lands	\$124,000,000	13.91%
Unit 2: Minnesota - Unknown Landowner	\$88,300,000	9.93%
Unit 2: Minnesota - Superior National Forest	\$50,600,000	5.69%
Unit 2: Minnesota - Minnesota Dept. of Natural Resources	\$49,100,000	5.52%
Unit 3: Northern Rocky Mountains - Montana Dept. of Natural Resources	\$44,200,000	4.97%
Unit 1: Maine - Unknown Landowner	\$35,600,000	4.00%
Unit 4: North Cascades - Washington Dept of Natural Resources	\$21,070,000	2.37%
Unit 1: Maine - Maine Dept of Conservation	\$13,600,000	1.53%
Unit 1: Maine - Conservation NGO	\$7,090,000	0.80%
Unit 3: Northern Rocky Mountains - Montana University System	\$6,920,000	0.78%
Unit 3: Northern Rocky Mountains - Montana Fish, Wildlife, and Parks	\$2,670,000	0.30%
Unit 1: Maine - Baxter State Park Authority	\$1,410,000	0.16%
Unit 2: Minnesota - Private Timber Lands	\$1,320,000	0.15%
Unit 3: Northern Rocky Mountains - Conservation NGO	\$576,000	0.06%
Unit 1: Maine - National Park Service	\$307,000	0.03%
Unit 3: Northern Rocky Mountains - U.S. Fish and Wildlife Service	\$293,000	0.03%
Unit 1: Maine - Maine Dept. of Inland Fish & Wildlife	\$260,000	0.03%
Unit 3: Northern Rocky Mountains - U.S. Bureau of Land Management	\$260,000	0.03%
Unit 3: Northern Rocky Mountains - Idaho Dept. of Land	\$230,000	0.03%
Unit 4: North Cascades - Washington Dept of Fish and Wildlife	\$180,000	0.02%
Unit 2: Minnesota - Private Mining Lands	\$30,600	0.00%
Unit 1: Maine - U.S. Fish and Wildlife Service	\$0	0.00%
Unit 3: Northern Rocky Mountains - U.S. Bureau of Reclamation	\$0	0.00%
Unit 3: Northern Rocky Mountains - Municipal/City Government	\$0	0.00%
Unit 4: North Cascades - Unknown Private Landowners	\$0	0.00%

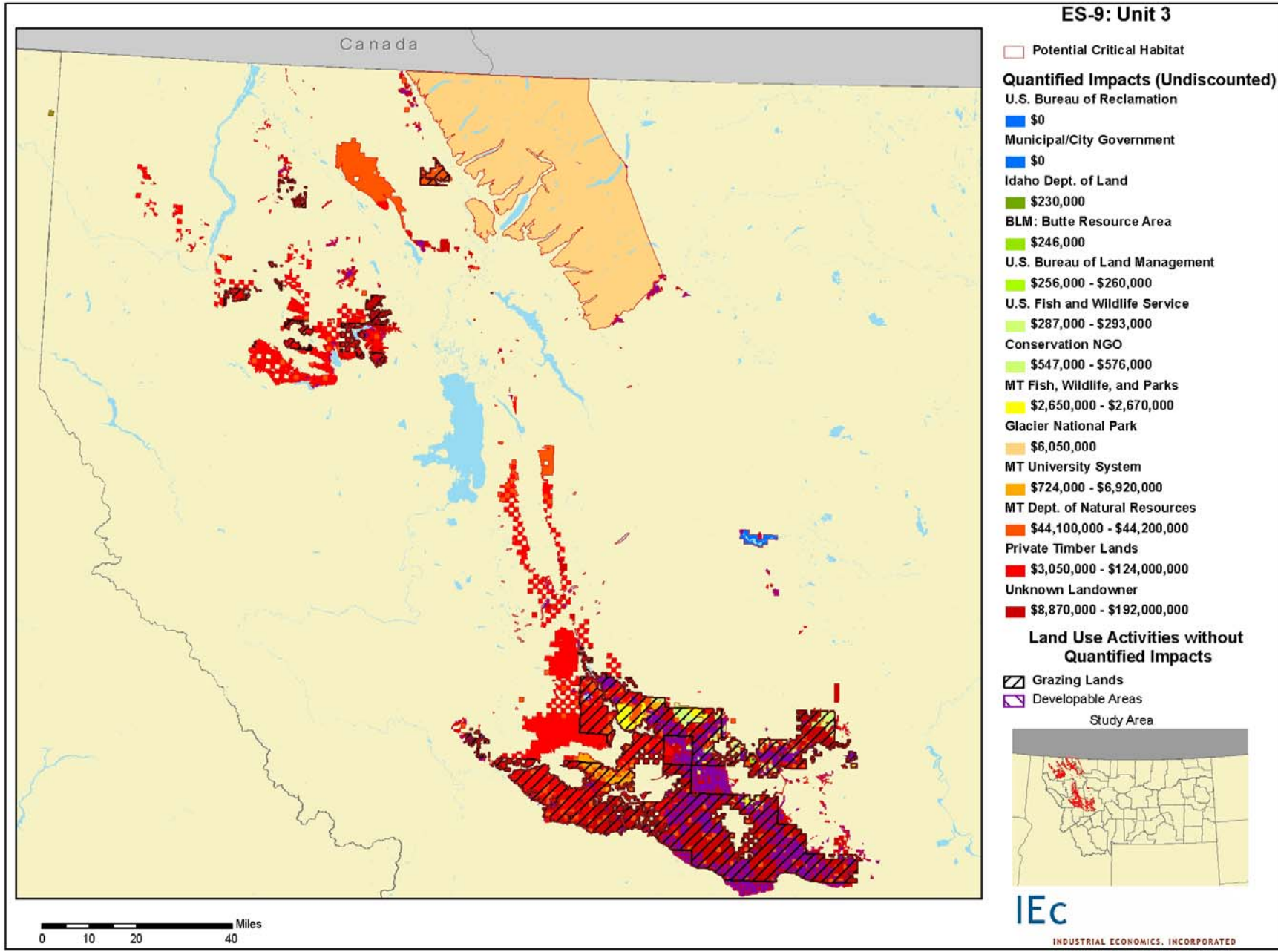
EXHIBIT ES-6. DETAILED IMPACTS BY SUBUNIT (2006 - 2025)

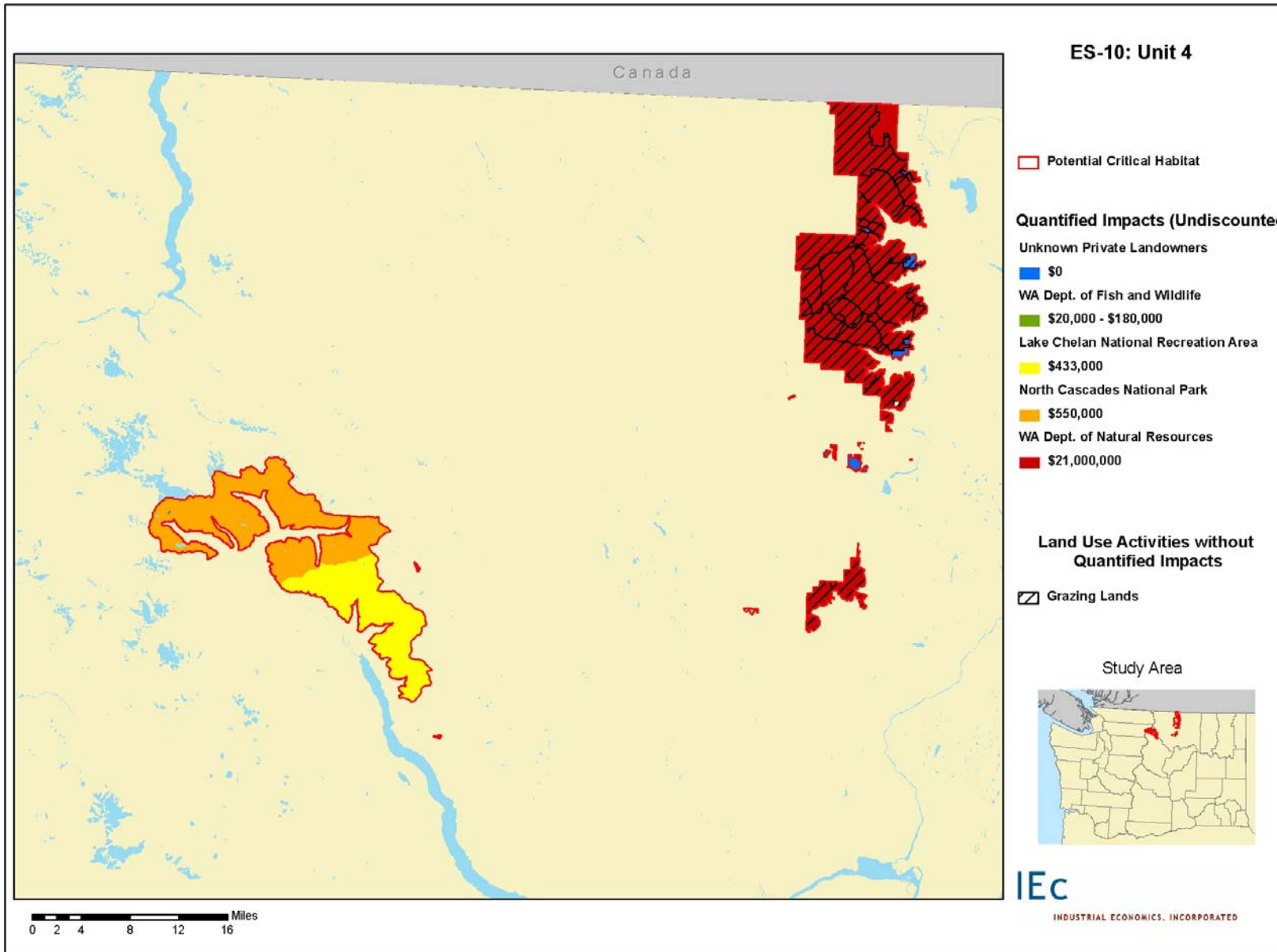
UNIT/SUBUNIT	FUTURE (UNDISCOUNTED)		FUTURE PRESENT VALUE 3%		FUTURE PRESENT VALUE 7%		ANNUALIZED 3%		ANNUALIZED 7%	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
<i>Proposed Critical Habitat</i>										
<i>UNIT 1: MAINE</i>										
National Park Service	\$303,000	\$307,000	\$247,000	\$250,000	\$192,000	\$194,000	\$16,600	\$16,800	\$18,100	\$18,300
U.S. Fish and Wildlife Service	-	-	-	-	-	-	-	-	-	-
Maine Dept of Conservation	\$2,210,000	\$13,600,000	\$2,030,000	\$8,390,000	\$1,820,000	\$9,220,000	\$136,000	\$564,000	\$172,000	\$871,000
Maine Dept. of Inland Fish & Wildlife	\$255,000	\$260,000	\$205,000	\$209,000	\$156,000	\$159,000	\$13,800	\$14,000	\$14,800	\$15,000
Baxter State Park Authority	\$1,400,000	\$1,410,000	\$1,270,000	\$1,280,000	\$1,130,000	\$1,140,000	\$85,600	\$85,900	\$107,000	\$107,000
Private Timber Lands	\$36,500,000	\$250,000,000	\$33,100,000	\$153,000,000	\$29,600,000	\$168,000,000	\$2,230,000	\$10,300,000	\$2,790,000	\$15,900,000
Conservation NGO	\$6,780,000	\$7,090,000	\$3,600,000	\$3,740,000	\$3,090,000	\$3,200,000	\$242,000	\$252,000	\$292,000	\$302,000
Unknown Landowner	\$15,600,000	\$35,600,000	\$12,200,000	\$25,500,000	\$9,210,000	\$21,300,000	\$818,000	\$1,710,000	\$869,000	\$2,010,000
<i>Subtotal Unit 1</i>	<i>\$63,100,000</i>	<i>\$308,000,000</i>	<i>\$52,600,000</i>	<i>\$192,000,000</i>	<i>\$45,200,000</i>	<i>\$203,000,000</i>	<i>\$3,540,000</i>	<i>\$12,900,000</i>	<i>\$4,270,000</i>	<i>\$19,200,000</i>
<i>UNIT 2: MINNESOTA</i>										
Superior National Forest	\$10,000,000	\$50,600,000	\$7,570,000	\$26,200,000	\$5,520,000	\$7,030,000	\$509,000	\$1,760,000	\$521,000	\$664,000
Minnesota Dept. of Natural Resources	\$6,450,000	\$49,100,000	\$5,310,000	\$24,700,000	\$4,290,000	\$5,500,000	\$357,000	\$1,660,000	\$405,000	\$519,000
Private Timber Lands	\$333,000	\$1,320,000	\$272,000	\$715,000	\$212,000	\$230,000	\$18,300	\$48,000	\$20,000	\$21,600
Private Mining Lands	\$29,000	\$30,600	\$21,800	\$23,000	\$15,700	\$16,600	\$1,460	\$1,540	\$1,480	\$1,560
Unknown Landowner	\$13,700,000	\$88,300,000	\$11,400,000	\$45,300,000	\$9,340,000	\$11,500,000	\$764,000	\$3,050,000	\$881,000	\$1,080,000
<i>Subtotal Unit 2</i>	<i>\$30,500,000</i>	<i>\$189,000,000</i>	<i>\$24,500,000</i>	<i>\$97,000,000</i>	<i>\$19,400,000</i>	<i>\$24,300,000</i>	<i>\$1,650,000</i>	<i>\$6,520,000</i>	<i>\$1,830,000</i>	<i>\$2,290,000</i>
<i>UNIT 3: NORTHERN ROCKY MOUNTAINS</i>										
U.S. Fish and Wildlife Service	\$287,000	\$293,000	\$230,000	\$234,000	\$174,000	\$177,000	\$15,400	\$15,700	\$16,400	\$16,700
U.S. Bureau of Reclamation	-	-	-	-	-	-	-	-	-	-
U.S. Bureau of Land Management	\$256,000	\$260,000	\$201,000	\$204,000	\$149,000	\$150,000	\$13,500	\$13,700	\$14,000	\$14,200
Montana Dept. of Natural Resources	\$44,100,000	\$44,200,000	\$11,500,000	\$11,500,000	\$662,000	\$694,000	\$772,000	\$775,000	\$62,500	\$65,600
Montana Fish, Wildlife, and Parks	\$2,650,000	\$2,670,000	\$2,580,000	\$2,600,000	\$2,520,000	\$2,530,000	\$173,000	\$175,000	\$238,000	\$239,000
Montana University System	\$724,000	\$6,920,000	\$577,000	\$2,100,000	\$444,000	\$500,000	\$38,800	\$141,000	\$41,900	\$47,200
Idaho Dept. of Land	\$230,000	\$230,000	\$182,000	\$258,000	\$135,000	\$272,000	\$12,200	\$17,300	\$12,800	\$25,600
Municipal/City Government	-	-	-	-	-	-	-	-	-	-
Private Timber Lands	\$3,050,000	\$124,000,000	\$2,730,000	\$31,300,000	\$2,410,000	\$218,000	\$184,000	\$2,110,000	\$228,000	\$20,500
Conservation NGO	\$547,000	\$576,000	\$458,000	\$480,000	\$372,000	\$388,000	\$30,800	\$32,300	\$35,100	\$36,600
Unknown landowner	\$8,870,000	\$192,000,000	\$7,370,000	\$51,300,000	\$6,020,000	\$3,480,000	\$495,000	\$3,450,000	\$568,000	\$328,000
<i>Subtotal Unit 3</i>	<i>\$60,800,000</i>	<i>\$370,000,000</i>	<i>\$25,800,000</i>	<i>\$100,000,000</i>	<i>\$12,900,000</i>	<i>\$8,400,000</i>	<i>\$1,740,000</i>	<i>\$6,730,000</i>	<i>\$1,220,000</i>	<i>\$793,000</i>

UNIT/SUBUNIT	FUTURE (UNDISCOUNTED)		FUTURE PRESENT VALUE 3%		FUTURE PRESENT VALUE 7%		ANNUALIZED 3%		ANNUALIZED 7%	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
UNIT 4: NORTH CASCADES										
Washington Dept of Fish and Wildlife	\$20,000	\$180,000	\$19,700	\$134,000	\$19,300	\$94,000	\$1,330	\$8,980	\$1,830	\$8,870
Washington Dept of Natural Resources	\$21,000,000	\$21,000,000	\$21,600,000	\$21,600,000	\$22,400,000	\$22,400,000	\$1,450,000	\$1,450,000	\$2,110,000	\$2,110,000
Unknown Private Landowners	-	-	-	-	-	-	-	-	-	-
Subtotal Unit 4	\$21,100,000	\$21,200,000	\$21,600,000	\$21,800,000	\$22,400,000	\$22,500,000	\$1,450,000	\$1,460,000	\$2,110,000	\$2,120,000
SUBTOTAL AREAS PROPOSED FOR DESIGNATION	\$175,000,000	\$889,000,000	\$125,000,000	\$411,000,000	\$99,900,000	\$259,000,000	\$8,380,000	\$27,600,000	\$9,430,000	\$24,400,000
Areas Considered for Exclusion										
UNIT 1: MAINE										
Tribal lands	\$283,000	\$2,380,000	\$231,000	\$1,210,000	\$187,000	\$912,000	\$15,600	\$81,200	\$17,700	\$86,100
Subtotal Unit 1	\$283,000	\$2,380,000	\$231,000	\$1,210,000	\$187,000	\$912,000	\$15,600	\$81,200	\$17,700	\$86,100
UNIT 2: MINNESOTA										
Voyageurs National Park	\$1,100,000	\$1,110,000	\$995,000	\$1,000,000	\$885,000	\$890,000	\$66,900	\$67,400	\$83,500	\$84,000
Tribal Lands	\$1,530,000	\$2,430,000	\$1,170,000	\$1,860,000	\$870,000	\$1,380,000	\$78,800	\$125,000	\$82,100	\$130,000
Subtotal Unit 2	\$2,630,000	\$3,540,000	\$2,170,000	\$2,860,000	\$1,750,000	\$2,270,000	\$146,000	\$192,000	\$166,000	\$214,000
UNIT 3: NORTHERN ROCKY MOUNTAINS										
Glacier National Park	\$6,050,000	\$6,050,000	\$5,560,000	\$5,560,000	\$5,030,000	\$5,030,000	\$374,000	\$374,000	\$475,000	\$475,000
BLM: Butte Resource Area	\$246,000	\$246,000	\$222,000	\$222,000	\$196,000	\$196,000	\$14,900	\$14,900	\$18,500	\$18,500
Subtotal Unit 3	\$6,290,000	\$6,290,000	\$5,780,000	\$5,780,000	\$5,230,000	\$5,230,000	\$388,000	\$388,000	\$494,000	\$494,000
UNIT 4: NORTH CASCADES										
North Cascades National Park	\$550,000	\$550,000	\$476,000	\$476,000	\$401,000	\$401,000	\$32,000	\$32,000	\$37,900	\$37,900
Lake Chelan National Recreation Area	\$433,000	\$433,000	\$367,000	\$367,000	\$302,000	\$302,000	\$24,700	\$24,700	\$28,500	\$28,500
Subtotal Unit 4	\$983,000	\$983,000	\$844,000	\$844,000	\$703,000	\$703,000	\$56,700	\$56,700	\$66,400	\$66,400
SUBTOTAL AREAS CONSIDERED FOR EXCLUSION	\$10,200,000	\$13,200,000	\$9,020,000	\$10,700,000	\$7,870,000	\$9,110,000	\$606,000	\$719,000	\$743,000	\$860,000









SECTION 1 | FRAMEWORK FOR THE ANALYSIS

1. The purpose of this report is to estimate the economic impact of actions taken to protect the federally listed Canada lynx (*Lynx Canadensis*) and their habitat. It attempts to quantify the economic impacts to activities occurring within the study area.¹ It does so by taking into account the cost of conservation efforts associated with economic activities within the study area boundaries. The analysis looks retrospectively at costs incurred since the lynx was listed in 2000, and forecasts impacts after the proposed critical habitat is finalized in 2006.
2. This information is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.² In addition, this information allows the Service to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).³ This report also complies with direction from the U.S. Court of Appeals for the 10th Circuit that “co-extensive” effects should be included in the economic analysis to inform decision-makers regarding which areas to designate as critical habitat.⁴
3. This section describes the framework for the analysis. First, it describes the general analytic approach to estimating economic effects, including a discussion of both efficiency and distributional effects. Next, this section discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. It then presents the analytic time frame used in the report. Finally, this section lists the information sources relied upon in the analysis.

¹ For the purposes of this analysis, the “study area” is defined as both areas proposed for critical habitat designation, as well as areas considered for exclusion from critical habitat.

² 16 U.S.C. 1533(b)(2).

³ Executive Order 12866, Regulatory Planning and Review, September 30, 1993; Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001; 5 U.S.C. “601 et seq; and Pub Law No. 104-121.

⁴ In 2001, the U.S. Court of Appeals for the 10th Circuit instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass’n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001)).

1.1 APPROACH TO ESTIMATING ECONOMIC EFFECTS

4. This economic analysis considers both the economic efficiency and distributional effects that may result from efforts to protect the lynx and its habitat (hereinafter referred to collectively as “lynx conservation efforts”). Economic efficiency effects generally reflect “opportunity costs” associated with the commitment of resources required to accomplish species and habitat conservation. For example, if activities that can take place on a parcel of land are limited as a result of the designation or the presence of the species, and thus the market value of the land is reduced, this reduction in value represents one measure of opportunity cost or change in economic efficiency. Similarly, the costs incurred by a Federal action agency to consult with the Service under section 7 represent opportunity costs of lynx conservation efforts.
5. This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation efforts on small entities and the energy industry. This information may be used by decision-makers to assess whether the effects of lynx conservation efforts unduly burden a particular group or economic sector. For example, while conservation efforts may have a relatively small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience relatively greater impacts. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

1.1.1 EFFICIENCY EFFECTS

6. At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action. In the context of regulations that protect lynx habitat, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.⁵
7. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a Federal land manager, such as the U.S. Forest Service, may enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The effort required for the consultation is an economic opportunity cost because the landowner or manager's time and effort would have been spent in an alternative activity had the parcel not been included in the designation. When compliance activity is not expected to significantly affect markets -- that is, not result in a shift in the quantity of a good or

⁵ For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see: Gramlich, Edward M., *A Guide to Benefit-Cost Analysis* (2nd Ed.), Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. Environmental Protection Agency, *Guidelines for Preparing Economic Analyses*, EPA 240-R-00-003, September 2000, available at <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>.

service provided at a given price, or in the quantity of a good or service demanded given a change in price -- the measurement of compliance costs can provide a reasonable estimate of the change in economic efficiency.

8. Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, a designation that precludes the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the market.
9. This analysis begins by measuring costs associated with efforts undertaken to protect lynx and their habitat. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. However, if the cost of conservation efforts is expected to significantly impact markets, the analysis will consider potential changes in consumer and/or producer surplus in affected markets.

1.1.2 DISTRIBUTIONAL AND REGIONAL ECONOMIC EFFECTS

10. Measurements of changes in economic efficiency focus on the net impact of conservation efforts, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.⁶ This analysis considers several types of distributional effects, including impacts on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that these are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

Impacts on Small Entities and Energy Supply, Distribution, and Use

11. This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the Regulatory Flexibility Act, might be affected by future lynx conservation efforts.⁷ In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the future impacts of conservation efforts on the energy industry and its customers.⁸

⁶ U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

⁷ 5 U.S.C. ' 601 et seq.

⁸ Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001.

Calculating Present Value and Annualized Impacts

For each land use activity, this analysis presents economic impacts incurred in different time periods in present value terms. The present value represents the value of a payment or stream of payments in common dollar terms. That is, it is the sum of a series of past or future cash flows expressed in today's dollars. Translation of the economic impacts of past or future costs to present value terms requires the following: a) past or projected future costs of lynx conservation efforts; and b) the specific years in which these impacts have been or are expected to be incurred. With these data, the present value of the past or future stream of impacts (PV_c) of lynx conservation efforts from year t to T is measured in 2006 dollars according to the following standard formula:^a

$$PV_c = \sum_{t=t_0}^{t=T} \frac{C_t}{(1+r)^{t-2006}}$$

C_t = cost of lynx conservation efforts in year t

r = discount rate^b

Impacts of conservation efforts for each activity in each unit are also expressed as annualized values (i.e., the series of equal annual costs over some defined time period that have the same present value as estimated total impacts). Annualized values are calculated to provide comparison of impacts across activities with varying forecast periods (T). For this analysis, all activities employ a forecast period of 20 years, 2006 through 2025, except the analysis of impacts of restricting pre-commercial thinning (as discussed in Section 3), which employs a forecast period of 100 years due to the time horizon over which silviculture activities are planned. In order to compare impacts across activities, however, this analysis reports the annualized impacts of pre-commercial thinning restrictions over the first 20 years. Annualized impacts of future lynx conservation efforts (APV_c) are calculated by the following standard formula:

$$APV_c = PV_c \left[\frac{r}{1 - (1+r)^{-N}} \right]$$

N = number of years in the forecast period (in this analysis, 20 or 100 years)

^a To derive the present value of past conservation efforts for this analysis, t is 2000 and T is 2005; to derive the present value of future conservation efforts, t is 2006 and T is 2025.

^b To discount and annualize costs, guidance provided by the OMB specifies the use of a real rate of seven percent. In addition, OMB recommends sensitivity analysis using other discount rates such as three percent, which some economists believe better reflects the social rate of time preference. (U.S. Office of Management and Budget, Circular A-4, September 17, 2003 and U.S. Office of Management and Budget, "Draft 2003 Report to Congress on the Costs and Benefits of Federal Regulations; Notice," 68 *Federal Register* 5492, February 3, 2003.)

Regional Economic Effects

12. Regional economic impact analysis can provide an assessment of the potential localized effects of conservation efforts. Specifically, regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using regional input/output models. These models rely on multipliers that represent the relationship between a change in one sector of the economy (e.g., expenditures by recreationists) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreationists). These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.
13. The use of regional input/output models in an analysis of the impacts of species and habitat conservation efforts can overstate the long-term impacts of a regulatory change. Most importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by impacted businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity within the region.
14. Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. Thus, these types of distributional effects are reported separately from efficiency effects (i.e., not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects, but should be considered as distinct measures of impact.

1.2 SCOPE OF THE ANALYSIS

15. This analysis identifies those economic activities most likely to threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the study area. Due to the difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be coextensive with the designation.^{9,10}

⁹ In 2001, the U.S. Court of Appeals for the 10th Circuit instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Assn v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001)).

¹⁰ In 2004, the U.S. Ninth Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (*Gifford Pinchot Task Force v. United States Fish and Wildlife Service*). The Service is currently reviewing the

16. Coextensive effects may also include impacts associated with overlapping protective measures of other Federal, state, and local laws that aid habitat conservation in the areas proposed for designation. In past instances, some of these measures have been precipitated by the listing of the species and/or impending designation of critical habitat. Because conservation efforts affording protection to a listed species likely contribute to the efficacy of critical habitat designation, the impacts of these actions are considered relevant for understanding the full effect of critical habitat designation. Enforcement actions taken in response to violations of the Act, however, are not included.

1.2.1 SECTIONS OF THE ACT RELEVANT TO THE ANALYSIS

17. This analysis focuses on activities that are influenced by the Service through sections 4, 7, 9, and 10 of the Act. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as the critical habitat. In this section, the Secretary is required to list species as endangered or threatened "solely on the basis of the best available scientific and commercial data."¹¹ Section 4 also requires the Secretary to designate critical habitat "on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat."¹²
18. The protections afforded to threatened and endangered species and their habitat are described in sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections are the focus of this analysis:
- Section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent compliance costs associated with the listing of the species and proposed critical habitat.¹³
 - Section 9 defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, or collect, or to attempt to engage in any such conduct."¹⁴ The economic impacts associated with this section manifest themselves in sections 7 and 10.

decision to determine what effect it (and to a limited extent *Center for Biological Diversity v. Bureau of Land Management* (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

¹¹ 16 U.S.C. 1533.

¹² 16 U.S.C. 1533.

¹³ The Service notes, however, that a recent Ninth Circuit judicial opinion, *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, has invalidated the Service's regulation defining destruction or adverse modification of critical habitat. The Service is currently reviewing the decision to determine what effect it (and to a limited extent *Center for Biological Diversity v. Bureau of Land Management* (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

¹⁴ 16 U.S.C. 1532.

- Under section 10(a)(1)(B) of the Act, an entity (e.g., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for an endangered animal species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.¹⁵ The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately minimized and mitigated. The designation of critical habitat does not require completion of an HCP; however, the designation may influence conservation measures provided under HCPs.

1.2.2 OTHER RELEVANT PROTECTION EFFORTS

19. The protection of listed species and habitat is not limited to the Act. Other Federal agencies, as well as state and local governments, may also seek to protect the natural resources under their jurisdiction. For the purpose of this analysis, such protective efforts are considered to be co-extensive with the protection offered by critical habitat, and costs associated with these efforts are included in this report. In addition, under certain circumstances, critical habitat may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other state or local laws. In cases where these costs would not have been triggered absent the designation of critical habitat, they are included in this economic analysis.

1.2.3 ADDITIONAL ANALYTIC CONSIDERATIONS

20. This analysis also considers the potential for other types of economic impacts that can be related to section 7 consultations in general and critical habitat in particular, including time delay, regulatory uncertainty, and stigma impacts.

Time Delay and Regulatory Uncertainty Impacts

21. Time delays are costs due to project delays associated with the consultation process or compliance with other regulations. Regulatory uncertainty costs occur in anticipation of having to modify project parameters (e.g., retaining outside experts or legal counsel to better understand their responsibilities with regard to critical habitat). For example, in the case of the lynx critical habitat, landowners of private timberland inholdings in National Forests have expressed concern that there may be delays associated with using U.S. Forest Service roads to access their lands if critical habitat is designated for the lynx. This is discussed in Section 3 of this analysis.

Stigma Impacts

22. Stigma refers to the change in economic value of a particular project or activity due to negative (or positive) perceptions of the role critical habitat will play in developing, implementing, or conducting that policy. For example, changes to private property values associated with public attitudes about the limits and costs of implementing a

¹⁵ U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," August 6, 2002, accessed at <http://endangered.fws.gov/hcp/>.

project in critical habitat are known as "stigma" impacts. This analysis does not quantify any stigma impacts associated with the proposed critical habitat designation for the lynx.

1.2.4 BENEFITS

23. Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.¹⁶ OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits and ancillary benefits*. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.¹⁷
24. In the context of critical habitat, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.¹⁸ *Rather than rely on economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.*
25. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.
26. It is often difficult to evaluate the ancillary benefits of critical habitat designation. To the extent that the ancillary benefits of the rulemaking may be captured by the market through an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if habitat preserves are created to protect a species, the value of existing residential property adjacent to those preserves may increase, resulting in a measurable positive impact. Where data are available, this analysis attempts to capture the *net* economic impact (i.e., the increased regulatory

¹⁶ Executive Order 12866, Regulatory Planning and Review, September 30, 1993.

¹⁷ U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

¹⁸ *Ibid.*

burden less any discernable offsetting market gains), of species conservation efforts imposed on regulated entities and the regional economy.

27. The lynx has a demonstrated use value, trapping and pelt sales, historically within portions of the study area, and currently in other regions. For example, in Washington State, lynx trapping occurred historically; hunting and trapping seasons were closed when the lynx was listed as a candidate species in Washington in 1991.¹⁹ Additionally, lynx trapping occurs in all Canadian Provinces except New Brunswick, where the lynx is considered regionally endangered. This analysis does not quantify use values associated with potential future lynx trapping activities within the study area as a benefit associated with critical habitat designation. This is due to the lack of information regarding: a) how the lynx population in the study area is expected to change over time; and b) at what population thresholds the lynx may be delisted and trapping allowed.
28. Lynx conservation may also result in economic benefits associated with wildlife viewing. This analysis does not, however, quantify enhanced wildlife viewing associated with lynx conservation. First, data are not available regarding the number of wildlife viewing participants within the study area. Information is also not available to estimate the increment by which wildlife viewing may be improved if the lynx conservation efforts described in this analysis are undertaken. More specifically, the extent to which the likelihood of viewing lynx is increased due to lynx conservation efforts, and the incremental value of a wildlife viewing trip associated with lynx sightings, are unknown.

1.2.5 GEOGRAPHIC SCOPE OF THE ANALYSIS

29. The geographic scope of the analysis includes areas intended to be proposed for critical habitat designation as well as areas considered for exclusion from critical habitat, collectively referred to as the "study area" for the purposes of this analysis. The economic impacts of the critical habitat designation are estimated for each of these two categories of land identified in the proposed rule. The analysis focuses on activities within or affecting these areas.
30. Section 2 describes the geographic scale at which results of the analysis are aggregated.

¹⁹ Stinson, D. 2001. State of Washington Lynx Recovery Plan. Washington Department of Fish and Wildlife.

Defenders of Wildlife’s Economic Impact Assessment of Critical Habitat for the Lynx

An existing study by the Defenders of Wildlife (DOW) regarding the economic impacts of critical habitat for the lynx attempts to quantify economic costs as well as the use and non-use benefits of critical habitat designation for the lynx.¹ Appendix B of this analysis includes a discussion of the methods used in the DOW report to estimate the benefits of critical habitat designation for the lynx and the limitations of applying the results in this draft economic analysis (DEA).

The analytic methods used in this DEA to quantify impacts to land use activities associated with lynx conservation efforts are comparable to those used in the DOW report. The analyses differ, however, in terms of scope. First, this DEA is limited geographically to the boundaries of proposed critical habitat; in the absence of information on the boundaries of critical habitat, the DOW report applied case studies of two regions within the range of the lynx in Maine and Montana. Second, this analysis applies a time frame of 20 years; the DOW report forecasts impacts over ten years. Further, the DOW report describes impacts associated solely with section 7 of the Act related to the critical habitat designation of the lynx. That is, it assigns a definition to “jeopardy” and “adverse modification” in order to isolate the incremental impacts of the critical habitat rulemaking. In contrast, as described above, this DEA considers all future conservation-related impacts to be coextensive with the designation.

Additionally, the DOW report attempts to assign values to the public's willingness to pay for improved prospects for lynx recovery, preservation of undeveloped landscapes, and maintenance of biodiversity as a result of critical habitat designation. Generally, DOW used existing studies estimating values of species and ecological services to quantify benefits. Specifically, the analysis applied a benefits transfer using an existing contingent valuation study for a river otter in the United Kingdom. While benefits transfer is not an uncommon approach and is appropriate when applied following certain guidelines, the DOW report applies a number assumptions in order to conduct their transfer that are not appropriate for application in this analysis. For example, absent any information on the potential change in lynx population that may be associated with critical habitat designation, the DOW assumes an increase in lynx population of between ten and 25 percent; this assumption is not based in any scientific study of the potential affects of designation on the population of this species. Further, the DOW report transfers the values of a single study. The Office of Management and Budget (OMB) guidelines for conducting a credible benefits transfer notes that the studies should be reviewed to determine whether the following things are comparable: 1) the commodity being valued; 2) the baseline and extent of change; and 3) the effected populations (those valuing the commodity). In the case of the DOW study, the commodities being valued have significant differences; while the animals are both carnivores of comparable size, their basic habitat types are different (rivers compared to forested land). In addition, while the extent of change is similar (25 percent population increase), the level of assumed population change for the lynx in the DOW report is not supported, and information is not available regarding the baseline population levels. Finally, the affected populations reside in different countries (the United Kingdom and the U.S.) with potentially different value structures.

The second category of benefit of critical habitat described in the DOW report is preservation of undeveloped landscapes, and the associated preservation of ecosystem services and biodiversity. DOW notes, however, that limited information is available to quantify the full value of these benefits. As a result, the majority (99 percent in the Montana case study) of quantified benefits in the DOW report are associated with the willingness to pay for increased lynx populations. The method used to estimate these benefits, and the limitations of applying them in this analysis, are discussed in more detail in Appendix B.

1.3 ANALYTIC TIME FRAME

31. The analysis estimates impacts based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. The analysis estimates economic impacts to activities from 2000 (year of the species' final listing) to 2025 (20 years from the expected year of final critical habitat designation). Estimated impacts are divided into pre-designation (2000-2005) and post-designation (2006-2025) impacts. The land uses within the study area are not expected to substantially change over this time period.
32. Where information is available to reliably forecast economic activity beyond the 20-year time frame, this analysis incorporates that information. The only activity for which long-term planning information is available is timber management. This analysis estimates impacts of modifications to timber harvest management over a 100 year time frame (2006 - 2105) to match the average time horizon over which timber harvest rotations are planned. In order to compare impacts across activities, however, this analysis reports the annualized impacts of pre-commercial thinning restrictions over the first 20 years.

1.4 INFORMATION SOURCES

33. The primary sources of information for this report are communications with and data provided by personnel from the Service, Federal, state, and local governments and other stakeholders. In addition, this analysis relies upon the Service's section 7 consultation records, transcripts from public hearings and public comments on the proposed rule. Due to the high number of entities contacted, the complete list of contacted stakeholders is within the reference section at the end of this document.
34. The primary assumption applied in the analysis is that *lynx conservation measures from the Lynx Conservation Assessment Strategy (LCAS) will be implemented across public and private lands within the study area.*²⁰ While various states have based their lynx management or habitat conservation plans on the LCAS, most private lands are not currently being managed to meet LCAS standards. This analysis assumes that increased public pressure on the Service and industries associated with critical habitat to conserve lynx could potentially lead to changes in silviculture practices, development projects, recreation, mining, and other activities on private lands. As the LCAS is considered by the Service to be the best information available regarding conservation measures for the lynx, the analysis assumes that, absent more specific information, public and private landowners across the potential critical habitat will use the LCAS as a model for lynx conservation needs. Where more specific conservation standards have been developed for use in a particular area, such as in the Superior National Forest Plan, these are quantified

²⁰Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53. Available for download at: <http://mountain-prairie.fws.gov/species/mammals/lynx/miscellaneous.htm>.

in place of the LCAS standards in this analysis. Specific LCAS conservation measures applied to each activity are highlighted in Exhibit 1-1.

EXHIBIT 1-1. LCAS CONSERVATION GUIDELINES

ACTIVITY	CONSERVATION GUIDELINES
Timber	Pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat.
Development	Not addressed in LCAS.
Recreation	No net increase in over the snow routes.
Public Lands Management	<ul style="list-style-type: none"> • Lynx habitat will be mapped using criteria specific to each geographic area to identify appropriate vegetation and environmental conditions. • Prepare a broad-scale assessment of landscape patterns that compares historical and current ecological processes and vegetation patterns
Transportation Municipal, and Utilities	<ul style="list-style-type: none"> • Where needed, develop measures such as wildlife fencing and associated underpasses or overpasses to reduce mortality risk; • Identify and map the location of "key linkage areas" where highway crossings may be needed to provide habitat connectivity and reduce mortality of lynx; • Within the range of lynx, complete a biological assessment for all proposed highway projects on Federal lands; • Dirt and gravel roads traversing lynx habitat should not be paved or otherwise upgraded in a manner that is likely to lead to significant increases in traffic volumes, traffic speeds, increased width of the cleared right-of-way, or would foreseeably contribute to development of increases in human activity in lynx habitat.
Mining	Not addressed in LCAS.

1.5 STRUCTURE OF REPORT

35. This remainder of this report is organized as follows:

- Section 2: Background;
- Section 3: Timber Activities;
- Section 4: Development;
- Section 5: Recreation;
- Section 6: Public Lands Management and Conservation Planning;
- Section 7: Transportation, Utilities, and Municipal Activities;
- Section 8: Mining;
- Section 9: Tribal Activities;
- References;
- Appendix A: Consultation Costs;

- Appendix B: Summary of the Defenders of Wildlife Lynx Critical Habitat Analysis;
- Appendix C: Small Business and Energy Impacts Analysis;
- Appendix D: Timber Impacts Technical Appendix;
- Appendix E: Recreation Benefits Transfer Appendix; and
- Appendix F: Detailed Impacts by Activity and Subunit.

SECTION 2 | BACKGROUND

36. This section summarizes the study area and provides information on the land use activities considered in this analysis. The Canada lynx are medium-sized cats that are highly specialized predators of snowshoe hare. The Proposed Rule describes the species in detail.²¹

2.1 PROPOSED CRITICAL HABITAT DESIGNATION

37. The proposed critical habitat rule for the lynx delineates four units across five states as areas proposed for designation and areas considered for exclusion from critical habitat, collectively referred to in this analysis as the "study area."
- Unit 1 - Maine: portions of Aroostook, Franklin, Piscataquis, Penobscot, and Somerset Counties.
 - Unit 2 - Minnesota: portions of Lake, Cook, and St. Louis Counties.
 - Unit 3 - Northern Rocky Mountains (Montana and a small portion of Idaho): portions of Lincoln, Flathead, Glacier, Lake, Missoula, Granite, Teton, Lewis and Clark, and Powell Counties, MT, and Boundary County, ID.
 - Unit 4 - North Cascades (Washington): portions of Okanogan, Skagit, and Chelan Counties.

The study area lands are generally characterized as moist boreal forests that have cold, snowy winters and a snowshoe hare prey base.

38. According to GIS data provided by the Service, the four critical habitat units comprise 9.8 million acres proposed for designation and 1.19 million acres considered for exclusion from critical habitat. In order to provide results of the economic analysis at a more refined geographic scale than the four units, this analysis identifies "subunits" by landowner type.²² A graphical depiction of these subunits is presented in Exhibits 2-1 through 2-4, and information on their relative sizes is described in Exhibit 2-5. Importantly, although results are presented by landowner type, impacts as quantified are not necessarily borne by the landowner type describing the subunit. For example, impacts to activities on private inholdings in Superior National Forest that may be borne

²¹ U.S. Fish and Wildlife Service, 50 CFR Part 17, November 9, 2005.

²² A number of methods to present more spatially refined results was considered in developing this analysis, including by county, census tract, and watershed. The decision-making process that led to the delineation of subunits by landowner type is described in a memorandum from Industrial Economics to the U.S. Fish and Wildlife Service dated February 3, 2006.

by mining companies or private timber companies are included as impacts associated with designating the Superior National Forest subunit; they are not, however, impacts expected to be borne by the U.S. Forest Service.

39. Of the total study area, approximately 80 percent are private lands, 14 percent are state-owned, and six percent are Federal. Of the 9.8 million acres proposed for designation, approximately 55 percent (5.4 million acres) are private timber lands in Maine belonging to more than 50 private landowners; ten of these private landowners are timber companies owning more than 200,000 acres each.
40. Additionally, water bodies and "developed areas such as towns, or human-made structures such as buildings, airports, paved and gravel roadbeds, active railroad beds, and other structures that lack the [primary constituent elements] PCEs for the lynx" are not included in critical habitat.²³ The Proposed Rule identifies about 250 towns and place-based features (e.g., marinas, campsites, historical sites, etc.) across the study area that are not intended to be included in the proposed critical habitat despite falling within the outer boundaries as mapped in the proposed rule. GIS information regarding the explicit boundaries of the majority of these towns and features is not available. As the Service intended only to not include the developed portions of these areas (due to the lack of PCEs) and not the entire area within their boundaries, this analysis considers impacts to any activities that occur within these areas with the potential to affect the PCEs for the lynx.²⁴ For example, new construction on undeveloped lands within the boundaries of not included towns are considered in this analysis.

²³ PCEs for the lynx are described in the Proposed Rule: U.S. Fish and Wildlife Service, 50 CFR Part 17, November 9, 2005.

²⁴ As clarified in a memorandum from IEC to the U.S. Fish and Wildlife Service dated February 3, 2006.

EXHIBIT 2-1. UNIT 1: MAINE

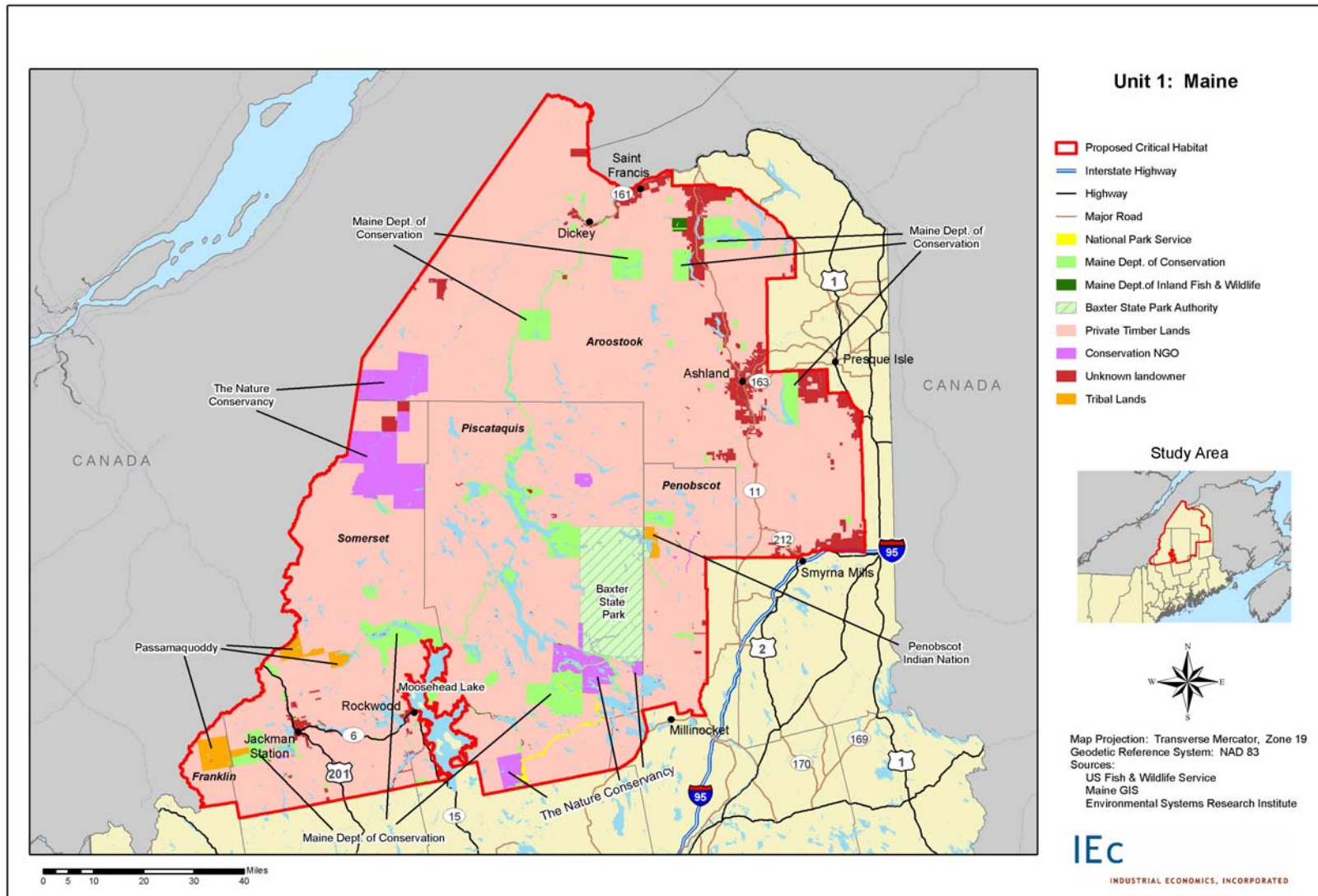


EXHIBIT 2-2. UNIT 2: MINNESOTA

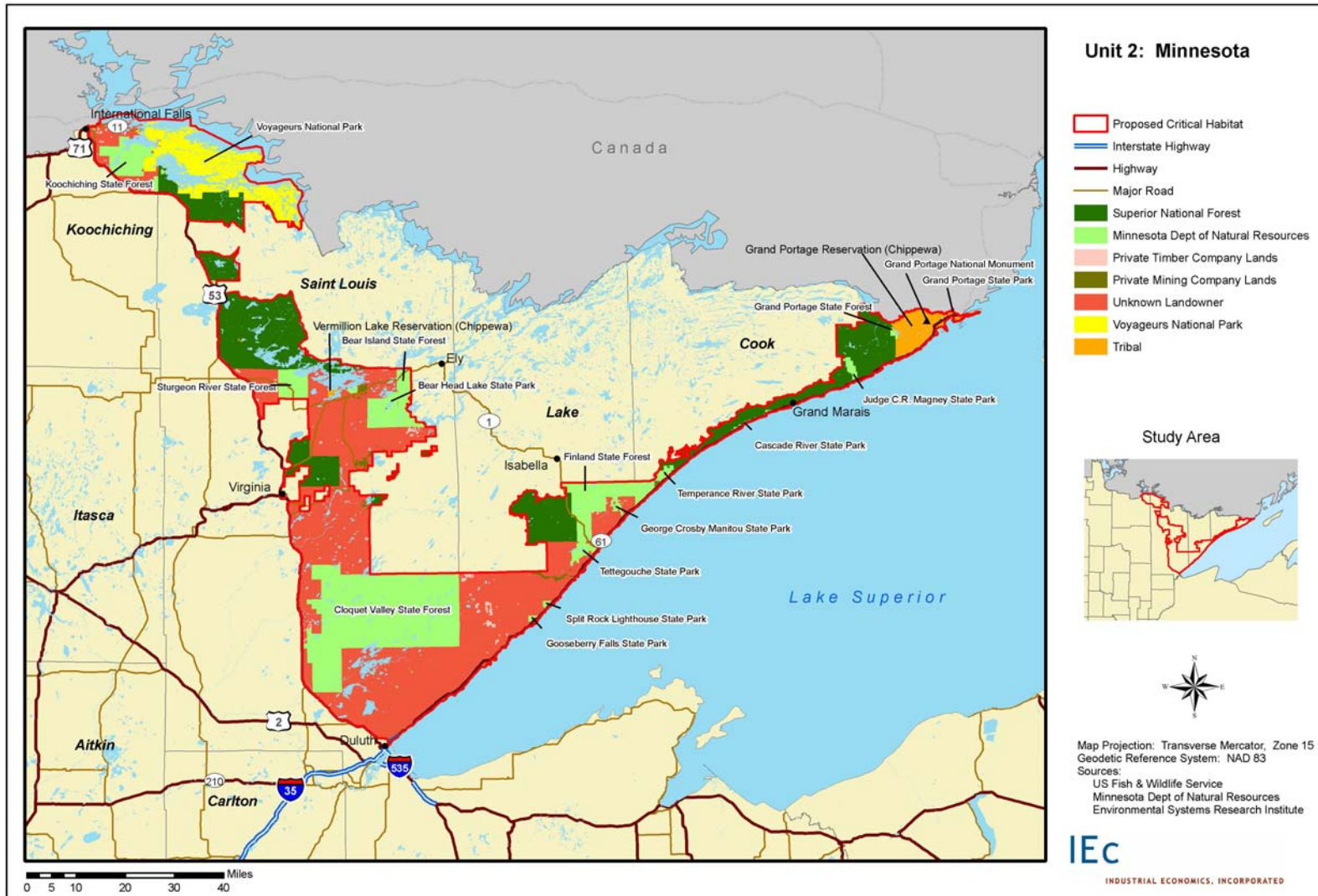


EXHIBIT 2-3. UNIT 3: NORTHERN ROCKY MOUNTAINS

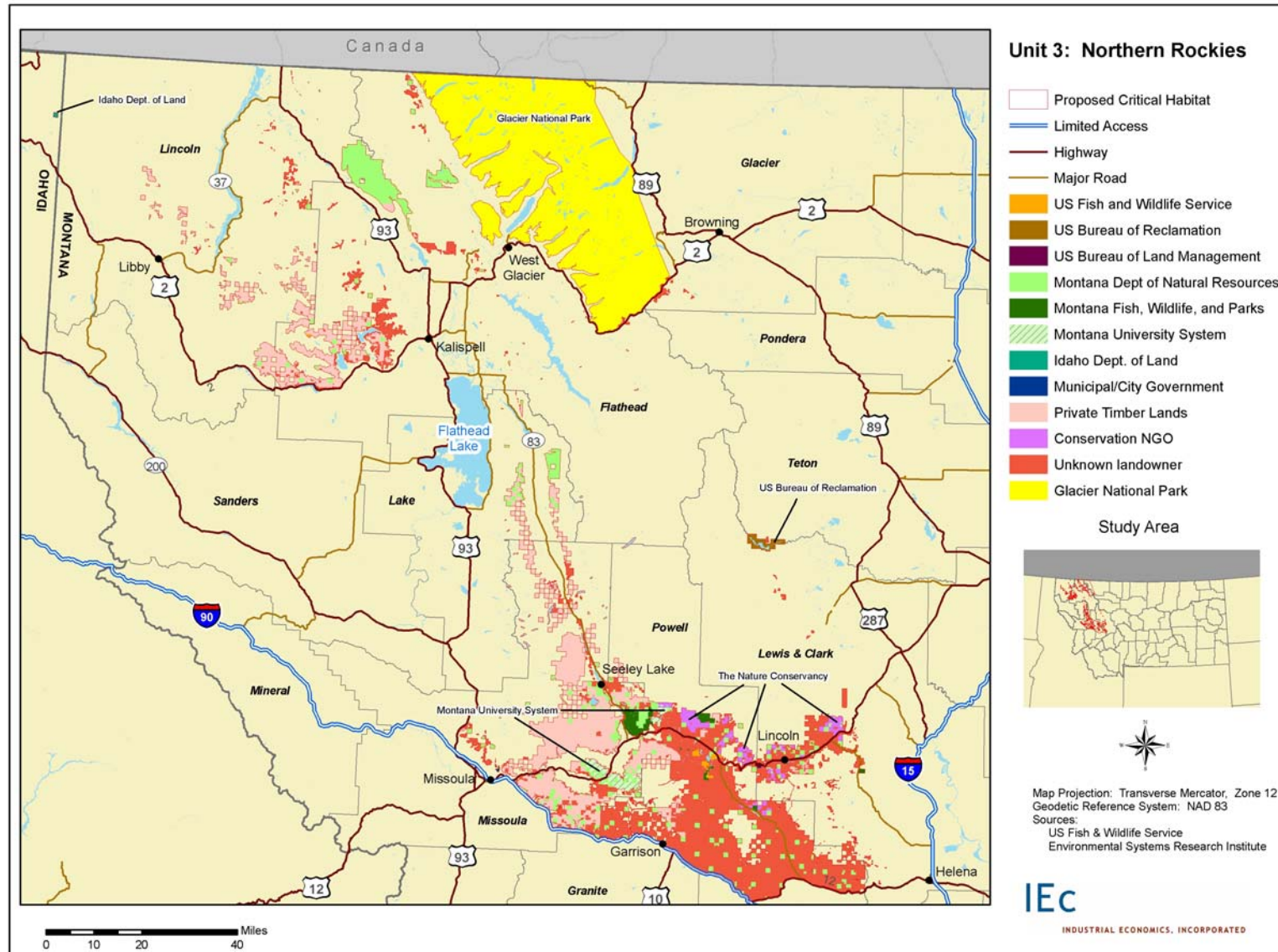


EXHIBIT 2-4. UNIT 4: NORTH CASCADES

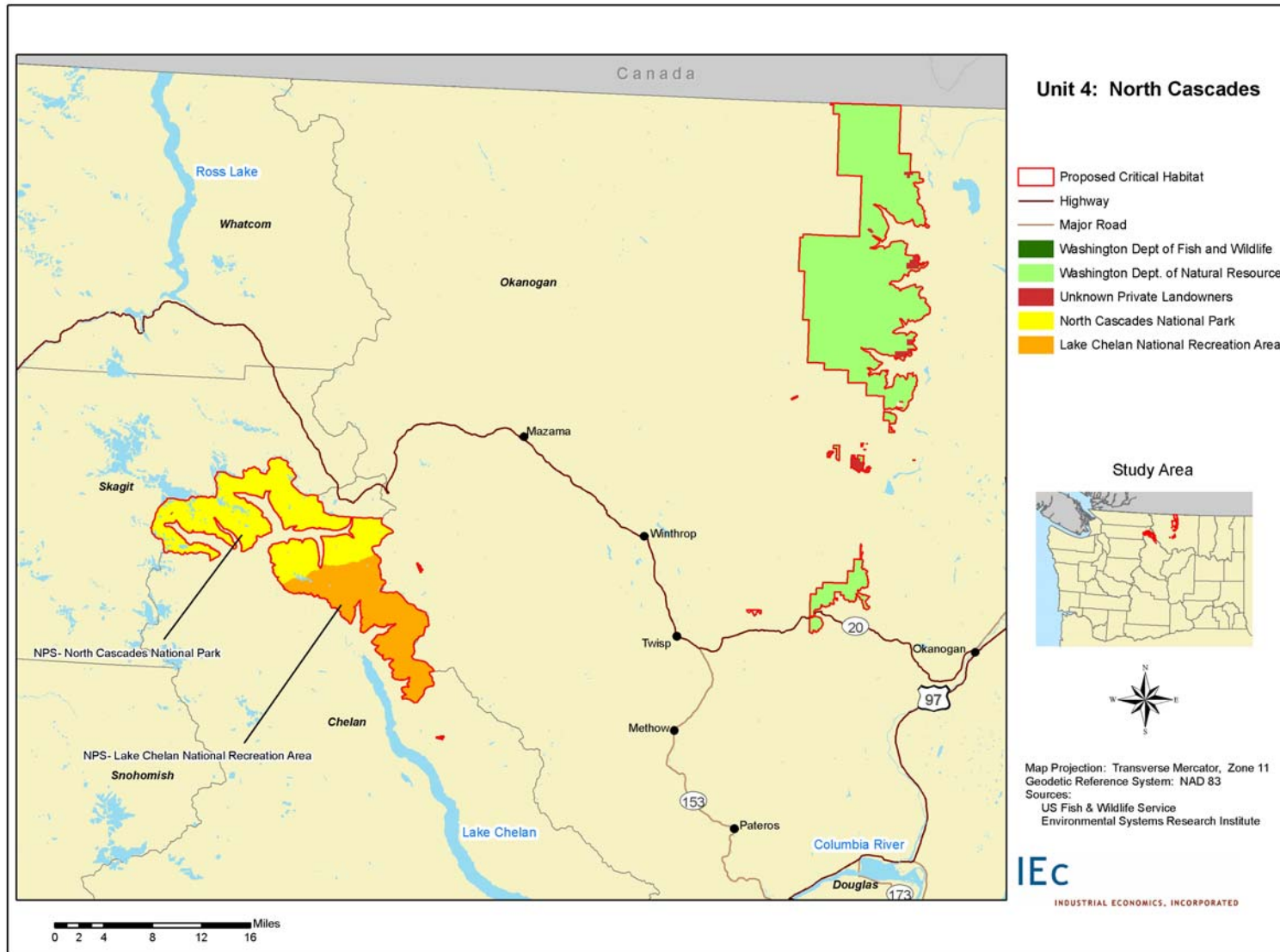


EXHIBIT 2-5. ACREAGES BY SUBUNIT

SUB-UNIT	ACREAGE PROPOSED FOR DESIGNATION	ACREAGE CONSIDERED FOR EXCLUSION	PERCENT OF TOTAL IN UNIT
UNIT 1: MAINE			
National Park Service	10,054		0.15%
U.S. Fish and Wildlife Service	41		0.00%
Maine Dept of Conservation	346,676		5.34%
Maine Dept. of Inland Fish & Wildlife	4,965		0.08%
Baxter State Park Authority	205,436		3.16%
Private Timber Lands	5,385,955		82.92%
Conservation NGO	240,890		3.71%
Unknown Landowner	247,421		3.81%
Tribal lands		53,593	0.83%
<i>SUBTOTAL</i>	<i>6,441,438</i>	<i>53,593</i>	
UNIT 2: MINNESOTA			
Superior National Forest	473,366		22.91%
Minnesota Dept. of Natural Resources	507,473		24.56%
Private Timber Lands	12,074		0.58%
Private Mining Lands	9,702		0.47%
Unknown Landowner	889,522		43.04%
Voyageurs National Park		126,149	6.10%
Tribal Lands		48,209	2.33%
<i>SUBTOTAL</i>	<i>1,892,136</i>	<i>174,358</i>	
UNIT 3: NORTHERN ROCKY MOUNTAINS			
U.S. Fish and Wildlife Service	4,784		0.21%
U.S. Bureau of Reclamation	8,002		0.36%
U.S. Bureau of Land Management	13		0.00%
Montana Dept. of Natural Resources	189,771		8.52%
Montana Fish, Wildlife, and Parks	20,465		0.92%
Montana University System	21,656		0.97%
Idaho Dept. of Land	646		0.03%
Municipal/City Government	246		0.01%
Private Timber Lands	428,205		19.23%
Conservation NGO	36,201		1.63%
Unknown landowner	644,028		28.92%
Glacier National Park		871,668	39.14%
BLM: Butte Resource Area		1,089	0.05%
<i>SUBTOTAL</i>	<i>1,354,016</i>	<i>872,757</i>	

SUB-UNIT	ACREAGE PROPOSED FOR DESIGNATION	ACREAGE CONSIDERED FOR EXCLUSION	PERCENT OF TOTAL IN UNIT
UNIT 4: NORTH CASCADES			
Washington Dept of Fish and Wildlife	3		0.00%
Washington Dept of Natural Resources	105,023		54.29%
Unknown Private Landowners	2,630		1.36%
North Cascades National Park		53,135	27.47%
Lake Chelan National Recreation Area		32,665	16.89%
<i>SUBTOTAL</i>	<i>107,656</i>	<i>85,800</i>	
GRAND TOTAL	9,795,246	1,186,509	4.00

2.2 THREATS TO THE SPECIES AND ITS HABITAT

41. Through review of the threats listed in the proposed rule, and past consultation regarding the lynx, this analysis identifies the following land use activities as potential conservation threats to the lynx:
- Silviculture;
 - Development;
 - Recreation;
 - Public lands management;
 - Transportation, utilities, and municipal activities;
 - Mining; and
 - Tribal activities.
42. The extent of the various land use activities across the study area reflects the species' preference for regenerating forested lands with deep snow. That is, the lynx favors dening and hunting in areas away from people and developed areas. This is evidenced by the fact that the majority of the lands of the study area (as described above) are rural landscapes primarily used for silviculture.
43. Each of the above land use activities is examined to determine how it may need to be modified to mitigate threats to the lynx and critical habitat in this analysis.

SECTION 3 | TIMBER ACTIVITIES

44. This section addresses potential impacts to silviculture resulting from lynx conservation efforts. Approximately 9.4 million acres included in the study area (85 percent of total study area) are currently managed for timber harvest. Landowners that conduct silvicultural activities in the study area include both public and private timber companies, state and county land management agencies, and individuals. Two of the largest landowners are timber companies: JD Irving, Limited (1.13 million acres) and Plum Creek Timber Company (969,000 acres).
45. Impacts to timber activities have historically resulted from implementation of existing lynx conservation plans in Minnesota and Washington. In addition to these continuing impacts, under Scenario 1, this analysis forecasts the impact of minimal compliance with LCAS guidelines (e.g. preparing lynx management plans). Under Scenario 2, in addition to Scenario 1 costs, impacts are based on the assumption that landowners would comply with Lynx Conservation Assessment Strategy (LCAS) guidelines regarding pre-commercial thinning (effectively precluding investment in pre-commercial thinning) throughout the study area.²⁵ Total forecast impacts to timber activities over 20 years are summarized below.

Post-designation impacts in areas proposed for designation

- Undiscounted: \$117 million to \$809 million
 - Present value applying a seven percent discount rate: \$63.5 million - \$210 million (annualized \$6.0 million - \$19.8 million)
 - Present value applying a three percent discount rate: \$78.1 million - \$348 million (annualized \$5.3 million - \$23.4 million)
46. This remainder of this section is divided into five parts. The first provides an overview of the regional timber industry within the study area. Changes in timber activities expected to result from lynx conservation efforts are summarized in the second section. The third and fourth sections provide a summary of pre-designation and post-designation impacts to timber activities, respectively. The last section describes the major uncertainties underlying the analysis of timber impacts. Additional detail regarding the analysis of timber impacts is included in Appendix D.

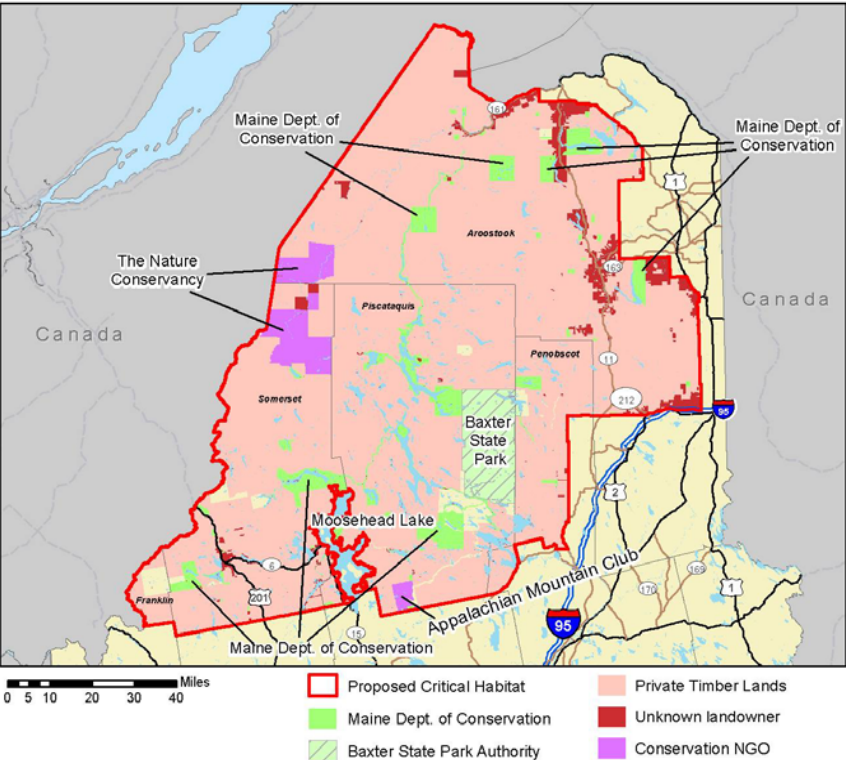
²⁵ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53. Also, Personal communications with Bob Seymour University of Maine, March 24, 2006; Kenny Ferguson, Huber Resources, March 1, 2006; and, Russell Roy, Penobscot Nation, March 8, 2006.

3.1 PROFILES OF REGIONAL TIMBER INDUSTRIES

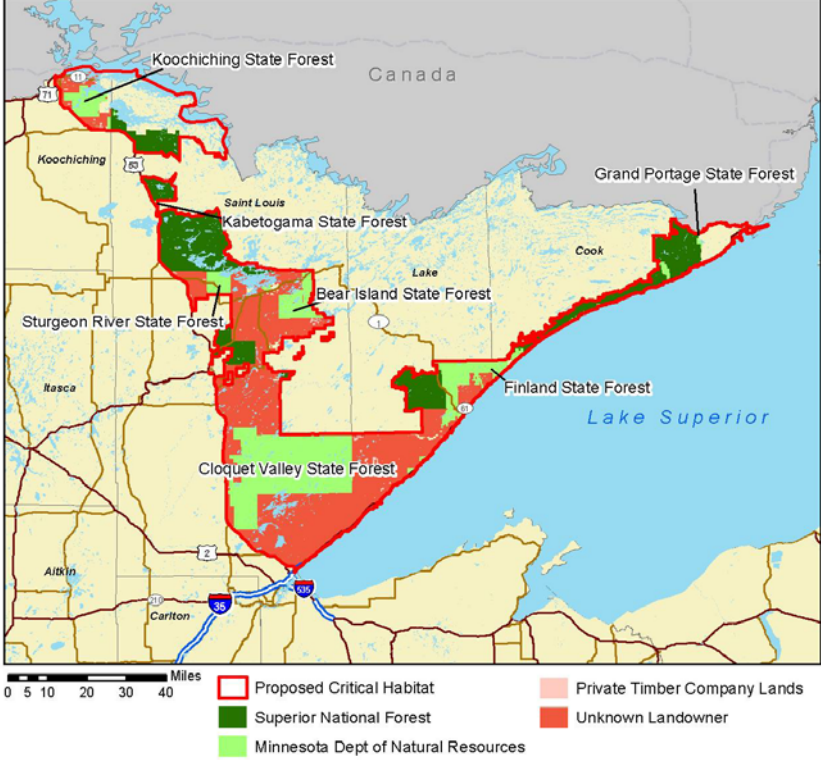
47. Exhibit 3-1 illustrates the location of timberlands within the study area. As a means of providing context for the impact estimates provided in this section, the full value of timberlands in the study area is estimated in Exhibit 3-2. The timber values presented in Exhibit 3-2 represent the value of land as a silvicultural input and generally reflect the present value of the standing timber. The timber value of these lands is separate from development value, which is discussed in Section 4.

EXHIBIT 3-1. LOCATION OF TIMBERLANDS IN STUDY AREA

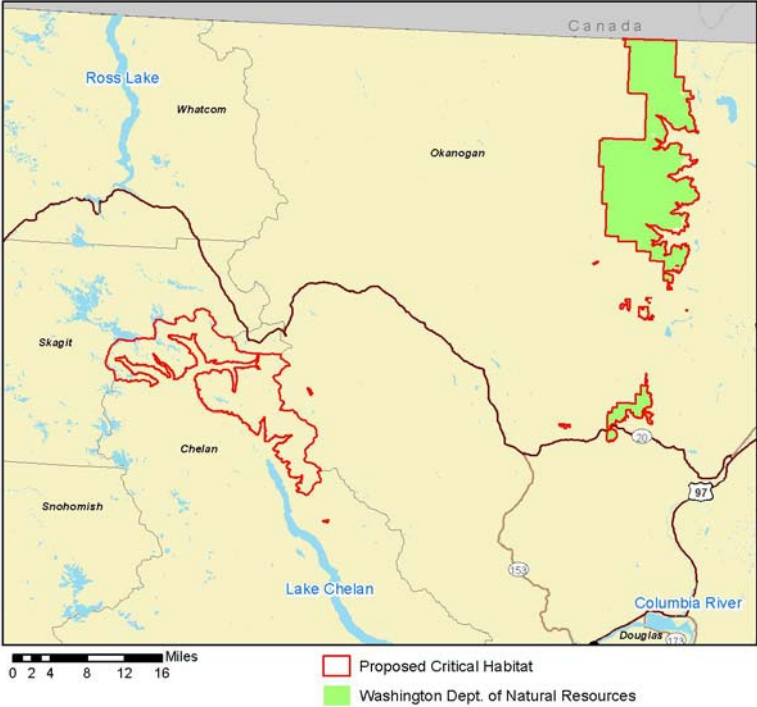
Unit 1: Maine



Unit 2: Minnesota



Unit 4: North Cascades



Unit 3: Northern Rockies

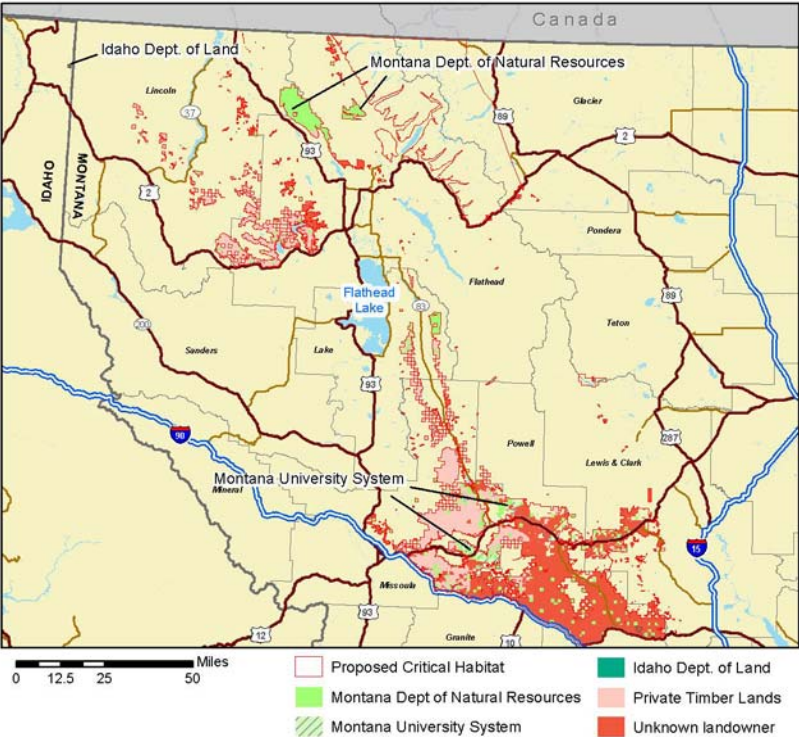


EXHIBIT 3-2. VALUE OF TIMBERLANDS IN STUDY AREA

UNIT	TIMBERLAND IN STUDY AREA (ACRES)	TIMBER VALUE PER ACRE (2006\$)	VALUE OF TIMBERLAND IN STUDY AREA (2006\$)
Unit 1: Maine	6,093,116	\$300	\$1,830,000,000
Unit 2: Minnesota	1,882,434	\$880	\$1,660,000,000
Unit 3: Northern Rockies	1,284,306	\$652	\$837,000,000
Unit 4: North Cascades	105,023	\$1,440	\$151,000,000
TOTAL	9,364,879		\$4,470,000,000
Sources: Unit 1. MRS appraisal data provided by LURC on April 19, 2006 and subsequent communication with Bob Doirion at MRS on April 26, 2006. Unit 2. Data from St. Louis County Parent Land Sales Database. Received from Bruce Grohn, GIS Specialist, St. Louis County Planning Dept. on April 20, 2006. Unit 3. Data from the Montana State Cadastral database for acreage type "timber". Accessed at http://nris/mt/gov/gis/gisdata/lib/gisddatalist.aspx Unit 4. Data for parcels denoted "Designated Forest Land" (use code 88) from Okanogan County Assessors office data, "Book of Sales.zip" downloaded 6/14/06 from http://okanogancounty.org/Assessor . Discussion with WADNR indicates that most recent sale of WADNR lands in this area were sold for \$800/acre; however, this was a large parcel (25,000 acres) that went into a conservation easement (thus may not have been as productive for timber purposes). Personal communication with Kymm Boire, WADNR, June 19, 2006.			

48. Exhibit 3-3 presents an overview of industry statistics, by unit. A brief discussion of regional timber industries follows.

3.1.1 UNIT 1: MAINE

49. A total of 6.1 million acres of timberlands (36 percent of timberland in the state) are included in the study area in Maine. At 90 percent, Maine has the highest percentage of forested land of any state. In addition, it has one of the highest percentages of privately-owned forestland (95 percent). The Maine Forest Practices Act, initially implemented in 1990, reduced the practice of clearcutting while increasing use of partial harvest and shelterwood harvest methods. In 2004, clearcutting accounted for less than five percent of acres harvested.²⁶ Many of the stands that were affected by the spruce budworm outbreak (1970 – 1990), and subsequent extensive harvesting, are nearing merchantability. In addition, over the last several decades, ownership of Maine's forests has changed, with land investment ownership increasing and forest industry ownership declining.²⁷ This change in ownership may lead to changes in timber management practices, as investors look to maximize earnings over a shorter investment timeframe.

²⁶ Maine Forest Service. 2005. 2004 Silvicultural Activities Report. Published October 27, 2005. Available online at www.maine-forestservice.org.

²⁷ Maine Forest Service. 2005. The 2005 Biennial Report on the State of the Forest and Progress Report on Forest Sustainability Standards. December 29, 2005. Accessed at: <http://www.state.me.us/doc/mfs/pubs.htm>. Also, Hagan, J.M., L.C. Irland, and A.A. Whitman. 2005. Changing timberland ownership in the Northern Forest and implications for biodiversity. Manomet Center for Conservation Sciences, Report # MCCA-FCP-2005-1, Brunswick, Maine.

EXHIBIT 3-3. STATEWIDE FORESTRY INDUSTRY STATISTICS

DATA ITEM	MAINE	MINNESOTA	MONTANA	WASHINGTON
Forested Area (2002) ⁽¹⁾	17.7 million acres (90% of total land area)	16.7 million acres (33% of total land area)	23.3 million acres (25% of total land area)	21.8 million acres (51% of total land area)
Timberland Ownership (2002) ⁽¹⁾	17.0 million acres (96% private; 5% state and Federal government)	14.7 million acres (48% private; 38% state and local government; 14% Federal)	19.2 million acres (65% Federal; 31% private; 4% state and local government)	17.3 million acres (65% private; 35% Federal; 13% state and local government)
Growing Stock Species Mix ⁽¹⁾ ⁽⁵⁾	Approximately 60% hardwood/40% softwood	Approximately 76% hardwood/24% softwood	Nearly all softwood (softwoods were over 95% of 1998 harvest)	Primarily softwood (85% conifers)
Annual Harvest Levels (2004) ⁽²⁾	3,250 mmbf (6.5 million cord equivalents)	1,800 mmbf (3.6 million cords)	Average of 690 mmbf annually (2003-2004)	3,539 mmbf
Average Stumpage Prices ⁽³⁾	Sawlogs \$61 - \$304/mbf; veneer \$86 - \$563/mbf	Sawtimber \$27 - \$169/mbf; pulpwood \$5 - \$37/cord	Sawlogs \$364 - \$513/mbf; veneer logs \$413 - \$550/mbf	\$22 - \$523/mbf
Forestry Earnings and Employment (2003) ⁽⁴⁾	\$440.9 million (2% of total) 29,925 jobs (4 % of total)	\$1.0 billion (1% of total); 56, jobs (2% of total)	\$327.2 million (2% of total); 10,718 jobs (2% of total)	\$1.4 billion (1% of total); 59,239 jobs (2% of total)
Number of Wood Product and Paper Manufacturing Facilities ⁽¹⁾ ⁽⁶⁾	289 facilities	493 facilities	205 facilities	178 facilities
Notes: 1 mbf = 500 cords				
(1) American Forest and Paper Association state economic brochures, available at www.afandpa.org . Revised 2003.				
(2) Maine Forest Service. 2005. 2004 Wood Processors Report. Published October 27, 2005. Available online at www.maineforestservice.org . Keegan, Charles and Todd Morgan. 2005. Montana's Timber and Forest Products Industry Situation, 2004. May 2, 2005. Available at http://www.bber.umt.edu/content/?x=1079 . Washington State Department of Natural Resources. 2004. Preliminary Timber Harvest Report Data. Washington State Timber Harvest Calendar Year 2003. Accessed at http://dnr.wa.gov/htdocs/obe/timberharvest/2003preliminary.htm .				
(3) Maine Forest Service. 2005. 2004 Stumpage Prices by Maine County. Published October 27, 2005. Available online at www.maineforestservice.org . Range of prices represents different species. Minnesota Department of Natural Resources, Division of Forestry. 2005. Minnesota's Forest Resources. December 2005. Accessed at http://files.dnr.state.mn.us/forestry/um/index.html on March 27, 2006. Bureau of Business and Economic Research. University of Montana. 2005. Montana Sawlog and Veneer Log Price report for July - September, 2005. Accessed at www.bber.umt.edu . State of Washington, Department of Revenue. 2006. Tax reporting instructions and Stumpage value determination tables January 1 through June 30, 2006. Accessed at http://dor.wa.gov.content.taxes.timber/forst_stump00.aspx .				
(4) Forestry-related earnings combines code 101 Forestry & Logging and code 511 Wood Product manufacturing. Earnings information and total state employment from BEA, accessed at http://www.bea.gov/bea/regional/reis . Forestry-related employment from state economic brochures compiled by the American Forest and Paper Association, available at www.afandpa.org .				
(5) Keegan, Charles, et. al 2001. Montana's Forest Products Industry: A descriptive analysis, 1969-2000. Accessed at http://www.bber.umt.edu/frest/pdf/fidacs/mt2000.pdf , March 22, 2006				
(6) Washington State Department of Natural Resources. 2005. Washington Mill Survey 2002. Series Report #16. May 2005. Accessed at http://www.dnr.wa.gov/htdocs/millsurveys/2002ms.html .				

50. Maine's primary manufacturing sector is dominated by paper manufacturing; Maine is the second largest paper producing state (by volume). While output volume at paper mills and sawmills in Maine has reached near record levels recently, employment is down. The need to be competitive in a global market has meant decreasing employment as manufacturers look to increase productivity by employing fewer, more highly skilled workers.²⁸

3.1.2 UNIT 2: MINNESOTA

51. A total of 1.9 million acres of timberlands (13 percent of timberland in the state) are included in the study area in Minnesota. The following factors are currently affecting the timber industry in Minnesota:

- Currently, demand for the limited local supply of aspen is high, leading to increased imports into the state as stumpage prices for aspen in Minnesota have risen significantly in the last several years.²⁹ Aspen pulpwood is an important component for many mills in Minnesota; aspen makes up 60 percent of timber harvested in the State (by volume).³⁰
- Harvest on lands managed by state and county agencies has become an increasingly important source of timber as changes in management emphasis have led to reductions in timber harvest on Federal lands.³¹
- The Minnesota legislature has approved funding for several biomass energy plants, which are scheduled to come online within the next year. The biomass industry may provide a new market for pre-commercial thinning residues and other slash and brush. Minnesota Department of Natural Resources (MNDNR) is part of a committee formulating guidelines for biomass harvests that could include lynx conservation measures.³²

3.1.3 UNIT 3: NORTHERN ROCKIES

52. A total of 1.3 million acres of timberlands (7 percent of timberland in the state) are included in the study area in the Northern Rockies unit. The primary issues facing the timber industry in the Northern Rockies relate to the level of harvest necessary to keep timber-processors operating efficiently. A May 2005 report states “with no change in

²⁸ Innovative Natural Resource Solutions, LLC. Maine Future Forest Economy Project - Current Conditions and Factors Influencing the Future of Maine's Forest Products Industry. March 2005. Prepared for Department of Conservation - Maine Forest Service and Maine Technology Institute. Available online at <http://www.state.me.us/doc/mfs/mfshome.htm>

²⁹ Minnesota Department of Natural Resources, Division of Forestry. 2005 Public Stumpage Price Review and Price Index. Provided by fax from Jon Nelson, April 7, 2006. The Minnesota stumpage price index rose to 208.1 versus an inflation index of 112.1 in 2005 (base year 2000 = 100).

³⁰ Minnesota Department of Natural Resources, Division of Forestry. 2005. Minnesota's Forest Resources. December 2005. Accessed at <http://files.dnr.state.mn.us/forestry/um/index.html> on March 27, 2006.

³¹ Ibid.

³² Personal communication with St. Louis County Lands Department, March 23, 2006. Also see, Minnesota Department of Natural Resources, Division of Forestry. 2005. Minnesota's Forest Resources. December 2005. Accessed at <http://files.dnr.state.mn.us/forestry/um/index.html> on March 27, 2006

current harvest levels, Montana will likely see the closure of more than one of its largest timber processors, along with the shut-down of several smaller mills.”³³ Timber harvest on National Forests in Montana declined 70 percent from 1980 to 2004. This decline is attributable to various factors including lawsuits challenging timber sales, cumulative effects of past harvesting, and reductions in Forest Service budgets. Timber processing facilities in Montana were operating at 70 percent in 2004.³⁴ Within the study area in the Flathead Valley, a local mill recently shut-down the night shift on half of its operations due to decreased timber harvest on Federal lands.³⁵ Earnings received by workers in the lumber and wood products and forestry sub-sector in Flathead County, Montana, decreased by \$9.0 million (1996\$) over the period from 1990 to 2000.³⁶

3.1.4 UNIT 4: NORTH CASCADES

53. Approximately 105,000 acres of timberlands (1 percent of timberland in the state) are included in the study area in Washington. Of timberlands in the eastern Washington region, where the study area is located, the majority are National Forest lands (38 percent), while other public ownership makes up 12 percent, forest industry ownership 14 percent, and other private (primarily tribal) ownership 36 percent.³⁷ However, in 2003, National Forests contributed only eight percent of regional timber harvest, while private lands contributed 59 percent, tribal lands contributed 21 percent, and state and other public lands contributed 12 percent.³⁸ Within Okanogan County, where the timberlands in the study area are located, designated timberlands receive substantial tax advantages.³⁹

³³ Keegan, Charles and Todd Morgan. 2005. Montana’s Timber and Forest Products Industry Situation, 2004. May 2, 2005. Available at <http://www.bber.umn.edu/content/?x=1079>.

³⁴ Ibid.

³⁵ Public comments by Ron Buentemeier, F.H. Stoltze Lumber Company, at the Lynx Critical Habitat public meeting January 10, 2006, Kalispell, Montana.

³⁶ National Parks Conservation Association. 2003. Gateway to Glacier The Emerging Economy of Flathead County. Available at http://www.npca.org/across_the_nation/npca_in_the_field/northern_rockies/gateway/introduction.asp.

³⁷ Bolsinger, Charles, et. al. 1997. Washington’s public and private forests. Resour. Bull PNW-RB-218. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Available at <http://www.fs.fed.us/pnw/publications/rb218/>.

³⁸ Washington State Department of Natural Resources. 2003. Preliminary Timber Harvest Report Data. Washington State Timber Harvest Calendar Year 2003, Preliminary data as of 11/10/04. Available at <http://dnr.wa.gov/htdocs/obe/timberharvest/2003preliminary.htm>.

³⁹ Designated forest land refers to “land in any contiguous ownership of 20 or more acres, which is primarily devoted to and used for growing and harvesting timber.” (<http://okanogancounty.org/assessor/designat.htm>). Personal communication Jim White, Okanogan County Assessors Office, June 16, 2006.

Market for Pre-commercial thinning Residue: Biomass Energy Production

Within the context of energy production, biomass consists primarily of waste products from the agriculture and timber industry. In 2003, biomass was the leading source of renewable energy in the United States, representing 47 percent of all renewable energy sources and four percent of the total energy produced nationally.^a A large percentage of biomass fuelstock comes from forestry residue, often deriving from unmerchantable or pre-commercial thinning.

With rising energy prices and advances in technology like the ability to retrofit coal plants to burn both coal and biomass, biomass is becoming increasingly attractive. The U.S. Department of Energy and National Renewable Energy Laboratory has rated biomass production potential for areas in and around all four proposed critical habitat units as "good" or "excellent" and demand for biomass fuel is expected to increase over the coming decades.^b

Biomass energy production within the study area is increasing. In the Maine counties containing lynx critical habitat, over 4.8 million tons of forestry residue was purchased for biomass at a cost of approximately \$6.5 million from 1999 to 2004.^c Two biomass plants exist within Unit 1 (Stratton and Ashland) and three more are situated within a 100 miles.^d Within Unit 2 in northeastern Minnesota, the state legislature recently passed a measure that included funding to retrofit two energy plants within to utilize biomass. A study conducted to determine the available forest residue around these plants (to be operated by the Laurentian Energy Authority) estimated that approximately 730,000 green tons of residue could be available annually within a 100 mile radius.^e In support of this project, the St. Louis County Land Commissioner provided a letter of intent to the Laurentian Energy Authority offering to provide waste wood from its logging operations for biomass production.^f In Montana, biomass energy production currently provides only three percent of energy consumed. However, it is estimated that potential biomass fuel sources (including 1.3 million dry tons of forest residues) could provide up to 23 percent of Montana's energy consumption.^g

An increase in biomass energy production could increase the demand and provide a market for residue from pre-commercial thinning. If this occurs, the impacts of restricting pre-commercial thinning estimated in this report could be understated.

^a Biomass Program, Energy Efficiency and Renewable Energy, U.S. Department of Energy. May 2006. Available at http://www1.eere.energy.gov/biomass/biomass_today.html

^b Bioenergy Basics, U.S. Department of Energy. May 2006. At <http://www.arkansasrenewableenergy.org/bioenergy/bioenergy.html>.

^c Email communication containing stumpage price records for counties containing proposed lynx critical habitat, from Gregory Lord, Maine Forest Service, April 11, 2006.

^d Maine Renewable Energy - Hydroelectric and Biomass Generating Stations. May 2006. Available at <http://www.energymaine.com/docs/List%20of%20Generating%20Facilities.xls>

^e Berguson et al. "Analysis of Forest Harvest Residue Availability for the Laurentian Energy Authority Project." University of Minnesota, Natural Resources Research Institute. January 20, 2005.

^f Letter from David Epperly, Land Commissioner, Saint Louis County, to the Laurentian Energy Authority, dated July 22, 2005.

^g Rogers, Hiram. "Biorefineries: Building the Road from Petroleum to Biomass". May 2006. Available at http://www.biomass.govtools.us/newsletters/Apr_2006/default.html

Haq, Zia. "Biomass for Electricity Generation". Energy Information Administration, Biomass for Electricity Generation. May 2006. Available at <http://www.eia.doe.gov/oiaf/analysispaper/biomass/pdf/biomass.pdf>.

3.2 CHANGES IN TIMBER MANAGEMENT PRACTICES AS A RESULT OF LYNX CONSERVATION EFFORTS

54. To estimate impacts to timber management activities, this analysis employs two scenarios to bound the potential impacts, recognizing that there is significant uncertainty regarding the type and level of lynx conservation that will be undertaken by timber landowners

following designation. While both scenarios assume that all landowners will undertake lynx conservation efforts; they differ in the type of lynx conservation undertaken.

55. Scenario 1, the lower-bound scenario, quantifies two types of lynx management: 1) landowners continue to implement their ongoing lynx conservation efforts (e.g., adherence to ongoing management plans and limiting roads through habitat); and 2) landowners that do not currently actively manage for the lynx develop lynx management plans. Specifically, Scenario 1 includes:
- **Adherence to ongoing lynx management efforts in Conservation NGO lands in Maine, Superior National Forest lands, WADNR lands, and MTDNRC lands.** These lands are all expected to be operating under management plans with guidelines similar to the guidelines outlined in the Lynx Conservation Assessment Strategy (LCAS), including restrictions on pre-commercial thinning activities. In addition, in some areas, activities may be modified to avoid lynx denning areas and to maintain threshold levels of suitable lynx habitat specified in management plans.⁴⁰
 - **Modifications to timber projects needing permits to access private timberland inholdings across Federal lands.** The study area in Minnesota and Montana is characterized by numerous private inholdings on Federal lands. Scenario 1 quantifies the impacts of closing access routes when they are no longer needed. In addition, Federal review of access permits may delay projects from one month to two years or more in some instances.⁴¹ The analysis estimates costs of building alternative roads in lieu of obtaining an access permit.⁴²
 - **Researching and developing lynx management guidelines.** Scenario 1 assumes that all timber landowners will undertake development of lynx management plans including associated species surveying and monitoring.⁴³
56. Scenario 2, the upper-bound scenario, assumes that, in addition to the cost components of Scenario 1, landowners will restrict pre-commercial thinning activities on their lands. This scenario assumes that the LCAS represents the best available information regarding lynx conservation needs and identifies pre-commercial thinning as a threat to the lynx (see text box). This scenario is considered an upper bound because it assumes all land managers will cease all pre-commercial thinning activities whereas the restrictions on pre-commercial thinning in the LCAS have not been adopted by private timber

⁴⁰ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53.

⁴¹ Personal communication with Mike Houser, Potlatch Corporation April 14, 2006. Personal communication Scott McLeod, MTDNRC, April 14, 2006.

⁴² Note that the analysis does not anticipate any changes to the current exemption from U.S. Army Corps of Engineering 404 wetlands permits for roads constructed and used specifically for timber access; however, stakeholders have expressed concern that if this exemption were affected by lynx conservation efforts this could result in extensive impacts.

⁴³ Note that costs of developing lynx management plans on public lands are included in Section 6; thus this section only includes these costs for private and unknown lands.

companies to date; and programmatic planning standards in the LCAS state, “Conservation measures will generally apply only to lynx habitat on Federal lands within LAUs.”⁴⁴

57. The actual impact likely falls between these two bounds; however, information allowing for further refinement regarding where pre-commercial thinning may be restricted for the benefit of the lynx in the future is not readily available. More research is needed to evaluate the effects of pre-commercial thinning in geographic areas other than those covered in the LCAS.⁴⁵

PRE-COMMERCIAL THINNING

Pre-commercial thinning refers to “thinnings made purely as investments in future growth of stands so young that none of the felled trees are extracted and utilized.”^a Typically, pre-commercial thinning is performed when a stand is between 10 and 20 years old and is usually performed manually, although mechanical methods are sometimes applied, as is the case in aspen stands in Minnesota.

Pre-commercial thinning is identified in the proposed rule as one of the activities that may “significantly reduce the quality of snowshoe hare habitat such that the landscape’s ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.”^b As snowshoe hare are the primary prey of the lynx, pre-commercial thinning is therefore considered a threat to lynx. Several studies have determined that pre-commercial thinning activity may affect usage of an area by snowshoe hare.^c However, it is important to note that research is ongoing to understand impacts of timber practices on lynx and its habitat. As mentioned in the proposed rule, “Timber management practices that provide for a dense understory are beneficial for lynx and snowshoe hares.”^d For example, in Maine, when a stand regenerates after a clearcut, there is typically a dense understory. However, in order to make these stands more productive, pre-commercial thinning is often applied, which reduces dense understory and thus reduces hare habitat.

Pre-commercial thinning provides a variety of benefits including increasing yields, decreasing time to commercial harvest, allowing for growth of desired species, and reducing risk of blowdowns and disease. Additionally, “economic analyses have repeatedly shown that precommercial thinning often is the most rewarding long-term investment that can be made in silvicultural treatment.”^a Available information indicates that pre-commercial thinning is performed regularly across private timberlands in the study area in Maine and Montana, but less frequently in Minnesota. LCAS guidance recommends delaying pre-commercial thinning until stands no longer provide snowshoe hare habitat. Based on discussions with timber land managers, delaying pre-commercial thinning until such a time as a specified in the LCAS effectively means precluding pre-commercial thinning activity.^e

^aSmith, David et. al. 1997, *The Practice of Silviculture: Applied Forest Ecology*. 9th Ed. Published by John Wiley & Sons, Inc.

^b 70 FR 68306.

^c Ausband, D.E. and G.R. Baty. 2005. Effects of precommercial thinning on snowshoe hare habitat use during winter in low-elevation montane forests. *Canadian Journal of Forest Research* 35:206-210. Homyack, J.A. 2003. Effects of precommercial thinning on snowshoe hares, small mammals, and forest structure in northern Maine. M.S. Thesis, University of Maine. May 2003

^d 70 FR 68304.

^e Personal communications with Bob Seymour University of Maine, March 24, 2006; Kenny Ferguson, Huber Resources, March 1, 2006; and, Russell Roy, Penobscot Nation, March 8, 2006.

⁴⁴ Ruediger 2000, p. 7-3.

⁴⁵ Comments provided by Mark McCollough, FWS MEFO, provided to IEc on June 12, 2006.

58. In addition to the standard regarding pre-commercial thinning, the LCAS includes the following timber-related conservation guidelines:
- Management actions (e.g., timber sales, salvage sales) shall not change more than 15 percent of lynx habitat within a lynx analysis unit (LAU) to an unsuitable condition within a 10-year period;
 - If more than 30 percent of lynx habitat within an LAU is in unsuitable condition, no further reduction of suitable conditions shall occur; and,
 - Within an LAU, maintain denning habitat in patches generally larger than five acres, comprising at least 10 percent of lynx habitat.
59. Quantification of the costs of managing land uses according to these guidelines is complicated by a number of factors. First, the lynx conservation efforts quantified in this analysis (e.g., restrictions on pre-commercial thinning and development of snowmobile trails) are relevant to these thresholds. That is, this analysis includes the effects of limiting or modifying land use activities that may reduce suitable lynx habitat and therefore quantifies the impacts of accomplishing a degree of compliance with the three conservation standards highlighted above.
60. Specifically, the extent to which these three standards are met by the conservation efforts quantified in this analysis is unknown as LAUs have not been delineated in the study area (with the exception of WADNR lands). Assigning proxy boundaries for LAUs based, for example, on subunits for the purpose of this analysis would be arbitrary and potentially misleading, as estimated impacts would be sensitive to LAU boundaries.
61. While this analysis does not separately quantify costs of accommodating these three conservation guidelines because of their dependence on LAU boundaries, it does estimate the impacts of lynx conservation to land use activities that may otherwise reduce the amount of suitable lynx habitat within the study area, including pre-commercial thinning and development of snowmobile trails. In addition, the analysis provides the full value of these lands for timber purposes is estimated to inform decision makers and to provide context, as shown earlier in Exhibit 3-2.
- 3.3 PRE-DESIGNATION IMPACTS TO TIMBER ACTIVITIES**
62. Pre-designation impacts on timber activities have occurred in Minnesota and Washington, and are summarized in Exhibit 3-4. In Minnesota, past impacts have been associated with implementing lynx conservation efforts included in the Superior National Forest forest plan and project modifications for projects requiring road access across national forest land. In addition, pre-designation impacts include implementation costs for WADNR's lynx conservation plan, which has been in place since 1996.

EXHIBIT 3-4. PRE-DESIGNATION IMPACTS (2000 - 2005)

CRITICAL HABITAT UNIT	SUBUNIT	UNDISCOUNTED	PRESENT VALUE 3 PERCENT	PRESENT VALUE 7 PERCENT
Unit 2: Minnesota	Superior National Forest	\$180,000	\$187,000	\$197,000
Unit 4: North Cascades	WADNR	\$6,140,000	\$6,820,000	\$7,840,000
Total		\$6,320,000	\$7,010,000	\$8,030,000
Note: Totals may not sum due to rounding.				

3.4 POST-DESIGNATION IMPACTS TO TIMBER ACTIVITIES

63. Exhibit 3-5 presents a summary of post-designation impacts under the two scenarios outlined earlier. Detailed discussion of the derivation of these impacts is provided in the Appendix D. Post-designation impacts are presented over a 20-year timeframe.⁴⁶
64. Under Scenario 1, impacts were estimated based on the following steps:
- Estimated costs of implementing existing lynx conservation efforts on Maine Conservation NGO, Superior National Forest, MTDNRC and WADNR lands based on input from these landowners;
 - Identified types and costs of project modifications based on review of section 7 consultation history and communication with affected land managers; and,
 - Developed estimates of costs to prepare a lynx management plan, based on costs to landowners who had previously conducted similar efforts.
65. Under Scenario 2, additional impacts were estimated based on the following methods:
- For Maine, estimated costs of precluding pre-commercial thinning based on previously conducted modeling by the University of Maine Cooperative Forestry Research Unit; and,
 - For Minnesota and Northern Rockies, modeled impacts resulting from precluding pre-commercial thinning based on available regional information on expected levels of pre-commercial thinning, timing and costs of pre-commercial thinning activities, and timing and value of expected increases in harvest resulting from pre-commercial thinning.

⁴⁶ Note that these include pre-commercial thinning impacts calculated over a 100-year period and then annualized. Twenty years of annualized costs are included in the total present value estimates reported in this chapter.

EXHIBIT 3-5. POST-DESIGNATION IMPACTS (2006-2025)

CRITICAL HABITAT UNIT	SUBUNIT	TOTAL IMPACTS ⁽¹⁾ (UNDISCOUNTED)		TOTAL PRESENT VALUE ⁽¹⁾ (DISCOUNTED AT 7 PERCENT)		TOTAL PRESENT VALUE ⁽¹⁾ (DISCOUNTED AT 3 PERCENT)	
		SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2
Unit 1: Maine	Maine Dept. of Conservation	\$0	\$11,300,000	\$0	\$7,330,000	\$0	\$6,270,000
	Private Timber Lands	\$31,100,000	\$240,000,000	\$26,400,000	\$163,000,000	\$28,900,000	\$145,000,000
	Conservation NGO	\$5,170,000	\$5,460,000	\$1,780,000	\$1,880,000	\$2,140,000	\$2,260,000
	Unknown	\$1,640,000	\$11,200,000	\$1,340,000	\$7,590,000	\$1,500,000	\$6,840,000
	<i>Subtotal Unit 1</i>	\$37,900,000	\$268,000,000	\$29,500,000	\$179,000,000	\$32,500,000	\$161,000,000
	<i>Annualized Unit 1</i>			\$2,780,000	\$16,900,000	\$2,190,000	\$10,800,000
Unit 2: Minnesota	Superior National Forest	\$3,500,000	\$42,000,000	\$1,980,000	\$2,500,000	\$2,680,000	\$19,800,000
	MNDNR	\$0	\$41,300,000	\$0	\$558,000	\$0	\$18,400,000
	Private Timber Lands	\$295,000	\$1,280,000	\$191,000	\$204,000	\$243,000	\$681,000
	Unknown	\$5,320,000	\$77,700,000	\$4,460,000	\$5,440,000	\$4,920,000	\$37,200,000
	<i>Subtotal Unit 2</i>	\$9,120,000	\$162,000,000	\$6,640,000	\$8,710,000	\$7,840,000	\$76,100,000
	<i>Annualized Unit 2</i>			\$627,000	\$822,000	\$527,000	\$5,110,000
Unit 3: Northern Rockies	MTDNRC	\$43,000,000	\$43,000,000	\$0	\$0	\$10,600,000	\$10,600,000
	Montana University System	\$0	\$6,100,000	\$0	\$0	\$0	\$1,450,000
	Idaho Dept. of Land	\$0	\$0	\$0	\$136,000	\$0	\$75,900
	Private Timber Lands	\$2,680,000	\$123,000,000	\$2,220,000	\$0	\$2,460,000	\$31,000,000
	Unknown	\$3,920,000	\$185,000,000	\$3,270,000	\$0	\$3,610,000	\$46,600,000
	<i>Subtotal Unit 3</i>	\$49,600,000	\$358,000,000	\$5,490,000	\$136,000	\$16,700,000	\$89,800,000
	<i>Annualized Unit 3</i>			\$518,000	\$12,900	\$1,120,000	\$6,030,000
Unit 4: North Cascades	WADNR	\$20,500,000	\$20,500,000	\$21,900,000	\$21,900,000	\$21,100,000	\$21,100,000
	<i>Subtotal Unit 4</i>	\$20,500,000	\$20,500,000	\$21,900,000	\$21,900,000	\$21,100,000	\$21,100,000
	<i>Annualized Unit 4</i>			\$2,070,000	\$2,070,000	\$1,420,000	\$1,420,000
Total All Units		\$117,000,000	\$809,000,000	\$63,500,000	\$210,000,000	\$78,100,000	\$348,000,000
Annualized All Units				\$6,000,000	\$19,800,000	\$5,250,000	\$23,400,000

Notes: Totals may not sum due to rounding. Administrative costs of consultations are included in Appendix A.

(1) To estimate impacts of precluding pre-commercial thinning, total impacts are calculated over a 100-year period and then annualized. Twenty years of annualized costs are included in the total present value estimates reported here. For Unit 3, benefits are shown as zero, assuming that analysis has understated impacts.

66. Under the simplified model applied in Montana, when a seven percent discount rate is applied, the analysis finds that eliminating pre-commercial thinning may result in a net benefit across the 100 year timeframe. This is due to the near term savings associated with removing the cost of pre-commercial thinning, despite the future costs of reduced harvest at the time of cutting. However, since firms indicate that they are performing pre-commercial thinning, and assuming these firms are acting to maximize revenues, it is unlikely that eliminating pre-commercial thinning would result in net benefits. Rather, the outcome likely indicates that seven percent is an inappropriate discount rate to apply to this industry. Thus, the results report a zero for subunits where the model calculates a net benefit.

SENSITIVITY OF TIMBER IMPACTS ANALYSIS

Timeframe

For the purposes of this analysis, impacts stemming from a restriction on pre-commercial thinning activities are modeled over a 100-year time period.^a Rotation schedules vary across the study area and are dependent on species mix and timber management regime. The 100 year timeframe captures impacts of approximately one to one and a half rotations.

Discount Rate

Given the time period over which impacts are modeled and the timing of cash flows, the results of this analysis are sensitive to the discount rate applied. This analysis quantifies impacts at both three and seven percent discount rates.^a Available information, however, indicates that industry specific discount rates of four to six percent (real discount rates) may be more appropriate.^b Under the simplified model applied in Montana, the analysis finds that if impacts are discounted at seven percent, eliminating pre-commercial thinning may result in a net benefit across the 100 year timeframe. This is due to the near term savings associated with removing the cost of pre-commercial thinning, despite the future costs of reduced harvest at the time of cutting. However, since firms indicate that they are performing pre-commercial thinning, and assuming these firms are acting to maximize revenues, it is unlikely that eliminating pre-commercial thinning would result in net benefits. Rather, the outcome likely indicates that seven percent is an inappropriate discount rate to apply to this industry and activity.

Other Factors

Two other factors may contribute to the underestimate of impacts associated with restricting pre-commercial thinning in Minnesota and Montana. First, the model does not include impacts of any related lost cash flows that may result from delaying harvests across ownerships (e.g., allowable cut effects). If owners are no longer able to increase growth through high-yield practices such as pre-commercial thinning, they may compensate by adjusting harvest schedules to make standing timber last longer. The analysis only accounts for a reduction in harvest at the time at which increased yields would have been available on thinned acres. While this type of factor is included in the model applied to estimate impacts in Maine, information is not available to account for it in Minnesota and Montana. Additionally, this analysis does not account for potential difference in stumpage prices between thinned and unthinned stands. That is, the extent to which thinning may provide better quality timber is not known and therefore not incorporated. Furthermore, no attempt is made to forecast future timber markets or prices in this analysis.

^a This time frame was chosen in part to match the University of Maine model (Wagner et. al., 2003) used to assess silvicultural research priorities in Maine, which is applied in this analysis.

^b Based on OMB guidance. (U.S. Office of Management and Budget, Circular A-4, September 17, 2003 and U.S. Office of Management and Budget, "Draft 2003 Report to Congress on the Costs and Benefits of Federal Regulations; Notice," 68 Federal Register 5492, February 3, 2003.)

^c Idaho Department of Lands and MTDNRC both use four percent real discount rates when evaluating forestry practices. Wagner et. al. (2003) note that they apply a six percent real discount rate for forestry in Maine because it represents the lower rate of return required by timberland investment management organizations, and they recognize that not all timberlands in their analysis are investment grade.

67. Plum Creek provided comment on the Proposed Rule that include an estimate of timber impacts on their lands in the study area.⁴⁷ Similar to this analysis, the Plum Creek analysis of timber impacts is based the assumption that "protecting denning environments

⁴⁷ Plum Creek Timber Company comments prepared with assistance from Dr. David L. Sunding (Senior Consultant at CRA International) and Kristina Sepetyts (Senior Consultant at NERA Economic Consulting), Economic Comments: Proposed Designation of Critical Habitat for the Canada Lynx on Plum Creek Lands in Maine and Montana, April 2006.

for both the Canada lynx and its primary prey (the snowshoe hare) may result in thinning and cutting limits, and harvest scheduling limitations.” The major assumptions underlying the Plum Creek analysis, and their per-acre results, are compared to those utilized in this analysis in Exhibit 3-6.

68. Plum Creek’s estimated impacts are not directly comparable to the results of this analysis because Plum Creek’s per acre impacts are applied on only a portion of their timberlands in the study area (approximately one percent), whereas this analysis estimates impacts across the entire ownership. In addition, the Plum Creek estimate in Montana may incorporate specific information about their timber practices (such as how harvests are scheduled across their ownership) that was not available to customize the model of pre-commercial thinning impacts in Montana in this analysis.

EXHIBIT 3-6. COMPARISON OF ANALYTIC ASSUMPTIONS

ANALYSIS	DISCOUNT RATE	ANALYSIS TIME PERIOD (YEARS)	PER-ACRE IMPACT(1)
Maine: Plum Creek	15%	20	\$14 per year
Maine: Wagner Model Applied by IEc (2)	Undiscounted	100	\$194 present value
	3%	100	\$34 present value
	7%	100	\$18 present value
Montana: Plum Creek	15%	20	\$15 per year
Montana: IEc Model	Undiscounted	100	\$1,364 present value
	3%	100	\$102 present value
	7%	100	\$0
Notes:			
(1) Note that Plum Creek impacts are only spread across affected acreage (equal to one percent of total Plum Creek timberland in study area), whereas the IEc analysis impacts are spread across all acres of timberland in the unit.			
(2) Wagner, Robert G., Bowling, Ernest, and Seymour, Robert. 2003. Assessing Silviculture Research Priorities for Maine Using Wood Supply Analysis. Technical Bulletin 186. February 2003 Maine Agricultural and Forest Experiment Station. The University of Maine. Accessed at http://library.umaine.edu/cfru/pubs/CFRU309.pdf on March 14, 2006. Additional model runs provided by Ernest Bowling, JW Sewall on June 15, 2006.			

3.5 CAVEATS

69. The major assumptions underlying the analysis of impacts to timber activities are summarized in Exhibit 3-7. The majority of timber impacts quantified relate to a potential restriction on pre-commercial thinning. The analysis of impacts related to restrictions on pre-commercial thinning is sensitive to the timing of thinning and harvesting activities. For Minnesota and Montana, the analysis assumes that pre-commercial thinning would occur when a stand is between 10 and 20 years old. Thus, annual cost savings of not performing pre-commercial thinning begin at that time. However, impacts of reduced timber harvest are not incurred until a stand reaches rotation age (age 50 in Minnesota and age 85 in Montana for purposes of this analysis). The long term nature of these impacts adds greatly to their uncertainty, and sensitivity to choice of discount rate.

EXHIBIT 3-7. SUMMARY OF CAVEATS TO TIMBER ANALYSIS

ASSUMPTION	POTENTIAL EFFECT ON RESULTS
Under Scenario 2, pre-commercial thinning restrictions outlined in the LCAS will be implemented on all timberlands. This results in no pre-commercial thinning within the study area under this Scenario.	+
Lands where ownership is unknown are assumed to be managed for timber purposes.	+
Impacts of implementing LCAS measures relating to maintaining lynx habitat threshold levels within LAUs are not quantified where LAUs have not been defined.	-
Private timberland owners will undertake lynx conservation efforts akin to the LCAS including preparation of lynx management plans.	+
The analysis of pre-commercial thinning impacts in Maine does not take into account potential future declines in the amount of pre-commercial thinning activity occurring in the study area. These declines may result from changes in ownership to shorter-term timber management investment organizations.	+
The analyses of pre-commercial thinning impacts in Minnesota and Montana do not account for potential adjustment of harvest schedules which could result in delays in harvesting across ownerships in response to pre-commercial thinning restrictions.	-
No alternative management to speed growth or increase yield will occur in response to prohibitions on pre-commercial thinning (i.e., no substitute Silviculture treatment will be used in on stands that would have been pre-commercially thinned).	+
The analysis includes the full costs of project modifications related to road closures and preparation of management plans that may be undertaken for the benefit of other wildlife species in addition to the lynx.	+
The analysis assumes no market for slash from pre-commercial thinning exists. An increase in biomass energy production would create demand and provide a market for residue from pre-commercial thinning.	-
Analysis does not forecast future timber markets or prices; assumes future stumpage prices will be comparable to past prices.	+/-
Differences in quality between thinned and unthinned stands are not anticipated.	-
+: This assumption may result in an overestimate of real costs. -: This assumption may result in an underestimate of real costs. +/-: This assumption has an unknown effect on estimates.	

SECTION 4 | DEVELOPMENT

70. This section describes the value of future residential, commercial, and industrial development in the study area. Development may affect the species or its habitat by restricting movement via habitat fragmentation, or direct habitat loss.⁴⁸ Owners of parcels containing a federally-listed species, or designated as critical habitat for a listed species, may face certain land use restrictions that preclude, restrict, delay, or increase the cost of development on some or all of the parcel. Such outcomes may reduce the value of the property.
71. The extent to which a future development project may be impacted by lynx conservation efforts is difficult to estimate. Specifically, information is not available regarding how development activity has been affected by lynx conservation in the past, and no guidelines or standards have been developed to provide developers with information regarding how their activities may incorporate lynx conservation for future projects. For example:
- No consultations have taken place on residential development in consideration of the lynx. Only a handful of consultations associated with the permitting of commercial developments have occurred, all in Minnesota. None of these consultations resulted in project modifications; all were determined not to affect the lynx.
 - No other information is available regarding if or how private parties have modified their behavior regarding development in the past for the benefit of the lynx.
 - The LCAS does not specify conservation guidelines for the lynx and its habitat specifically related to commercial and residential developments. Regarding land ownership, the LCAS specifies as a general goal, "(w)ork toward unified management direction via habitat conservation plans, conservation easements, or agreements, and land acquisition." No parameters are specified, however, such as what size or type of development may require mitigation, or what mitigation ratios may be appropriate for the purchase of conservation easements associated with development projects.
72. Absent specific information on how residential and commercial development projects would mitigate or compensate for effects on the lynx and its habitat, this analysis does not attempt to quantify the economic impacts to development activities. *Instead, it reports the estimated full economic value of the option for future development within the study*

⁴⁸ Ruediger et. al. 2000, pg. 50.

area. The values reported in this section represent the non-timber component of land value. This information is provided for decision-makers to consider regarding the full value of potential future development within the boundaries of the study area.

73. This section also presents maps highlighting the land parcels within the study area that are identified for possible future development. These maps describe the spatial distribution of the reported values of future development at a more refined geographic scale than the subunit level.

4.1 SUMMARY OF RESULTS

74. The total value of the option for development in each subunit is estimated by multiplying acres of unimproved, developable land by a per acre value of potential future development. That is, the value of development across the study area is assumed to equal the option value to develop these acres plus the growth premium of the potential development. This analysis assumes that, absent development, the silvicultural use of the land remains. Exhibit 4-1 describes the acreage of developable land and the full value of development on those acres by subunit. The derivation of number of acres characterized as developable and per acre values of development is described in Section 4.2.
75. The total development value of the areas proposed for designation is approximately \$2.26 billion. Roughly 69.1 percent (\$1.56 billion) of this is the value of future development in Unit 2, 25.7 percent of this value (\$579 million) is for future development in Unit 1, and 5.2 percent (\$117 million) in Unit 3. Additionally, there is a total of \$1.57 million of development value for lands proposed for exclusion in Maine.
76. The total value of future development in Unit 2 is a high percentage of the total value for future development in the study area (69.1 percent) because it contains the greatest number, 551,000 (80 percent), of the acres considered developable in the proposed critical habitat area. While there are relatively few acres considered developable in Unit 1 (10,000), the average per-acre value of future development is relatively high (\$44,300 to \$57,100) as parcels zoned for development are scarce and are predominantly lakeshore properties. This information is detailed in Exhibit 4-1.

**EXHIBIT 4-1. SUMMARY OF THE VALUE OF FUTURE DEVELOPMENT WITHIN THE
PROPOSED CRITICAL HABITAT**

SUBUNIT	DEVELOPABLE ACRES	TOTAL VALUE OF FUTURE DEVELOPMENT (PRESENT VALUE, 2006\$)	
		LOW	HIGH
UNIT 1: MAINE			
National Park Service	10	\$159,000	\$159,000
Maine Dept. of Conservation	359	\$16,500,000	\$25,100,000
Private Timber Lands	5,377	\$185,000,000	\$212,000,000
Conservation NGO	42	\$543,000	\$543,000
Unknown Landowner	4,123	\$244,000,000	\$339,000,000
Baxter State Park	128	\$2,270,000	\$2,270,000
SUBTOTAL UNIT 1	10,157	\$450,000,000	\$581,000,000
AVERAGE PER ACRE VALUE OF FUTURE DEVELOPMENT IN UNIT 1		\$44,300	\$57,200
UNIT 2: MINNESOTA			
Private Mining Lands	8,862	\$24,300,000	
Private Timber Lands	11,797	\$31,900,000	
Unknown Landowner	530,101	\$1,504,000,000	
SUBTOTAL UNIT 2	550,760	\$1,560,000,000	
AVERAGE PER ACRE VALUE OF FUTURE DEVELOPMENT IN UNIT 2		\$2,830	
UNIT 3: NORTHERN ROCKY MOUNTAINS			
U.S. Fish and Wildlife Service	792	\$329,000	
Montana Dept. of Natural Resources	188	\$1,900,000	
Montana Fish, Wildlife, and Parks	85	\$579,000	
Montana University System	10	\$45,300	
Private Timber Lands	52	\$744,000	
Conservation NGO	64	\$347,000	
Unknown landowner	124,203	\$113,000,000	
U.S Bureau of Land Management	26	\$14,400	
SUBTOTAL UNIT 3	125,420	\$117,000,000	
AVERAGE PER ACRE VALUE OF FUTURE DEVELOPMENT IN UNIT 3		\$932	(\$120 in Powell County and \$5,700 in other areas)
Note: Totals may not sum due to rounding.			

77. In addition to the values reported above of future development in the proposed critical habitat, Tribal lands in Maine considered for exclusion are estimated to have a value of future development of \$1.57 million.
78. The per-acre value associated with future development is comparable in Units 2 and 3. The per-acre values are significantly higher in Maine, however. This is explained in part by the characteristics of developable lands in Maine. Specifically, most of the land zoned for development in Maine is lakefront property. Further, the scarcity of acres currently zoned for future development in Maine likely contributes to the high per-acre values.
79. As the study area in Unit 4 in Washington is characterized by public lands managed for timber and recreation, development is not considered a likely future land use and the value of these lands for future development is considered negligible.

4.2 METHODS AND ASSUMPTIONS

80. This analysis describes the value of future residential, commercial, or industrial developments, and expansions of existing developments that may occur within the undeveloped habitat areas for the lynx. Existing development, such as "towns, or human-made structures such as buildings, airports, paved and gravel roadbeds, active railroad beds, and other structures that lack the [primary constituent elements] PCEs for the lynx" are not included in the study area.⁴⁹ Activities such as reconstruction or maintenance of existing developments are therefore not expected to affect the lynx or the PCEs on which it depends, and are therefore not expected to be impacted by lynx conservation.
81. The conceptual framework for estimating the full development value for a parcel of land is based on the theoretical models developed by Capozza and Li (1994) and Capozza and Helsley (1990).^{50,51} Capozza and Helsley's study demonstrates that the price of agricultural land has three components: the value of agricultural rents, the growth premium, and the option value of potential development.
82. This analysis applies this logic to the forested lands within the study area by assuming that the price of land in the study area is comprised similarly of:
1. The value of silvicultural rents - This represents the value of land as a silvicultural input and generally reflects the commercial present value of the trees.
 2. The growth premium - This equals the present value of expected increases in land rents after being converted to development.
 3. The option value of potential development - This is the value of land derived from the option of future development.

⁴⁹ 70 FR 68304-5

⁵⁰ Capozza, D.R. and Yuming Li. "The Intensity and Timing of Investment: The Case of Land." *The American Economic Review*, Vol. 84, No. 4 (Sep., 1994):889:904.

⁵¹ Capozza, D. R. and R.W. Helsley. "The Stochastic City," *Journal of Urban Economics* 28(1990):187-203.

83. It follows that if development of a parcel of silvicultural land is restricted, it will be worth less than its value in the previously unrestricted state. This reduction in value is a cost to the landowner, with the magnitude of reduction depending on the type of land use restriction imposed. If future development is precluded from a parcel, the reduction in land value equals the sum of growth premium and option value.
84. In some cases, land use information indicates that silviculture is not a possible land use. This may be true, for example, where the tree species mix has negligible commercial value. In such cases, this analysis assumes that the only potential future use of the parcel is for development, and therefore that the full price of the land reflects only its development option and growth premium.
85. In order to estimate the full value associated with development of a land parcel, this analysis applies three steps. A unit by unit discussion of this process is detailed in the following section.
1. **Identify potentially developable lands within each unit.** Information from the U.S. Census Bureau regarding growth in building permits issued between 1990 and 2000 was consulted to help identify areas with development pressure. Data specifying areas zoned or dedicated for future development in each unit was then referenced to isolate the land parcels that may experience reduced values if development is restricted.
 2. **Estimate region-specific land prices for each developable parcel in the study area.** A mix of data on appraisals and recent land sales from state agencies and local appraisers was analyzed to determine prices of developable parcels.
 3. **Isolate the proportion of land value derived from the growth premium and option value for each parcel.** The method used to approximate the development option and growth premium value varies by unit across the study area depending on zoning and dedicated future land uses. Where developable land may also have silviculture value, the value of silvicultural rents is estimated and subtracted from the total land value; where the only future land use is development, the full value of the parcel is assumed to be the growth premium and the option value for development.
86. Applying this method assumes that if silviculture is not a possible land use, the full value of that land is the development value. That is, the underlying land value (outside of its potential uses) is relatively insignificant. Silviculture may not be a future land use, for example, for lands on which the tree species mix has a negligible commercial value.
87. The method applied in this analysis does not account for potential changes in future zoning across the study area. The values provided represent the value of developing unimproved parcels that are zoned or identified for development in each of the units by state and local planning agencies. However, this analysis does consider development pressure, indicated by changes in population levels and housing units from 1990 to 2000 in Census groups across the region, to determine the likelihood of major re-zoning to accommodate growth. Generally, however, the relatively rural character of the study area

does not suggest that significant levels of re-zoning are necessary to accommodate development pressure.

88. An exception to this assumption may occur in Maine. According to information from Maine's Land Use Regulatory Commission, 10,157 acres within the study area in Maine are currently zoned for development; these all occur along the shores of lakes. While development in the unincorporated region of Maine has been sparse in the past, the future development potential of this region is uncertain.⁵²

⁵² Personal communication with Catherine Carroll, Land Use Regulatory Commission, March 20, 2006.

Plum Creek Timber Company Comments on Development

A public comment provided by Plum Creek Timber Company on the Proposed Rule included information on the development value of their lands within the proposed critical habitat area in Maine and Montana (Plum Creek Analysis).^a The comment provided by Plum Creek provides the same type of information as this analysis developed for the Fish and Wildlife Service (FWS Analysis), the value of the lands for the option for future development; both the FWS Analysis and the Plum Creek Analysis provide this full value in place of an economic impact estimate in recognition of the uncertainty regarding how the designation of critical habitat will alter future development. A difference between the Plum Creek Analysis and the FWS Analysis is that the FWS Analysis does not specifically isolate particular landowners, such as Plum Creek, but rather presents impacts on "private timber company" lands collectively.

Roughly half of Plum Creek's lands in Maine, 545,000 acres fall within the proposed critical habitat for the lynx. Plum Creek is in the process of converting a portion of its timber holdings in Maine for development and recreational uses in the Moosehead Lake region. Plum Creek estimates that approximately 200,000 acres of the Moosehead project may be affected by the critical habitat designation. Details of the proposed project are provided in Plum Creek's public comment. To estimate the value of development for these lands in Maine, Plum Creek cites a recent report from the Open Space Institute (OSI Report).^b The OSI Report assumes that shorefront lots appreciate in value at eight percent per year for ten years and four percent per year thereafter, and Plum Creek applied a 15 percent discount rate to estimate the total present value of its future development at Moosehead Lake at \$43.2 million. As mentioned, while this FWS Analysis does not specifically present the development value of Plum Creek lands, it does estimate the development value of the lands surrounding Moosehead Lake, applying parcel-specific values in this region of between \$121,000 and \$212,000 per acre as described in Exhibit 4-3. These estimates of development value are comparable to the market values for these acres around Moosehead Lake as estimated in the OSI Report used by Plum Creek, \$175,000 to \$200,000 (OSI, pg. 8).

In Montana, Plum Creek owns approximately 413,467 acres of land within the proposed critical habitat. To estimate the development value of their lands in Unit 3, Plum Creek calculates the difference in current land prices between entitled and unentitled land, or land that only has timber value; in other words, Plum Creek applies the same method as applied in this FWS analysis as described above. The Plum Creek Analysis estimates a development value of \$261 million for their lands in Montana (undiscounted), a per acre value of about \$633. The FWS analysis estimates an average per acre value of development for lands in Montana of \$932 as described in Exhibit 4-1. Considering the variation in land values across the landscape depending on site-specific amenities, the values provided by Plum Creek do not contradict those estimated in this FWS Analysis.

Overall, the comments provided by Plum Creek are comparable to the methods and results provided in this FWS Analysis.

^a Plum Creek Timber Company comments prepared with assistance from Dr. David L. Sunding (Senior Consultant at CRA International) and Kristina Sepetys (Senior Consultant at NERA Economic Consulting), Economic Comments: Proposed Designation of Critical Habitat for the Canada Lynx on Plum Creek Lands in Maine and Montana, April 2006.

^b Industrial Economics, Inc., prepared for Open Space Institute, Plum Creek Financial Model: Discussion Paper No. 2, March 15, 2006 accessed at <http://www.osiny.org/>.

4.3 UNIT BY UNIT ANALYSIS

89. This analysis employed the best available data in each geographic region of the study area to estimate the number of developable acres and the development value of those acres.

4.3.1 UNIT 1: MAINE

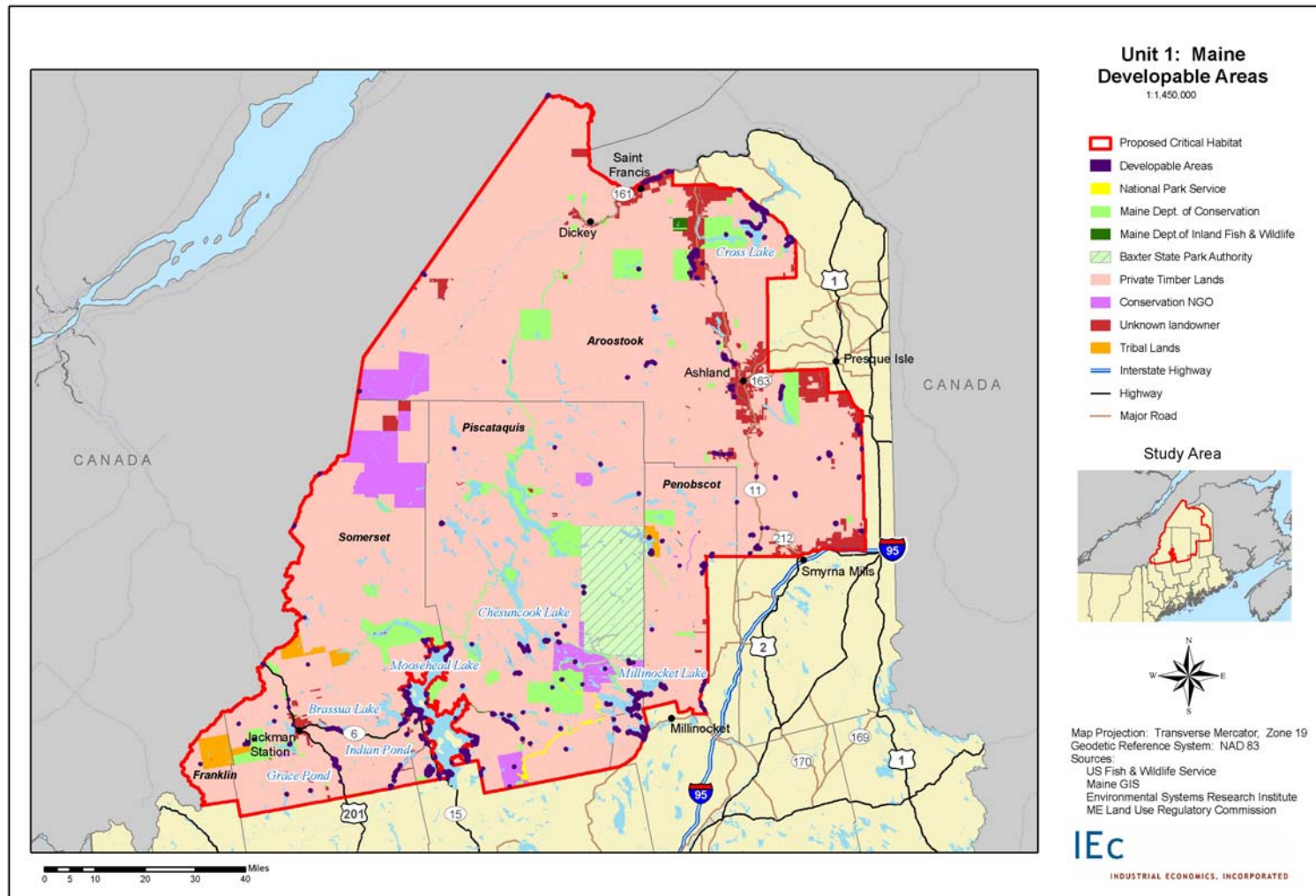
90. Maine's Land Use Regulatory Commission (LURC) has been the zoning and planning agency for the unincorporated area of Maine since 1971; the entirety of the study area in Maine is within LURC's jurisdiction. All developments occurring within LURC's jurisdiction, from small camplot developments to re-zoning efforts, must be permitted by LURC. Thirty-nine towns and plantations (similar to municipalities) exist within LURC's jurisdiction. LURC is the code enforcement officer for these areas. These 39 areas tend to be populated but the remainder of the jurisdiction is unpopulated. The Rangely region, next to the town of Rangely, experiences the greatest development pressure and generates close to one-third of LURC's permitting workload.

91. In Maine, developable areas were identified using GIS data provided by LURC that characterized land use zoning across the landscape.⁵³ According to these data, land parcels that were zoned for development and for which no data were included on the value of buildings/infrastructure were assumed to be undeveloped parcels amenable to future development.⁵⁴ Exhibit 4-2 maps these parcels zoned for development across the subunits in Maine. These parcels are small and scattered across the region. Some parcels within public lands are zoned for development; these may be private inholdings or they may be expected to experience development associated with public land uses (e.g., for buildings or infrastructure to support recreation). As described in Exhibit 4-1, there are 10,157 acres characterized as developable in the study area in Unit 1.

⁵³ LURC GIS data was received on April 19, 2006 from Ellen Jackson, LURC GIS Coordinator. The data consisted of a LURC zoning layer ("lurczones.shp") and a LURC-defined parcel layer for all counties within the study area. This method of identifying developable acres was approved by MRS.

⁵⁴ This assumption was considered to be reasonable according to LURC and the Maine Revenue Service.

EXHIBIT 4-2. DISTRIBUTION OF DEVELOPABLE ACRES IN UNIT 1: MAINE



92. This analysis considers areas zoned for development within a 250 foot buffer of a major lake as "water front", and others are defined as "inland".⁵⁵
93. For water front land values, the Maine Revenue Service (MRS) is in the process of appraising land across the unincorporated portion of Maine. MRS provided "front-foot values" (the value of a foot of shore frontage) for all lakes near parcels zoned for development in the study area.⁵⁶ Based on the front-foot length and corresponding parcel acreage, this analysis derived a per-acre value of developable waterfront land.
94. The resulting per-acre waterfront values are lake-specific and, for larger lakes, variances exist in waterfront property value at different locations along the lakefront (e.g., Moosehead and Millinocket Lake). These variances in land value are driven by the existence of amenities such as road access and proximity to developed areas.⁵⁷ Exhibit 4-3 describes the values per acre of lakefront parcels by lake.

EXHIBIT 4-3. VALUES PER ACRE OF WATERFRONT PARCELS IN MAINE BY LAKE

LAKE	VALUE PER ACRE OF WATERFRONT
Attean Pond	\$104,000
Brassua Lake	\$70,000
Chesuncook Lake	\$109,000
Cross Lake	\$73,000
Grace Pond	\$21,300
Indian Pond	\$349,000
Long Pond	\$80,500
Millinocket Lake	\$19,800 - \$25,000
Moose River	\$229,000
Moosehead Lake	\$121,000 - \$212,000
"Other Small Ponds"	\$21,300
Source: Written communication with Bob Doiron, Supervisor of Unorganized Territories at the Maine Revenue Service, April 26, 2006.	

⁵⁵ Front-foot values are measured within 250 ft. from the shoreline. Therefore, the analysis considers all land within 250 ft. "waterfront" and all lands beyond 250 ft. "inland". Personal communications with Bob Doiron, Maine Revenue Service, April 24, 2006.

⁵⁶ Written communication with Bob Doiron, Supervisor of Unorganized Territories at the Maine Revenue Service, on April 26, 2006. Communication included front-foot values for the following water bodies: Attean Pond, Brassua Lake, Chesuncook Lake, Cross Lake, Grace Pond, Indian Pond, Long Pond, Millinocket Lake, Moose River, and Moosehead Lake.

⁵⁷ Personal communication with Bob Doiron, Supervisor of Unorganized Territories at the Maine Revenue Service, April 26, 2006.

95. For inland acres zoned for development, this analysis applies a parcel-specific value as appraised by the MRS. These appraisal data were provided by LURC.⁵⁸
96. In order to isolate the portion of the total land value associated with its future development, this analysis subtracts the per acre value of silvicultural rents from the total value per acre. The per acre value of silvicultural rents was based on MRS tax appraisal data provided by LURC for which land values were estimated for parcels in the northwestern portion of LURC's jurisdiction where silviculture is the only current and likely future land use. The estimated value per acre of strictly silvicultural land is \$300.⁵⁹ Subtracting the timber value of the developable acres provides the per acre development value of the land.
97. Summing these estimates across acres currently zoned for development in the study area in Maine results in a total development value of Unit 1 of \$450 million to \$580 million. This translates to an average per acre value of development of \$44,300 to \$57,200.
98. A primary uncertainty associated with the development analysis in Maine is the estimated acreage which may be subject to development in the future. First, while this analysis estimates value only of parcels zoned for development, under LURC's current permitting guidelines, it is possible for limited development to occur in some protected areas. Concentrations of development are only permitted in acres that are zoned for development, and very minor levels (i.e., one dwelling per protected zone) of development may occur in protected areas.⁶⁰
99. Additionally, this analysis does not account for potential re-zonings in the future. LURC has permitted re-zonings in the past where it was demonstrated that the proposed development was consistent with the standards in the district and with the Commission's Comprehensive Land Use Plan's (1997) Goals and Policies. That is, if a petitioner is seeking re-zoning of an area for development, (s)he must assure orderly growth and no sprawl. The proposed land use must also demonstrate filling a need in the community and area, and must also have no undue impact on existing uses and resources.⁶¹
100. For example, Plum Creek Timber Company has proposed a long term development plan for 426,000 acres in the Moosehead Lake Region of Maine that includes re-zoning for development. This project is located in the study area. The proposed development project is currently being modified by Plum Creek, but originally included 380,000 acres for timber harvest, connection of recreation to conservation lands via trail construction,

⁵⁸ LURC sent IEC a database file containing MRS appraisal data with ID numbers matching those on LURC parcel polygons, received on April 19, 2006 from Ellen Jackson, LURC GIS Coordinator.

⁵⁹ MRS appraisal data provided by LURC on April 19, 2006 provided a per acre value of timberland of \$200, and subsequent communication with Bob Doirion, Supervisor of Unorganized Territories at MRS on April 26, 2006 suggested that timberland value likely ranges from \$200 to \$400 per acre. This value range was also corroborated by Tim Glidden, Land for Maine's Future (personal communication on April 27, 2006). This analysis therefore applies the average estimate of \$300 per acre.

⁶⁰ Personal communication with Catherine Carroll, Land Use Regulatory Commission, March 20, 2006.

⁶¹ Maine Land Use Regulatory Commission, Comprehensive Land Use Plan For Areas Within the Jurisdiction of the Maine Land Use Regulatory Commission, as amended in 1997, accessed at <http://www.maine.gov/doc/lurc/reference/clup.html>.

development of 975 residential lots in clusters, 1,000 acres of commercial development, 100 acres for affordable housing, as well as 180 miles of shore land to be preserved as conservation land.⁶²

101. The implications of the Plum Creek lake concept plan on the future of development in Maine is uncertain. LURC has indicated that if the Plum Creek Moosehead proposal is approved, more lake concept plans are likely to be proposed in the future in this region, which may change the landscape in terms of future development and conservation areas.⁶³

4.3.2 UNIT 2: MINNESOTA

102. As information is unavailable regarding which parcels are specifically zoned for future development in the study area in Minnesota, this analysis applied a number of assumptions to identify which parcels may be developable. First, this analysis removed from consideration all publicly administered lands, including county, Federal, State, and Tribal lands.⁶⁴ These public lands are primarily managed for timber, wildlife, and recreational uses and are considered in other sections of this analysis accordingly. Next, lands which were already developed were removed from consideration; specifically, based on aerial photography, this included a ten mile buffer around Duluth and a one-mile buffer along the coast of Lake Superior, where existing development in Unit 2 is concentrated.⁶⁵ The remaining acres in the study area are considered developable in this analysis as highlighted in Exhibit 4-4. As described in Exhibit 4-1, there are 550,760 acres characterized as developable in Unit 2.

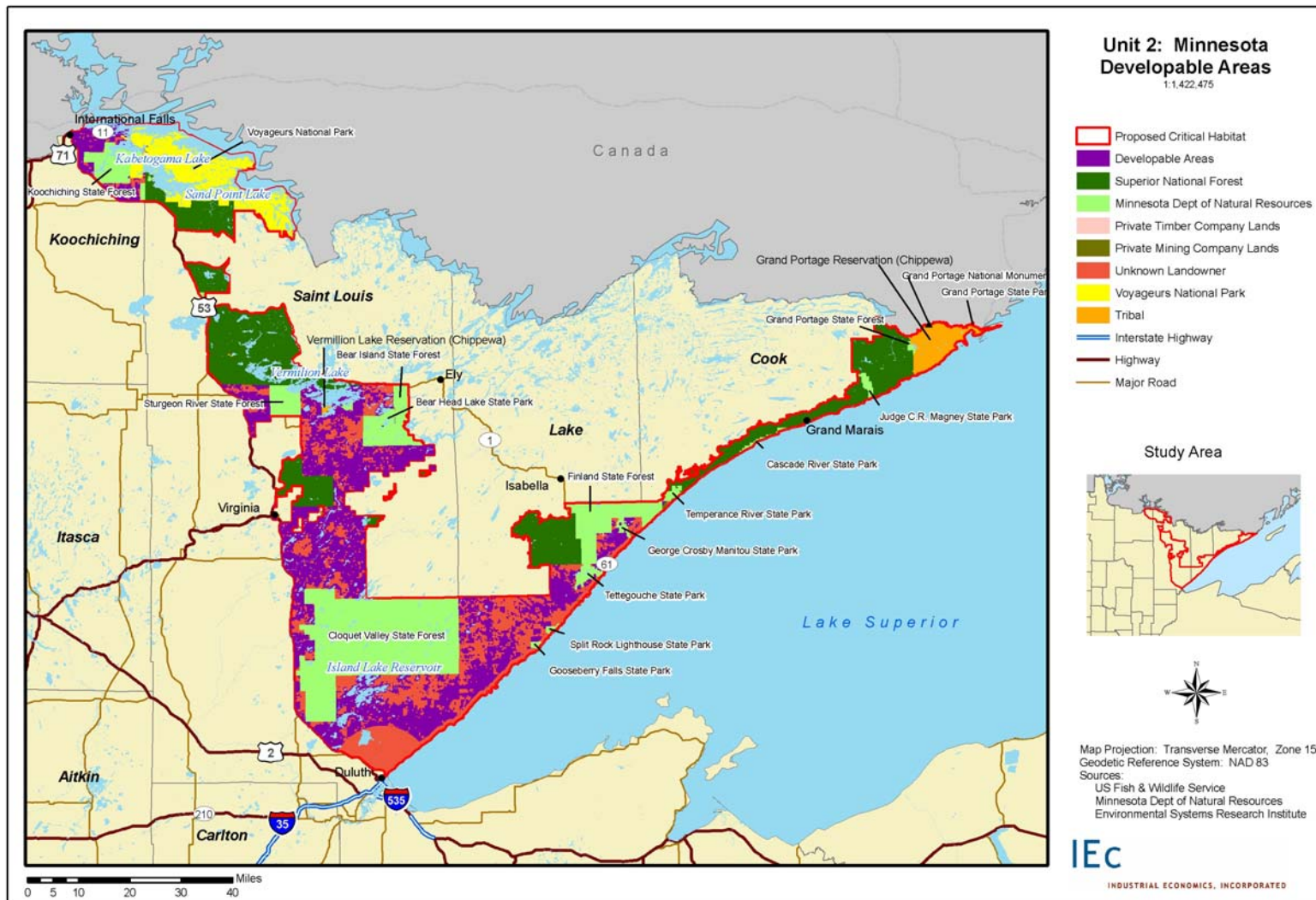
⁶² Plum Creek, "Plum Creek's Plan for the Moosehead Region of Maine," accessed at www.plumcreek.com, January 18, 2006.

⁶³ Personal communication with Catherine Carroll, Land Use Regulatory Commission, March 20, 2006.

⁶⁴ The following GIS layers were used to represent all publicly owned and administered lands: GAP- County Lands; GAP- Miscellaneous State Lands; GAP- Federal Lands; GAP- Tribal Lands; All " State Land Ownership" files. The files were obtained from MN DNR's Data Deli GIS data clearinghouse, accessed at <http://deli.dnr.state.mn.us/> on April 13, 2006.

⁶⁵ The 10-mile buffer around Duluth is consistent with review of housing unit density based on 2000 U.S. Census Block Group data (U.S. Census Bureau, American Factfinder. Decennial Census (2000). Datasets accessed at: http://factfinder.census.gov/servlet/DownloadDatasetServlet?_lang=en.

EXHIBIT 4-4. DISTRIBUTION OF DEVELOPABLE ACRES IN UNIT 2: MINNESOTA



103. Similar to the Maine analysis, per-acre total values for developable lands minus the value of timber describe the per acre development value of the land. These per acre total values of land are from St. Louis County's Parent Land Sales Database.⁶⁶ The database contains all transactions for empty lots from years 2003-2006 and includes information on sale price, lot acreage, sale date, type of land transferred (i.e. residential, commercial, farmland, timberlands, etc.), lake frontage details, and section, range, and township information. The data were filtered for townships that fall within the boundaries of proposed critical habitat and categorized as "timber", "private", or "private waterfront". Per-acre values for each category were estimated using a weighted average of the values of the total acreage transacted from 2003 to present. For the "timber", "private", and "private waterfront" classifications, 303, 232, and 1043 data points respectively were used to generate the average per acre value.
104. As with Maine, all lands within 250 feet of a major water body were considered "waterfront". Average values for the three land types were estimated as follows:
- Private - \$2,800 per acre
 - Private Waterfront - \$12,600 per acre
 - Timber - \$880 per acre
105. Geo-coded zoning information from St. Louis County GIS was used to determine where land may be managed for timber in order to identify where it was appropriate to subtract the per-acre value of silviculture rents approximated by the full value of acres for which the sole land use is silviculture (\$880) from the total value of the acre in order to determine the per-acre value of development.⁶⁷ Where silviculture was not identified as a viable land use, this analysis assumes the full value of the parcel is its value for development.
106. Summing these estimates across developable acres in the study area in Minnesota results in a total development value of Unit 2 of \$1.56 billion. This translates to an average per acre value of development of approximately \$2,800.

4.3.3 UNIT 3: NORTHERN ROCKY MOUNTAINS

107. To identify "developable" acres for the Northern Rockies Unit, this analysis applied data from the Montana Cadastral Database, a GIS parcel layer published by the Montana Department of Administration, Information Technology Services Division on April 17,

⁶⁶ St. Louis County Parent Land Sales Database. Received from John Gellatly, Principal Appraiser, St. Louis County Assessor's Office, April 26, 2006.

⁶⁷ St. Louis County GIS Zoning Layer. Received from Bruce Grohn, GIS Specialist, St. Louis County Planning Department, April 20, 2006.

2006. The data describe land ownership for taxable parcels (fee land) and public land (exempt property) for the entire state of Montana.⁶⁸

108. To isolate undeveloped lands in the study area, all parcels clearly defined as public lands were removed from the dataset. Private inholdings within public lands, however, were not removed from the dataset and are included in the development analysis. The database was then filtered for "vacant" parcels to isolate undeveloped land. The remaining parcels were then divided into lands managed for timber and those that were privately owned.
109. Parcels were considered to have silvicultural value where the property type was defined as "agricultural rural" or "agricultural urban" and nonzero values were identified for "timber acreage type".⁶⁹ Parcels considered to be privately owned are all non-timber managed parcels; that is, silviculture is not considered a viable land use of these parcels.
110. The resulting layer, containing empty, privately-owned lots (divided into "timber" and "private" categories) were then spatially joined by subunit to estimate the number of developable acres by landowner type. These "developable" lands are highlighted in Exhibit 4-5. As described in Exhibit 4-1, there are 125,420 acres characterized as developable in Unit 3.
111. Examination of the identified developable parcels in Unit 3 highlights that over 75 percent fall within Powell County, Montana. Powell County zoning regulations were changed in 1996 to define allowable lot sizes (in some areas at 160 acres) to discourage second home development and avert rural sprawl.^{70,71} Because this results in a marked difference in per acre values of developable land between Powell County and the remainder of the study area in Unit 3, this analysis estimates per acre values of developable land in two categories:
 - Powell County - \$120 per acre
 - Other - \$5,710 per acre

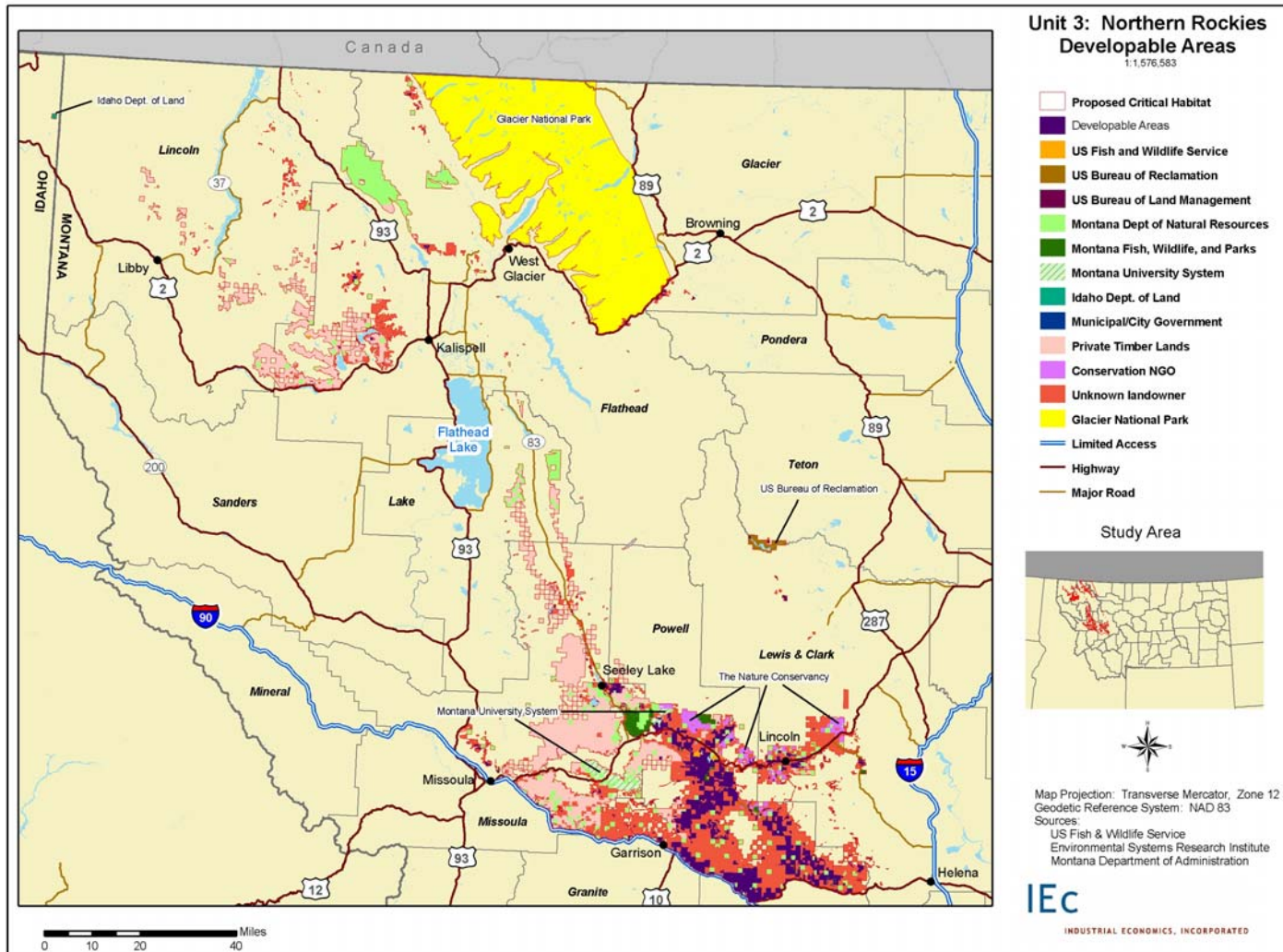
⁶⁸ Montana Natural Resource Information System (NRIS), GIS Datalab accessed, April 18, 2006 at <http://nris.mt.gov/gis/gisdatalib/gisDataList.aspx>.

⁶⁹ The property type attribute "agricultural rural" or "agricultural urban" describes agricultural/timber land located in incorporated and unincorporated areas of the county. The acreage type classification of "timber" denotes forest lands exceeding 15 contiguous acres that is capable of producing timber that can be harvested in commercial quantity. (<http://gis.mt.gov/InfoHtm/ValueInfo.htm>)

⁷⁰ County of Powell, Powell County Development Regulations, as amended in November 2000, accessed at <http://www.mtsmartgrowth.org/CS&Rpub/Ordinances/Powell%20County%20Development%20Regulations.pdf>, May 1, 2006.

⁷¹ Montana Smart Growth Coalition, Powell County Development Regulations, accessed at <http://www.mtsmartgrowth.org/CS&Rpub/CS/Powell.doc>, May 1, 2006.

EXHIBIT 4-5. DISTRIBUTION OF DEVELOPABLE ACRES IN UNIT 3: NORTHERN ROCKY MOUNTAINS



112. These values were derived by taking a weighted average per acre value in the two areas of the total 2005 taxable market value as identified in the Montana Cadastral Database. As the identified developable acres are not viable silvicultural lands, this analysis assumes the full value of these lands is their development option.
113. Summing these estimates across developable acres in the study area in Unit 3 results in a total development value of \$117 million. This translates to an average per acre value of development of approximately \$932.

SECTION 5 | RECREATION

114. Recreational activities that may affect the lynx and its habitat include extensions or rerouting of groomed or designated trails for snowmobiling and cross-country skiing, accidental trapping or shooting, and recreation area expansions such as ski resorts, campgrounds, or snowmobile areas.⁷² Snowmobile and cross country ski trails can introduce competition from other forest carnivores, such as coyotes, who lack the lynx's large furred paws specialized for deep snow travel.⁷³
115. This analysis assumes implementation of the LCAS guidelines regarding recreation on all designated lands and therefore quantifies the impact of precluding development of new groomed trails across the study area. The primary recreational activities expected to incur costs associated with lynx conservation are snowmobiling and trapping.
116. This section is divided into five parts. The first presents a summary of impacts to recreation activities within the critical habitat. The second describes the methods and assumptions employed in this analysis. The third forecasts impacts to snowmobiling. The fourth addresses impacts on hunting and trapping, and the fifth describes other recreational activities.

5.1 SUMMARY OF IMPACTS TO RECREATION

117. Forecast impacts to recreation activities from 2006 – 2025 include:

Post-designation impacts in areas proposed for designation

- Undiscounted: \$1.05 million - \$3.46 million
- Present value applying a seven percent discount rate: \$610,000 - \$1.88 million (annualized \$57,600 - \$178,000)
- Present value applying a three percent discount rate: \$811,000 - \$2.6 million (annualized \$54,500 – \$175,000)

Post-designation impacts in areas considered for exclusion

- Undiscounted: \$0 - \$10,700

⁷² 70 FR 68294

⁷³ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53.

- Present value applying a seven percent discount rate: \$0 - \$5,720 (annualized at \$0 - \$540)
- Present value at applying a three percent discount rate: \$0 - \$7,970 (annualized at \$0 - \$536)

118. Pre-designation costs of lynx conservation efforts on recreational activities are related to hunter and trapper education programs considering the lynx as presented in Exhibit 5-1.

EXHIBIT 5.1 - TOTAL PRE-DESIGNATION ECONOMIC IMPACTS TO RECREATION

UNIT	SUBUNIT	TOTAL PRE-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL PRE-DESIGNATION COSTS (PRESENT VALUE 7%) (2000-2005)		TOTAL PRE-DESIGNATION COSTS (PRESENT VALUE 3%) (2000-2005)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH
PROPOSED FOR CRITICAL HABITAT DESIGNATION		LOW	HIGH	LOW	HIGH	LOW	HIGH
1: Maine	Private Timber lands	\$300,000	\$360,000	\$383,000	\$459,000	\$333,000	\$400,000
2: Minnesota	State DNR lands	*	\$501	*	\$574	*	\$532
3: Northern Rockies	State of Montana Department of Fish, Wildlife & Parks	*	\$501	*	\$574	*	\$532
Unit 4: North Cascades	State of Washington Department of Fish and Wildlife	\$60,000	\$60,000	\$76,500	\$76,500	\$67,000	\$67,000
TOTAL		\$361,000	\$421,000	\$460,000	\$537,000	\$400,000	\$467,000
*Impacts less than \$500. Totals may not sum due to rounding.							

119. Post designation costs are forecast to result primarily from restrictions on the development of new snowmobile trails and continued trapper education efforts. Two scenarios are employed to bound the impacts to recreation activities, in order to account for uncertainty in the extent to which existing snowmobile trails can absorb the projected increases in snowmobiling activity, and thus the extent to which congestion associated with implementation of lynx conservation will impact snowmobilers; these scenarios are described in detail in Section 5.2.
120. Total forecast impacts to all recreation activities are presented in Exhibit 5-2. The majority of impacts forecast (approximately 80 percent) occur on private lands owned by timber companies in Maine, where snowmobiling and trapping activity is concentrated in this region.

EXHIBIT 5-2. TOTAL POST-DESIGNATION ECONOMIC IMPACTS TO RECREATION

UNIT	SUBUNIT	TOTAL POST-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 3%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 3%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 7%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 7%) (2006-2025)	
		SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2
PROPOSED FOR CRITICAL HABITAT DESIGNATION		SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2
1: Maine	National Park Service	\$0	\$3,770	\$0	\$2,800	\$0	\$188	\$0	\$1,980	\$0	\$187
	Baxter State Park Authority	\$0	\$5,350	\$0	\$4,000	\$0	\$266	\$0	\$2,810	\$0	\$265
	State Department of Conservation, Bureau of Parks and Lands	\$0	\$131,000	\$0	\$96,700	\$0	\$6,500	\$0	\$68,600	\$0	\$6,470
	Maine State Department of Inland Fisheries and Wildlife	\$0	\$5,720	\$0	\$4,240	\$0	\$285	\$0	\$3,000	\$0	\$283
	Private Timber lands	\$1,000,000	\$2,550,000	\$766,000	\$1,920,000	\$51,500	\$129,000	\$567,000	\$1,390,000	\$53,500	\$131,000
	Conservation NGO	\$0	\$31,100	\$0	\$23,000	\$0	\$1,550	\$0	\$16,300	\$0	\$1,540
	Unknown Landowner	\$0	\$212,000	\$0	\$157,000	\$0	\$10,500	\$0	\$111,000	\$0	\$10,500
2: Minnesota	Superior National Forest	\$0	\$55,900	\$0	\$41,800	\$0	\$2,800	\$0	\$30,000	\$0	\$2,830
	State DNR lands	\$24,100	\$85,400	\$23,600	\$69,500	\$1,590	\$4,670	\$23,200	\$56,100	\$2,190	\$5,300
	Private Timber Company Lands	\$0	\$2,010	\$0	\$1,500	\$0	\$101	\$0	\$1,080	\$0	\$102
	Private Mining Company Lands	\$0	\$1,620	\$0	\$1,210	\$0	\$81	\$0	\$867	\$0	\$82
	Unknown Landowner	\$0	\$107,000	\$0	\$80,400	\$0	\$5,400	\$0	\$57,700	\$0	\$5,440

UNIT	SUBUNIT	TOTAL POST-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 3%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 3%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 7%) (2006-2025)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 7%) (2006-2025)	
		SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2	SCENARIO 1	SCENARIO 2
PROPOSED FOR CRITICAL HABITAT DESIGNATION											
3: Northern Rockies	State of Montana Department of Natural Resources and Conservation	\$0	\$14,500	\$0	\$10,800	\$0	\$725	\$0	\$7,710	\$0	\$728
	State of Montana Department of Fish, Wildlife & Parks	\$2,000	\$17,800	\$1,530	\$13,300	\$103	\$897	\$1,130	\$9,600	\$107	\$906
	University of Montana System	\$0	\$14,500	\$0	\$10,800	\$0	\$725	\$0	\$7,710	\$0	\$728
	Private Timber lands	\$0	\$14,500	\$0	\$10,800	\$0	\$725	\$0	\$7,710	\$0	\$728
Unit 4: North Cascades	State of Washington Department of Natural Resources	\$0	\$32,000	\$0	\$23,000	\$0	\$1,560	\$0	\$16,000	\$0	\$1,520
	State of Washington Department of Fish and Wildlife	\$20,000	\$180,000	\$19,700	\$134,000	\$1,330	\$8,980	\$19,300	\$94,000	\$1,830	\$8,870
TOTAL		\$1,050,000	\$3,460,000	\$811,000	\$2,600,000	\$54,500	\$175,000	\$610,000	\$1,880,000	\$57,600	\$178,000
CONSIDERED FOR EXCLUSION											
Unit 2: Minnesota	Voyageurs National Park	\$0	\$10,700	\$0	\$7,970	\$0	\$536	\$0	\$5,720	\$0	\$540
TOTAL		\$0	\$10,700	\$0	\$7,970	\$0	\$536	\$0	\$5,720	\$0	\$540
Note: Totals may not sum due to rounding.											

5.2 METHODS AND ASSUMPTIONS

5.2.1 SNOWMOBILING

121. This analysis assumes that the LCAS standards guiding snowmobiling activities are applied broadly across the study area. These standards have already been adopted by Federal agencies that have incorporated the LCAS into their land use planning (e.g., Superior National Forest), and by the Washington State Department of Natural Resources in their 2006 Lynx Habitat Management Plan.⁷⁴ Exhibit 5-3 describes these lynx conservation efforts related to snowmobiling.

EXHIBIT 5-3. SNOWMOBILING RECREATION STANDARDS FOR LYNX CONSERVATION FROM EXISTING LYNX MANAGEMENT PLANS

LYNX CONSERVATION EFFORT	SOURCE
Allowing no net increase in groomed or designated snow routes and snowmobile play areas within a lynx analysis unit.	LCAS
Mapping and monitoring snow compacting activities.	LCAS
Designing trails, roads, and lifts to direct winter use away from diurnal security habitat.	LCAS
No increases in designated or groomed over-the-snow routes or snowmobile play areas will be allowed within lynx geographic range managed by DNR. Additionally, increased organized snowmobile use within the lynx management zones will not be promoted.	Draft WADNR management plan

122. The LCAS also addresses lynx conservation associated with development of new downhill ski areas; however, no new downhill ski areas are forecast within the study area.

Welfare impacts to snowmobilers in the study area

123. Two scenarios are presented to bound potential impacts to snowmobilers associated with implementing the lynx conservation efforts described in Exhibit 5-3. Both scenarios assume that all designated lands will comply with LCAS standards for recreation. These scenarios are employed to capture the uncertainty of the effect of crowding on snowmobiler welfare.
- **Scenario 1** – Scenario 1 assumes snowmobilers do not experience a reduced value for snowmobiling trips due to the application of LCAS standards for a combination of reasons:
 1. Congestion levels within the study area are relatively low; thus, no substantive deterioration in quality of snowmobiling experiences occurs under a scenario of no net increase in trail mileage. That is, the projected increases in congestion do not result in decreased participation or quality of experience due to abundant existing trails.

⁷⁴ Reudinger, B., et. al. 2000; Washington State Department of Natural Resources. Lynx Habitat Management Plan for DNR-Managed Lands. Final Draft. January 2006. p.41.

2. Despite growing numbers of registrations in the past, the number of miles of groomed trail has remained nearly constant. Information from the State snowmobile programs in the study area units indicates that snowmobile trail networks are well-established and rarely undergo expansions or closures.⁷⁵ Thus, despite projected increases in snowmobiling participation, it is possible that these areas do not require new trail development.
 3. Substitute sites for snowmobiling outside of the study area accommodate increases in snowmobiling activity.
 - **Scenario 2** - Scenario 2 assumes that precluding development of new snowmobile trails increases congestion on existing trails and there is a resulting reduction in social welfare for all snowmobilers in the study area.
124. These two scenarios are employed to account for the uncertainty regarding whether the increase in congestion reduces the value of this activity to snowmobilers. Determining whether increased congestion is discernable and generates decreased utility is difficult because information is not available regarding baseline levels of congestion across the existing trail systems in the study area. While some information is available regarding numbers of snowmobiling participants, their distribution across existing trails is unknown.⁷⁶
125. To the extent that increased congestion is observable (Scenario 2), the economics literature has considered the reduction in social welfare that can result from congestion at a recreational site. One such study provides insight into whether snowmobilers experience a reduction in surplus in response to an increase in congestion. This study was conducted for the National Park Service study to assess the impacts of temporary changes in snowmobiling regulations at Yellowstone National Park.⁷⁷
126. The Yellowstone study applied a travel cost (random utility) model to assess the changes in surplus, in terms of per day willingness-to-pay values, associated with varying management regimes. The estimated reduction in willingness to pay resulting from a change from low to moderate crowding was \$60-\$70 per day, representing a reduction in willingness to pay of 22 percent due to greater congestion. In this study, this equates to about a 0.07 percentage point reduction in willingness to pay for each one percentage point increase in crowding. This reduction in willingness to pay is applied in this analysis.⁷⁸

⁷⁵ Personal communication with Maine Snowmobile Association, Maine Bureau of Parks and Lands Snowmobile Program, Minnesota Department of Natural Resources, Montana Department of Fish, Wildlife and Parks, Washington Snowmobile Association (Various dates).

⁷⁶ Communication with the groups cited in footnote 119 indicate that few data on trail use are available. Those data that are available come from trail counters in Minnesota that are characterized as unreliable by MNDNR staff.

⁷⁷ RTI, International 2004. Economic Analysis of Temporary Regulations on Snowmobile Use in the Greater Yellowstone Area. Final Report; and RTI, International 2005. Winter 2002-2003 Visitor Survey: Yellowstone and Grand Teton National Parks. Revised Final Report.

⁷⁸ See Appendix E for further explanation and justification of the applicability of this study to this analysis.

127. Scenario 2 of this analysis applies the following method to estimate the impacts of increased congestion across the study area as follows:

1. **Calculate miles of trail available for snowmobiling in each subunit -** Geographic Information System (GIS) data were used to determine the total available snowmobile trail miles within the study area.⁷⁹ Mileage estimates by subunit are presented in Exhibit 5-4.
2. **Estimate numbers of snowmobilers in the study area -** Detailed information regarding the number of snowmobilers recreating within the study area was not available. This analysis therefore applies the ratio of miles of trail in each unit to total miles of trail in the respective State to estimate the percentage of snowmobilers in the State recreating in each unit.
3. **Calculate expected growth in numbers of snowmobiling participation in the study area -** Increased participation in snowmobiling is projected using data on historical participation levels in each State. In each Unit, a State agency requires that both resident and non-resident snowmobiles be registered yearly. Records of these statewide registrations in each unit informed a simple linear regression of the number of registrants by year. In Minnesota and Washington, additional available studies projecting recreational use are considered in forecasting future snowmobile registrations. Accordingly, future growth in registrations per year are estimated based on the following growth rates:⁸⁰
 - Unit 1 - Maine: 3.5%
 - Unit 2 - Minnesota: 2.5%
 - Unit 3 - Northern Rockies: 2.8%
 - Unit 4 - North Cascades: 5.2%
4. **Number of snowmobiling activity days per year currently taking place in these areas –** The analysis applies existing data regarding the number of snowmobile days in the study area units, as highlighted in Exhibit 5-5.

⁷⁹ Sources: Unit 1 - Maine Snowmobile Association. Unit 2 - Minnesota Department of Natural Resources GIS data deli: http://deli.dnr.state.mn.us/data_search.html. Unit 3 - Information provided by the State snowmobile program at the Montana Department of Fish, Wildlife & Parks (MTDFWP), regarding total trail miles in the study area and percentages of total Montana trails within various ownerships. Unit 4 - Washington State Parks and Recreation Commission, Winter Mapping office.

⁸⁰ Sources: Maine: Maine Snowmobile Association (MSA). March 9, 2006. Snowmobile registrations have been increasing steadily since the mid-1990s. Communication with MSA, and Scott Ramsay of Maine Bureau of Parks and Lands (March 17, 2006) indicated that during the winter of 2003-2004 there was very little snow in Maine. To provide a more accurate estimate of future impacts, this outlier year is excluded from the analysis. Minnesota: Minnesota Department of Natural Resources, Division of Trails and Waterways, March 21, 2006. Montana: Montana Department of Fish, Wildlife, and Parks Snowmobile Program. Washington: Washington State Commission of Parks and Recreation, March 14, 2006. Communication with Wayne Mohler, Washington State Snowmobile Association (March 9, 2006), indicated that during the winter of 2004-2005 there was very little snow in Washington. To provide a more accurate estimate of future impacts, this outlier year is excluded from the past registration numbers used in this analysis

5. **Determine willingness-to-pay for a day of snowmobiling per participant -**
Existing studies are drawn upon to estimate willingness to pay for a snowmobile activity day. These studies and the associated values are reported in Exhibit 5-6. The median willingness-to-pay for a snowmobiling day applied in this analysis is \$39.32.
6. **Calculate the decreased consumer surplus associated with increased snowmobiler congestion in the study area -** Based on the Yellowstone study, a one percent increase in congestion corresponds with a 0.07 percent decrease in an individual's welfare value per day. Therefore, for example, a 3.5 percent increase in congestion in Maine, corresponds to a 0.25 percent decrease in an individual's value per day, which results in a decrease of \$0.10 per snowmobiling day (i.e., \$39.32 multiplied by 0.25 percent). The median cost per day of \$39.32 (from Exhibit 5-6), is multiplied by the percentage decrease in value per day of increased congestion to estimate the decrease in consumer surplus.

EXHIBIT 5-4. MILES OF SNOWMOBILE TRAIL WITHIN THE STUDY AREA

SUBUNIT	MILES	PERCENTAGE OF TOTAL STATE TRAILS	PERCENTAGE WITHIN THE STUDY AREA
UNIT 1 SNOWMOBILE TRAIL MILES			
TOTAL WITHIN THE STUDY AREA: 784		TOTAL STATEWIDE : 2,974	
National Park Service	2	<1%	<1%
Baxter State Park Authority	2	<1%	<1%
Maine Department of Conservation	58	2%	7%
Maine Department of Inland Fish & Wildlife	3	<1%	<1%
Private Timber Land	604	20%	78%
Conservation NGO Land	14	<1%	2%
Unknown Landowner	95	3%	12%
Tribal Land	6	<1%	<1%
TOTAL	784	26%	100%
UNIT 2 SNOWMOBILE TRAIL MILES			
TOTAL WITHIN THE STUDY AREA: 793		TOTAL STATEWIDE : 18,884	
Superior National Forest	186	<1%	23%
Voyageurs National Park	36	<1%	4%
Minnesota department of natural resources	200	1%	25%
Private Mining Company Lands	5	<1%	<1%
Private Timber Company Lands	7	<1%	<1%
Unknown landowner	358	2%	45%
TOTAL	793	4%	100%

SUBUNIT	MILES	PERCENTAGE OF TOTAL STATE TRAILS	PERCENTAGE WITHIN THE STUDY AREA
UNIT 3 SNOWMOBILE TRAIL MILES			
TOTAL WITHIN THE STUDY AREA: 260		TOTAL STATEWIDE : 4,071	
State (MTDNRC, MTDFWP, MT University system).	195	5%	75%
Private Timber Land	65	1%	25%
TOTAL	260	6%	100%
UNIT 4 SNOWMOBILE TRAIL MILES			
TOTAL WITHIN THE STUDY AREA: 29		TOTAL STATEWIDE: 3002	
Washington Department of Natural Resources	29	<1%	100%
TOTAL	29	<1%	100%
Sources: Unit 1: Maine Snowmobile Association. GIS of Interconnected Trail System Map. Provided by Carl Morrison via email. March 13, 2006. Unit 2: Minnesota Department of Natural Resources. Data Deli. http://deli.dnr.state.mn.us/data_search.html Accessed March 17, 2006. Unit 3: Personal Communication, Bob Walker, Montana Department of Fish, Wildlife and Parks. Unit 4: Washington State Parks and Recreation Commission, Winter Mapping Program. Provided by Karen Behm, via email. March 14, 2006.			

EXHIBIT 5-5. SNOWMOBILING DAY ESTIMATES IN EACH UNIT

UNIT	STUDY	AVERAGE SNOWMOBILING DAYS PER YEAR PER PERSON	ESTIMATED NUMBER OF SNOWMOBILE MACHINES IN AREAS PROPOSED FOR CRITICAL HABITAT* (2006)	ESTIMATED SNOWMOBILING DAYS IN THE STUDY AREA (2006)**
1	Rubin, et al. 2001.	23.47	26,264	637,988
2	Schneider, I. E. Ph.D., P.Elizabeth, R. Salk, and T. Schoenecker. 2005.	11.6	11,368	135,160
3	Sylvester, J.T. 2002.	15	1,848	28,504
4	Moore, D.L. 2000.	17.4	358	6,562
<p>* Equal to most recent year available number of statewide registrations multiplied by the percentage of State trail miles within the unit. ** Equal to the estimated number of machines in the study area multiplied by the average number of snowmobiling days per year. Sources: Unit 1: Rubin, et al. 2001. Gasoline Consumption Attributable to Snowmobile Use in Maine. Prepared for The Commission to Study Equity in the Distribution of Gas Tax Revenues Attributable to Snowmobiles, All-Terrain Vehicles, and Watercraft. Margaret Chase Smith Center for Public Policy, The University of Maine. Unit 2: Schneider, I. E. Ph.D., P.Elizabeth, R. Salk, and T. Schoenecker. 2005. <i>Snowmobiling in Minnesota: Economic impact and Consumer Profile</i>. University of Minnesota Tourism Center, with the analytical assistance of Analysis & Evaluation at the Department of Employment & Economic Development. Unit 3: Sylvester, J.T. 2002. Snowmobiling in Montana 2002. Presented to the Montana Department of Fish, Wildlife & Parks and the Montana Snowmobile Association. Bureau of Business and Economic Research, The University of Montana. Unit 4: Moore, D.L. 2000. 2000 Survey of Registered Snowmobile Owners in Washington State. Technical Report. Survey conducted by Social and Economic Sciences Research Center, for Washington State parks, Snowmobile Program, Washington State Snowmobile Association, State of Washington.</p>				

EXHIBIT 5-6. SOCIAL WELFARE VALUE OF SNOWMOBILE TRIPS FROM PREVIOUS STUDIES

GEOGRAPHIC REGION	DESCRIPTION	SOURCE	VALUE PER DAY (\$2006)*
Yellowstone and Grand Teton National Parks	Willingness to Pay (WTP) calculated using travel cost method from data collected in a Winter 2002-2003 Visitor Survey for Yellowstone and Grand Teton National Parks. Study purpose was to evaluate alternative regulations on snowmobile use in the greater Yellowstone area. Values presented here are from the baseline scenario.	1	\$32.89
West Yellowstone		1	\$27.75
Continental Divide		1	\$28.78
Wyoming	Consumer surplus calculated using travel cost method. Study considered Wyoming State Trail System use, and focused on market segmentation by motivation for snowmobile trip. The consumer surplus presented here is from their pooled sample.	2	\$45.75
Wyoming and Utah	Consumer surplus averaged from two prior studies. Both studies calculated consumer surplus using the travel cost method.	3	\$82
Park County, Wyoming	Net economic value of snowmobiling	4	\$79.70
Median value per day		-	\$39.32
<p>* These values represent the amount that snowmobilers would pay per day over and above current cost.</p> <p>1) RTI International. October 2004. Economic Analysis of Temporary Regulations on Snowmobile Use in the Greater Yellowstone Area: Final Report. Prepared for National Park Service, Environmental Quality Division, Dr. Bruce Peacock; MACTEC Engineering and consulting, Inc., BBL Sciences, and RTI International. July 2005. Winter 2002-2003 Visitor Survey: Yellowstone and Grand Teton National Parks: Revised Final Report. Prepared for the National Park Service, Environmental Quality Division, Dr. Bruce Peacock.</p> <p>2) Coupal, R.H., C. Bastian, J. May, D.T. Taylor. 2001. Journal of Leisure Research. Fourth Quarter. 33:4. pp. 492-510.</p> <p>3) Rosenberger, R.S., and J.B. Loomis. 2001. Benefit Transfer of Outdoor Recreation Use Values. A Technical Document Supporting the Forest Service Strategic Plan (2000 Revision). Gen. Tech. Rep. RMRS-GTR-72. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.</p> <p>4) Taylor. 1999. Economic Importance of the Winter Season to Park County, Wyoming. University of Wyoming, Cooperative Extension Service, College of Agriculture, Department of Agricultural and Applied Economics. Report to Park County Commissioners.</p>			

Regional economic contribution of snowmobiling in the study area

128. This analysis also provides information on the regional economic contribution of snowmobiling in Maine and Minnesota, applying a regional economic model to quantify the dollar value of goods and services produced, and employment generated, by consumer expenditures.⁸¹ Regional economic modeling accounts for the interconnectedness of industries within a geographic area -- that is, industries not only supply goods and services to consumers, but also to each other. Thus, spending in one economic sector tends to have a larger impact on the regional economy as a whole. This concept is commonly referred to as the "multiplier" effect. Commonly used by State and Federal agencies for policy planning and evaluation purposes, the model applied in this analysis,

⁸¹ This analysis is only applied to Maine and Minnesota due to the relatively greater forecast impacts due to lynx conservation in these Units as compared with the Northern Rockies and North Cascades Units.

IMPLAN, translates estimates of trip expenditures into changes in demand for inputs to affected industries.⁸² Changes in output and employment are calculated for all industries and then aggregated to determine the regional economic contribution of snowmobiling to the counties containing proposed critical habitat in Maine and Minnesota.

129. For purposes of this regional economic analysis, the study area in Maine includes Aroostook, Franklin, Piscataquis, Penobscot, and Somerset Counties. In Minnesota, the study area includes Lake, Cook, St. Louis and Koochiching Counties. The model draws upon data from several Federal and State agencies, including the Bureau of Economic Analysis and the Bureau of Labor Statistics.
130. IMPLAN translates expenditures (e.g., food, lodging, snowmobile repair, and gas) into changes from demand for inputs to affected industries. These effects can be described as direct, indirect, or induced, depending on the nature of the change:
- *Direct effects* represent changes in output attributable to a change in demand or a supply shock. These are specified initially by the modeler (e.g., the change in ranching expenditures on goods and services, by sector);
 - *Indirect and induced effects* are changes in output industries that supply goods and services to those that directly affected by the initial change in expenditures; and Induced effects reflect changes in household consumption, arising from changes in employment (which in turn are the result of direct and indirect effects). For example, changes in employment in a region may affect the consumption of certain goods and services.
131. There are two important caveats relevant to the interpretation of IMPLAN model estimates, generally, and within the context of this analysis. The first is that the model is static in nature and measures only those effects resulting from a specific policy change (or the functional equivalent specified by the modeler) at a single point in time. Thus, IMPLAN does not account for posterior adjustments that may occur, such as the subsequent re-employment of workers displaced by the original policy change. A second caveat to the IMPLAN analysis is related to the model data. The IMPLAN analysis relies upon input/output relationships derived from 2002 data. Thus, this analysis assumes that this historical characterization of the affected counties' economies are a reasonable approximation of current conditions. If significant changes have occurred since 2002 in the structure of the economies of the counties in the study area, the results may be sensitive to this assumption. The magnitude and direction of any such bias are unknown.
132. The results of the IMPLAN analyses for Maine and Minnesota are presented along with the total welfare values of snowmobiling in Section 5.3 for context and to provide perspective to the estimated impacts to snowmobilers.

⁸² The IMPLAN model is owned and maintained by the Minnesota IMPLAN Group, Inc. (MIG). For more information see: IMPLAN Professional, Social Accounting and Impact Analysis Software, User's Guide, Analysis Guide, Data Guide, Minnesota IMPLAN Group, Inc. 1997.

5.2.2 OTHER RECREATION IMPACTS

133. In addition to impacts to snowmobiling activity, the analysis describes and quantifies the existing and expected education efforts by State agencies associated with managing hunter and trapper education programs based on information gathered from affected agencies. Also, the analysis estimates impacts related to expected project modifications to two non-motorized recreation trails currently being constructed in Unit 2.

5.3 SNOWMOBILING SCENARIO 2: ESTIMATED IMPACTS BY SUBUNIT

134. The following sections characterize snowmobiling activity in each subunit. In each unit, State agencies are responsible for managing grant-in-aid snowmobile programs that provide funding to local clubs to maintain trails. A percentage of the State gas tax and snowmobile registration fees support these programs. Numerous local clubs participate in maintaining trail networks across a variety of land ownerships as well as in negotiating permissions to use the lands.

5.3.1 UNIT 1 - MAINE

135. In Unit 1, snowmobiling occurs predominantly on private and State lands. Two State agencies and networks of private landowners manage the activity. Snowmobiling is a popular sport in Maine, with registrations through the Maine Department of Inland Fisheries and Wildlife growing steadily since the mid 1990s, and totaling over 100,000 machines in 2004-2005. A 1998 study estimated the economic impact of snowmobiling in Maine at \$261 million annually.⁸³
136. Snowmobiling in Maine primarily occurs in the 'tourist belt' that reaches from the population centers along Maine's coast north and west toward less populated areas. Trails in this area are wider and longer than those closer to population centers, and thus attract more snowmobilers.⁸⁴ While there have been few changes to the extent of Maine's snowmobile trails, trail routes change within existing road networks from year to year in response to private landowners' logging activities and requirements.⁸⁵

⁸³ An Economic Evaluation of Snowmobiling in Maine: An Update for 1997-98 Conducted by Stephen Reiling, Department of Resource Economics and Policy University of Maine, Orono, Maine 04469-5782 For: The Maine Snowmobile Association Available at: <http://www.mesnow.com/Study.html>

⁸⁴ Shorter, more narrow trails in closer proximity to population centers are not included as formally designated trails in Maine's trail system, the Interconnected Trail System (ITS), and therefore are not included in this analysis. Personal Communication. Scott Ramsay, March 13, 2006.

⁸⁵ Personal Communication, Bob Meyers, Director, Maine Snowmobile Association. March 9, 2006.

137. The majority of snowmobiling occurs in Maine on private lands. North Maine Woods (NMW), a non-profit organization formed in 1971 by the private landowners within the 3.5 million acre northwestern part of Maine, manages public use. Aside from snowmobile use to access ice-fishing points along the Allagash waterway, and some Interconnected Trail System (ITS) corridor and connector trails, there is no managed winter recreation in the NMW-managed lands and therefore, there is no record of how many snowmobiles operate on these private lands along the Allagash waterway each year.⁸⁶
138. Exhibit 5-7 provides information on the total economic value of snowmobiling in Unit 1. The estimated reduction in consumer surplus associated with lynx conservation efforts on recreation activities are presented in Exhibit 5-8. The distribution of formalized snowmobiling trails across Unit 1 is presented in Exhibit 5-9.

EXHIBIT 5-7. TOTAL VALUE OF SNOWMOBILING IN UNIT 1: MAINE

VALUE OF SNOWMOBILING IN UNIT 1: MAINE (2006)	
Total Welfare Value of Snowmobiling ⁽¹⁾	\$25,300,000
Direct Regional Economic Contribution ⁽²⁾	\$186,000,000
Indirect and Induced Regional Economic Contribution ⁽²⁾	\$89,400,000
Regional Employment ⁽²⁾	5,080
Economic contribution of snowmobiling in study area as percentage of total economic activity in the study area. ⁽²⁾	1.67%
Sources: (1) Total participation in 2006 multiplied by willingness-to-pay. (2) Calculated in IMPLAN analysis.	

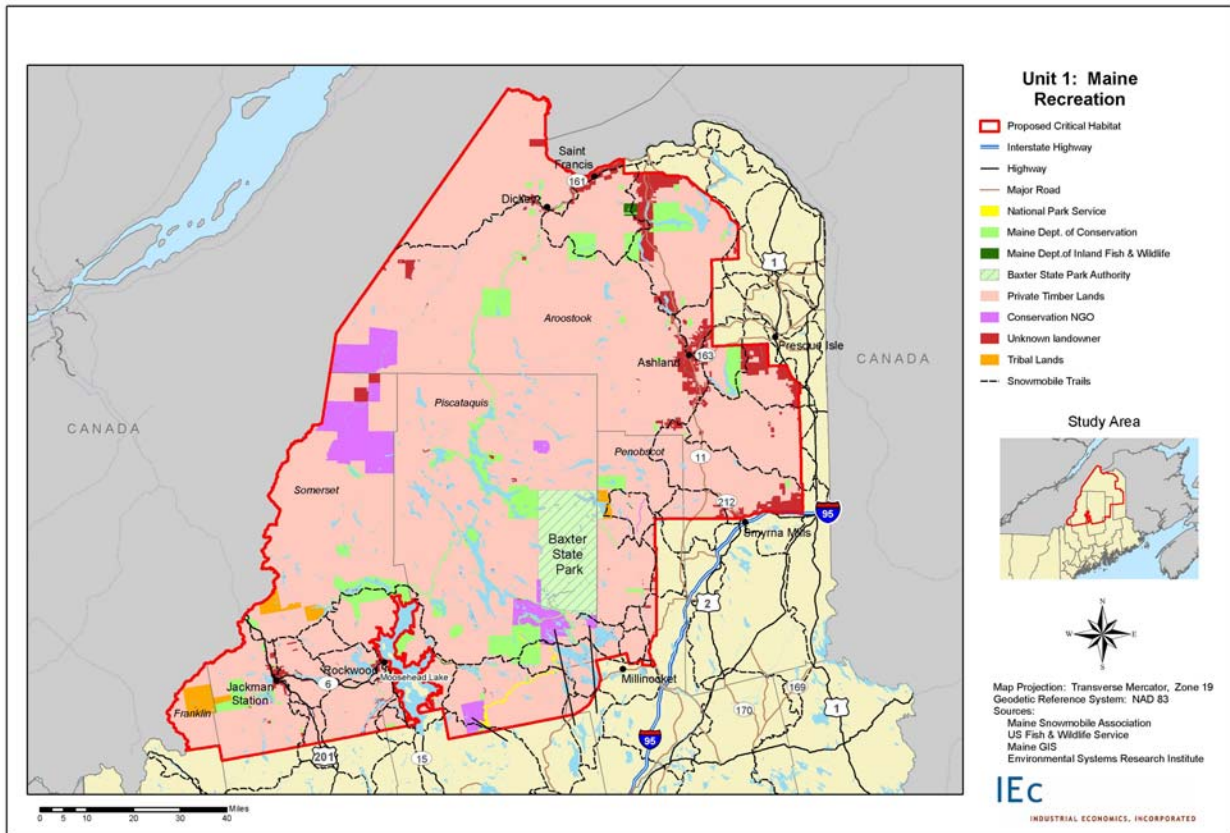
⁸⁶ Personal Communication, Al Cowperthwaite, Director, North Maine Woods, Inc. March 8, 2006.

**EXHIBIT 5-8. UNIT 1: MAINE FUTURE IMPACTS TO SNOWMOBILING BY SUBUNIT
UNDER SCENARIO 2**

SUBUNIT	POST-DESIGNATION COSTS UNDER SCENARIO 2 - 2006-2025				
	UNDISCOUNTED	PRESENT VALUE 7%	ANNUALIZED 7 %	PRESENT VALUE 3%	ANNUALIZED 3%
National Park Service	\$3,770	\$1,980	\$187	\$2,800	\$188
Baxter State Park Authority	\$5,350	\$2,810	\$265	\$3,960	\$266
State Department of Conservation, Bureau of Parks and Lands	\$131,000	\$68,600	\$6,470	\$96,700	\$6,500
Maine State Department of Inland Fisheries and Wildlife	\$5,720	\$3,000	\$283	\$4,240	\$285
Private Timber Lands	\$1,350,000	\$709,000	\$66,900	\$1,000,000	\$67,200
Conservation NGO	\$31,100	\$16,300	\$1,540	\$23,000	\$1,540
Unknown Landowner	\$212,000	\$111,000	\$10,500	\$157,000	\$10,500
Tribal Lands*	-	-	-	-	-
TOTAL	\$1,740,000	\$913,000	\$86,200	\$1,290,000	\$86,500

*Impacts to tribes are presented in Section 9.

EXHIBIT 5-9. SNOWMOBILE TRAILS IN UNIT 1: MAINE



5.3.2 UNIT 2 - MINNESOTA

139. Snowmobiling in Minnesota is focused in the northeast region of the State which experiences high quality snow over a long winter season (Exhibit 5-12 shows Minnesota snowmobile trails). There are 20,000 miles of trail statewide, and over 277,000 machines were registered in the State in 2004. A 2005 economic impact study of snowmobiling in Minnesota found that the direct snowmobiling expenditures in Minnesota totaled \$199.6 million.⁸⁷
140. Through the MNDNR-managed Grant-in-Aid program, local snowmobile clubs maintain Minnesota's trails across land ownerships.⁸⁸ Portions of four State trails fall within the study area.⁸⁹ Of these, the North Shore trail, managed by MNDNR, experiences the

⁸⁷ Schneider, I. E. Ph.D., P. Elisabeth, R. Salk, and T. Schoenecker. 2005. *Snowmobiling in Minnesota: Economic impact and Consumer Profile*. University of Minnesota Tourism Center, with the analytical assistance of Analysis & Evaluation at the Department of Employment & Economic Development.

⁸⁸ Personal Communication, Ed Quinn, Resource Coordinator, Parks & Recreation, Minnesota Department of Natural Resources, February 17, 2006

⁸⁹ They are the North Shore, Arrowhead, Taconite, and Tomahawk trails.

heaviest use and crosses four ownership types: private and private-industrial (6 percent), county (42 percent), State (17 percent), and Federal (35 percent) lands.^{90, 91}

141. Trail counters used for the last ten years provide an estimate of the number of snowmobiles ranging from 12,000 to 25,000 per season on the North Shore Trail.⁹² This contrasts with the other trails that receive less snow and have a shorter reliable snow season. For example, counts on the Taconite trail have shown an average of 3,000 to 4,000 snowmobiles per month in recent years. Due to the unreliability of these data, and consistent with the remainder of this analysis, registrations are used to estimate participation, rather than these counts.
142. Local trails also cross a combination of Federal, State, and county lands, as well as corporate timber and paper company lands, and private lands within the study area. Some corporate lands are being closed to snowmobile recreation, due to changes in management, or the perception that selling for development or recreation (hunting) leases is more profitable. No such closures are presently planned in the study area, but may limit trails in the future.⁹³
143. State funds from MNDNR are used for maintenance and modernization of trails. Modernization, that widens or straightens existing trails, was pushed heavily by snowmobile clubs approximately five years ago, but the number of these projects is expected to be minimal in the future.^{94, 95} One past informal section 7 consultation was conducted for a modernization project to widen, smooth sharp corners, and flatten the trailhead of the Gunflint trail in Minnesota. The U.S. Fish and Wildlife Service determined that the action would not increase compacted snow that might give lynx competitors an advantage, and allowed the project to continue as planned.
144. Exhibit 5-10 provides information on the total economic value of snowmobiling in Unit 2. The estimated reduction in consumer surplus associated with lynx conservation efforts on recreation activities are presented in the Exhibit 5-11. The distribution of formalized snowmobiling trails across Unit 2 is presented in Exhibit 5-12.

⁹⁰ Personal Communication, Tom Peterson, Minnesota Department of Natural Resources, Division of Trails and Waterways, Two Harbors Office, March 3, 2006.

⁹¹ Minnesota Department of Natural Resources. Unpublished Data, 2006. All-Terrain Vehicle Use on the North Shore State Trail: A Feasibility Study. Appendix A.

⁹² Personal Communication, Tom Peterson. March 3, 2006.

⁹³ Personal Communication, Scott Kelling, Minnesota Department of Natural Resources, Division of Trails and Waterways, Tower Office. March 2, 2006.

⁹⁴ Personal Communication, Scott Kelling. March 2, 2006.

⁹⁵ The Minnesota United Snowmobilers Association (MUSA) has expressed concern that designation of critical habitat for the lynx in Minnesota is not appropriate, based on the lack of the deep fluffy snow required by lynx, and other supporting information. Comments to the U.S. Fish and Wildlife Service, from Minnesota United Snowmobilers Association. February 3, 2006; Personal Communication with Nancy Hanson, Business Coordinator, Minnesota United Snowmobilers Association.

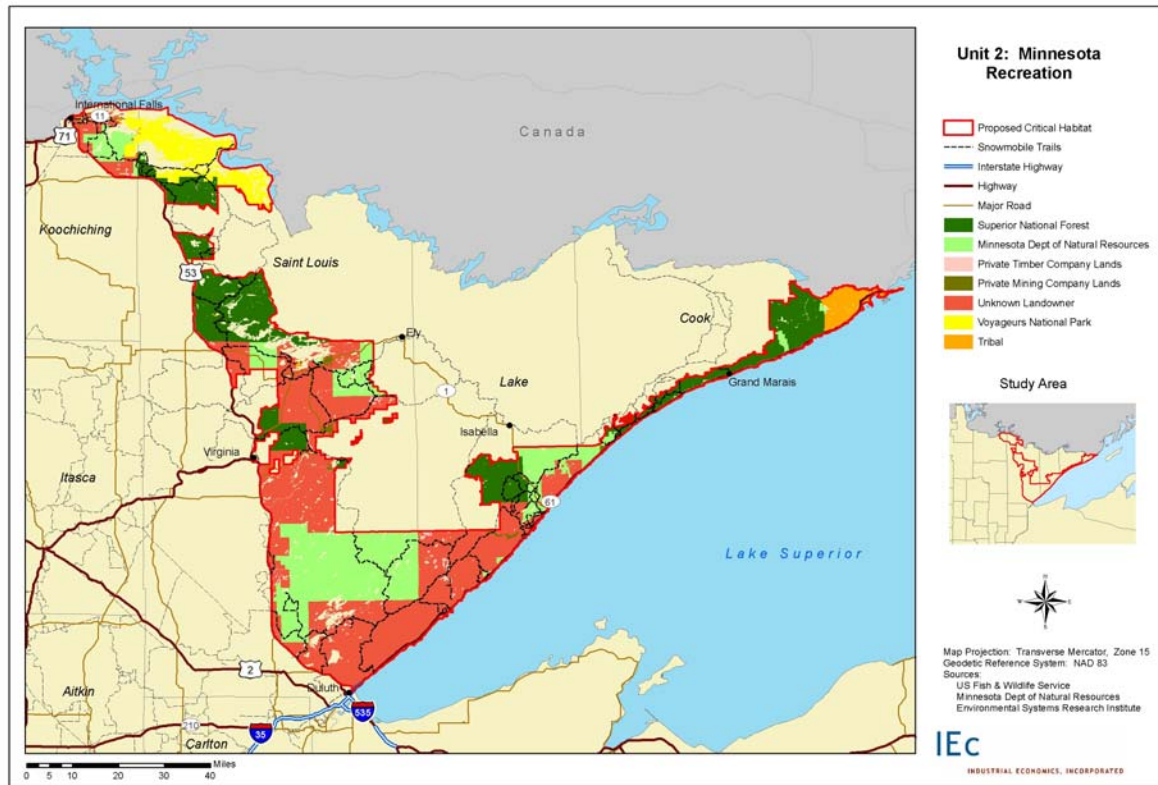
EXHIBIT 5-10. TOTAL VALUE OF SNOWMOBILING IN UNIT 2: MINNESOTA

VALUE OF SNOWMOBILING IN UNIT 2: MINNESOTA (2006)	
Welfare Value of Snowmobiling ⁽¹⁾	\$5,310,000
Direct Regional Economic Contribution ⁽²⁾	\$47,600,000
Induced and Direct Regional Economic Contribution ⁽²⁾	\$23,400,000
Regional Employment ⁽²⁾	1,321
Economic contribution of snowmobiling in study area as percentage of total economic activity in the study area. ⁽²⁾	0.56%
Sources: (1) Total participation in 2006 multiplied by willingness-to-pay. (2) Calculated in IMPLAN analysis.	

EXHIBIT 5-11. FUTURE IMPACTS TO SNOWMOBILING IN UNIT 2 - MINNESOTA UNDER SCENARIO 2

SUBUNIT	POST-DESIGNATION COSTS UNDER SCENARIO 2 - 2006-2025				
	UNDISCOUNTED	PRESENT VALUE 7%	ANNUALIZED 7%	PRESENT VALUE 3%	ANNUALIZED 3%
PROPOSED FOR CRITICAL HABITAT DESIGNATION					
Superior National Forest	\$55,900	\$30,000	\$2,830	\$41,800	\$2,810
State DNR Lands	\$60,000	\$32,200	\$3,040	\$44,900	\$3,020
Private Timber Company Lands	\$2,010	\$1,080	\$102	\$1,500	\$101
Private Mining Company Lands	\$1,620	\$867	\$82	\$1,210	\$81
Unknown Landowner	\$107,000	\$57,700	\$5,440	\$80,400	\$5,400
TOTAL	\$227,000	\$122,000	\$11,500	\$170,000	\$11,400
CONSIDERED FOR EXCLUSION					
Voyageurs National Park	\$10,700	\$5,720	\$540	\$7,970	\$536
TOTAL	\$10,700	\$5,720	\$540	\$7,970	\$536

EXHIBIT 5-12. UNIT 2: SNOWMOBILE TRAILS IN MINNESOTA



145. MNDNR produced a ten-year forecast of Minnesota adult outdoor recreation participation for the years 2004 to 2014.⁹⁶ Relying on MNDNR registration numbers, census data, and population projections, MNDNR expects a 4.3 percent decrease in snowmobile activity in terms of number of participants and annual hours of participation. It estimates that the percentage of the Minnesota population participating in snowmobiling will decrease by 16.8 percent by 2014. Communication with MNDNR staff indicates that the demand for snowmobile trails is largely satisfied, with the majority of trail work currently related to maintenance.⁹⁷
146. Consistent with the methods employed in this analysis, however, by looking at past snowmobile registration numbers in Minnesota, the growth rate forecast for Minnesota is 2.5 percent per year.

⁹⁶ Kelly, Tim. 2005. Ten-year forecasts of Minnesota adult outdoor recreation participation, 2004-2014. Minnesota Department of Natural Resources. Office of Management and Budget Services.

⁹⁷ Ed Quinn, Scott Kelling, Tom Peterson, Minnesota Department of Natural Resources.

5.3.3 UNIT3 - NORTHERN ROCKIES

147. Snowmobiling in the study area in Montana occurs on State and private lands.⁹⁸ A recent study estimated that statewide, in the winter 2001-2002 season, nonresident snowmobilers spent over \$46.5 million, and residents spent approximately \$105.8 million during the same period on snowmobiling-related expenditures (2006 dollars).⁹⁹ The total welfare value of snowmobiling in the study area in Montana is estimated to be \$1,120,000 in this analysis (2006 participation multiplied by willingness-to-pay).
148. The majority (over 96 percent) of snowmobiling in Montana occurs on Federal lands, less than one percent takes place on private lands, and the balance occurs on State lands. In the 2005-2006 season, 4,071 miles of snowmobile trail were groomed statewide in Montana.¹⁰⁰ The total number of groomed trails ranges between 3,950 and 4,150 from year to year, as logging activity locations can affect where grooming is allowed on approved trails.
149. The Montana Department of Fish Wildlife and Parks (MTDFWP) manages the State snowmobile program that provides coordination and funding of trail maintenance by local clubs.¹⁰¹ Most snowmobile trails occupy existing roads. Since 2000, only one project to construct new trail has occurred in Montana. This project involved a two-mile stretch connecting to existing trail.¹⁰² The most common trail projects are temporary or permanent rerouting in response to logging activity or new home construction, respectively.¹⁰³
150. Every mile of trail that is maintained with money from the State snowmobile program is required to undergo a Montana Environmental Policy Act and National Environmental Policy Act (MEPA/NEPA) review. Different levels of review depending on the project are required. This review may include checks on snowmobile trail project activities, including consideration of adverse effects to unique, rare, threatened or endangered species or their habitat, and discussion of mitigating efforts that may be undertaken to protect any species or habitat.¹⁰⁴ Review of each project by a wildlife biologist is required, and can result in additional mitigations or project modifications.¹⁰⁵ To date, the MTDFWP's MEPA/NEPA review process has not triggered any project modifications due to lynx conservation on snowmobile trails in Montana.

⁹⁸ Because snowmobiling is prohibited in Glacier National Park, no impacts are forecast. Recreation in Glacier National Park consists of hiking, camping, picnicking and wildlife viewing.

⁹⁹ Sylvester, J.T. 2002. Snowmobiling in Montana 2002. Presented to the Montana Department of Fish, Wildlife & Parks and the Montana Snowmobile Association. Bureau of Business and Economic Research, The University of Montana.

¹⁰⁰ Personal Communication. Bob Walker, Montana Department of Fish Wildlife and Parks, March 10, 2006.

¹⁰¹ Personal Communication, Bob Walker. March 10, 2006.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ Montana Fish Wildlife & Parks, Environmental Analysis MEPA/NEPA Checklist. p.8.

¹⁰⁵ Montana Fish Wildlife & Parks, Outdoor Recreation Grants Wildlife Review Form. pp 1-2.

151. Applying the analysis described Section 5.2, estimated post-designation impacts to snowmobiling in areas proposed for designation are \$57,800 in undiscounted dollars (a present value of \$30,800 applying a seven percent discount rate or \$43,100 applying a three percent discount rate). No impacts are anticipated in the areas considered for exclusion.

5.3.4 UNIT 4 - NORTH CASCADES

152. Snowmobiling occurs on Federal, State, and private lands within the study area in Washington State. There are a total of 3,000 to 3,500 miles of groomed snowmobile trails in Washington State. This analysis estimates that the total welfare value of snowmobiling in Unit 4 in 2006 is \$258,000 (estimated participation multiplied by willingness-to-pay).
153. A 2003 study by the State of Washington estimates future participation in outdoor recreation in the State.¹⁰⁶ For snowmobiling, it estimates a 43 percent increase in the number of people participating by 2013.¹⁰⁷ This would be a total of an additional 14,711 participants by 2013; however there is no information on how many additional snowmobilers would become active in any given year. Due to this lack of information, the study's estimate is provided as context, but is not applied to the analysis. This analysis estimates a higher increase in the number of statewide registrations, 18,685, by 2013, based on recent trends.
154. The Washington State Snowmobile Association (WSSA), which represents all Washington State registered snowmobilers and nearly 100 snowmobile-related businesses, has expressed concern that designation of critical habitat will introduce a regulatory burden and potentially affect the snowmobiling industry and associated infrastructure, including gear and rental shops.¹⁰⁸ WSSA estimates that after recreation restrictions were adopted due to the lynx's listing, two snowmobile rental operations in the Okanogan region were forced to shut down and a remaining shop experienced a decline in business and lost revenues.¹⁰⁹
155. Snowmobiling occurs on the Loup Loup block area, and on Loomis State Forest trails that are connected to the Okanogan-Wenatchee National Forest trail network. Loomis does not maintain visitor records, though on a sunny weekend day this year, 80 to 100

¹⁰⁶ This study relies on National Survey on Recreation and the Environment (NSRE) projections for the Pacific Region, which includes Washington State, age group participation and age trends in Washington, estimates of resource and facility availability, user group organization and representation, and land use and land designations.

¹⁰⁷ Interagency Committee for Outdoor Recreation. Salmon Recovery Funding Board. Estimates of future participation in outdoor recreation in Washington State. March 2003.

¹⁰⁸ Personal Communication, Wayne Mohler, Past President/Legislation Committee, Washington State Snowmobile Association, March 10, 2006; Cherise Oram and Douglas J. Steding, Stoel Rives, LLP, February 23, 2006; and Gary Allard, member WSSA, February 16, 2006.

¹⁰⁹ Comments on Proposed Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx. Stoel Rives, LLP for the Washington State Snowmobile Association. February 1, 2006.

snowmobilers were present on Loomis Forest lands.¹¹⁰ Of the 3,000 to 3,500 miles of trail statewide, only 29 miles are in the study area. The area is remote, and most snowmobile riding in the Loomis area is on ungroomed trails.¹¹¹

156. In areas that will be covered by WADNR's draft lynx management plan, creation of new snowmobile trails is precluded, and there is no encouragement for additional use of existing trails. The specific guideline for trails in lynx management zones follows:
- No increases in designated or groomed over-the-snow routes or snowmobile play areas will be allowed within lynx geographic range managed by DNR.
 - Closure of some areas that are currently used will be considered if specific areas of increased concern are identified and mutually agreed upon by DNR and the USFWS.
 - Strategies to discourage inappropriate use will include signing of gated systems and placement of physical barriers along the entrance to trail or road systems where appropriate.
 - Additionally, increased organized snowmobile use within the lynx management zones (LMZs) will not be promoted.¹¹²
157. While some trails in Washington are already considered overused, and a recent increase in grooming on trails in the area east of Loomis may indicate a trend toward increased development of trails in Washington, the WADNR lynx habitat management plan guidelines outlined above restrict such development within its LMZs.¹¹³ These restrictions will cover the majority of trails in critical habitat.
158. Applying the analysis described in Section 5.2.2., estimated post-designation impacts to snowmobiling in Unit 4 areas proposed for designation are \$31,700 in undiscounted dollars (present value of \$16,100 applying a seven percent discount rate or \$23,100 applying a three percent discount rate). No impacts are anticipated in the areas considered for exclusion.¹¹⁴

¹¹⁰ Personal Communication, Scott Fisher, Northeast Region, Washington Department of Natural Resources. February 13, 2006.

¹¹¹ Personal Communication, Wayne Mohler, March 10, 2006.

¹¹² Washington State Department of Natural Resources. Lynx Habitat Management Plan for DNR-Managed Lands. Final Draft. January 2006.

¹¹³ Personal Communication, Wayne Mohler. March 10, 2006.

¹¹⁴ Snowmobiling is prohibited in North Cascades National Park. The steep topography in the area precludes trail development beyond the existing 10 miles in a town within the Park, rendering the LCAS conservation measure of "no net increase in groomed or designated trails" inapplicable here. Personal communication with Roy Zipp, North Cascades National Park Complex, Environmental Protection Specialist. March 2, 2006.

5.4 HUNTING AND TRAPPING

159. Lynx conservation efforts related to hunting and trapping are for educational programs run by State agencies to assist trappers in identifying and avoiding incidental take of lynx.¹¹⁵ Incidental shooting or trapping, and predator control are identified as possible risks to the lynx in the LCAS.¹¹⁶ In 2003, the United States Fish and Wildlife Service (USFWS) and the International Association of Fish and Wildlife Agencies (IAFWA) produced a brochure titled, "How to Avoid Incidental Take of Lynx while Trapping or Hunting Bobcats and Other Furbearers" to assist State agencies in educating trappers and hunters.¹¹⁷

160. The following sections describe and quantify the existing and expected education efforts by State agencies associated with managing hunter and trapper education programs.

5.4.1. UNIT 1 - MAINE

161. In Maine, Maine Department of Inland Fisheries and Wildlife (IF&W) manages licensing and education programs that allow the public to participate in hunting and trapping. IF&W formerly managed a coyote snaring program that has since been halted due to concerns about lynx (see below education programs description). IF&W has spent \$50,000 to \$60,000 per year since 2000 on the following efforts related to lynx conservation in its trapper education program:¹¹⁸

- updates and changes to the 2003 brochure to incorporate Maine-specific information,
- annual mailings to licensed trappers including information on lynx,
- attendance at trapper association meetings, and
- operation of a 24-hour-a-day response program providing assistance to trappers who report having trapped a lynx.

162. Costs borne by IF&W for these combined efforts range between \$300,000 and \$360,000 per year. Future costs expected to be borne by IF&W for continued implementation of the trapper education programs, range from \$1 million to \$1.2 million in undiscounted dollars (a present value of \$567,000 to \$680,000 applying a seven percent discount rate or \$766,000 to \$919,000 applying a three percent discount rate). These impacts are expected to derive from the designation of private timber lands; no trapping occurs on IF&W lands, and the private timber lands provide the majority of available area for trapping within the study area.

¹¹⁵ The agencies are: Unit 1: Maine Department of Inland Fisheries and Wildlife; Unit 2: Minnesota Department of Natural Resources; Unit3: Montana Department of Fish, Wildlife and Parks; Unit 4: Washington Department of Fish and Wildlife.

¹¹⁶ LCAS, page 2-15.

¹¹⁷ "How to Avoid Incidental Take of Lynx while Trapping or Hunting Bobcats or Other Furbearers" is available online at: <http://www.fws.gov/international/animals/lynx.htm> (accessed March 13, 2006).

¹¹⁸ Personal Communication, Ken Elowe, Maine Department of Inland Fisheries and Wildlife. February 23, 2006.

Coyote snaring program

163. From 1981 to 2003, IF&W hired hunters to snare coyotes near deer wintering yards to protect them from predation during the winter. In 2003-2004, the coyote snaring program implemented by IF&W was put on hold due to concerns that the snaring efforts posed a threat to the Canada lynx and bald eagle.¹¹⁹
164. The program typically cost \$15,000 per year during its implementation. Having the program on hold, while eliminating the costs of program implementation, has resulted in significant use of staff time for IF&W to manage public concern equal to the amount of effort that was being put into the program implementation. There is therefore no cost savings estimated associated with removing program implementation costs.¹²⁰
165. Information is not available to correlate the effect of the coyote snaring program on deer populations; it is therefore unclear whether hunting opportunity is impacted by the cessation of the program.¹²¹

5.4.2 UNIT 2 - MINNESOTA

166. The MNDNR has distributed the USFWS and IAFWA 2003 informational brochure to hunters and trappers. Since 2003, MNDNR estimates the total costs of this effort at approximately \$300 to \$500.¹²² Assuming that the MNDNR's involvement in lynx-related hunter and trapper education remains the same into the future (i.e., \$300 to \$500 per three-year period), total post-designation cost are forecast at \$2,000 to \$3,340 in undiscounted dollars (present value of \$1,130 to \$1,890 applying a seven percent discount rate or \$1,530 to \$2,560 applying a three percent discount rate).

5.4.3 UNIT 3 - MONTANA

167. Similar to Unit 2, the 2003 USFWS/IAFWA brochure is made available to hunters and trappers by MTDFWP.¹²³ Absent State-specific information, this analysis assumes costs to MTDFWP are similar to those born by the MNDNR for the same effort. Pre-designation costs are therefore estimated at \$300 to \$500. Post-designation costs are forecast at \$2,000 to \$3,340 in undiscounted dollars (present value of \$1,130 to \$1,890 applying a seven percent discount rate or \$1,530 to \$2,560 applying a three percent discount rate).

5.4.4 UNIT 4 - WASHINGTON

168. The Washington Department of Fish and Wildlife (WADFW) has developed and distributed lynx identification materials to hunters in its predator control program for

¹¹⁹ Personal Communication, Ken Elowe. February 23, 2006, and IF&W's 2005-2006 Trapper information, available at: <http://www.state.me.us/ifw/hunttrap/trapperinfo2005-2006.htm>.

¹²⁰ Personal Communication, Ken Elowe, March 16, 2006.

¹²¹ Personal communication, Ken Elowe. February 23, 2006.

¹²² Personal Communication, Conrad Christensen, Furbearer Specialist, Minnesota Department of Natural Resources. March 13, 2006.

¹²³ <http://fwp.mt.gov/hunting/trapping/default.html> (accessed March 15, 2006).

cougar since 2000. The cougar program licenses 150 to 170 people per year to hunt cougar with hounds for livestock predation prevention, and human safety protection. Cougar hunters receive information as part of their training, and a once-yearly brochure mailing for differentiating between lynx, and other forest carnivore cats, including a map identifying lynx management areas. The cougar hunting season takes place when cougars are at lower elevations, and rarely in lynx habitat, as identified by the WADFW and WADNR's management plans. Because cougar hunting activity is not bounded by the lynx management zones, and because some areas within the study area for the lynx are not included in the lynx management zones, the total program costs are reported in this analysis.

169. Legislation allows the current program to operate with a scheduled reevaluation after the 2006-2007 hunting season. After that point, it will either be terminated, or adopted, possibly permanently. WADFW has spent a total of \$10,000 per year on these education efforts since 2000. Pre-designation costs total \$60,000. With the low end assuming that the program is terminated in 2007, and the high end estimate assuming that it is adopted permanently, the post-designation costs are \$20,000 to \$180,000 in undiscounted dollars (present value of \$19,300 to \$94,000 applying a seven percent discount rate or \$19,700 to \$134,000 applying a three percent discount rate).

5.5 OTHER RECREATION ACTIVITIES

170. Cross-country skiing is identified as a possible threat to lynx because it often occurs on groomed trails. Data on miles of cross country ski trails within the study area is not available for all areas. In Units 1 and 3, cross-country skiing is not a formalized activity, and occurs on a variety of groomed, ungroomed, non-designated trails, and trails designed primarily for other uses. MTDNRC began charging a client-based fee for use of its trails in 2006. However, only 7.5 miles of cross-country ski trail are present in the study area on MTDNRC lands, and impacts due to lynx conservation are not expected. In Units 2 and 4, some permitting is required for use of State trails, but information is not available on where permitted cross country skiers recreate. Overall, absent information suggesting a demand for more groomed cross-country ski trails, and given the dispersed and non-formalized nature of the sport, impacts to cross-country skiing activities are not expected in the study area.
171. The LCAS identifies other recreation projects including construction of campgrounds, and ski-area expansions as potential threats to the lynx. No planned expansions of campgrounds or ski areas were identified within the study area. A past section 7 consultation for a campground construction in Maine, resulted in no project modifications.¹²⁴ The Pacific Northwest Ski Areas Association has expressed concern that designation of critical habitat could burden, or eliminate future development of ski areas in Washington.¹²⁵

¹²⁴ Personal Communication, David Field, Ph.D. Overseer of Lands. Maine Appalachian Trail Club. March 10, 2006.

¹²⁵ Comments to the U.S. Fish and Wildlife Service. February 7, 2006.

172. Two non-motorized recreation trails are currently being constructed in Unit 2. Snowmobiling will be permitted on some sections of them, though their primary uses are for other sports.

The Gitchi-Gami

173. The Gitchi-Gami trail, once complete, will stretch 86 miles from Two Harbors to Grand Marais.¹²⁶ The trail will primarily be used for bicycling, running, and walking. Some sections of the trail utilize existing snowmobile routes, which will continue to be open to snowmobile use. In addition, sections that cross state park land will be groomed for cross-country skiing.¹²⁷
174. The trail is being built primarily along existing and abandoned highway corridors, in a piecemeal fashion. These areas are considered developed, and therefore do not contain the primary constituent elements of lynx habitat. Approximately 10 percent, or 8.6 miles of the trail are being built in previously undeveloped areas. Assuming compliance with the LCAS no net increase in over-the-snow trails standard, 8.6 miles of trail would be closed elsewhere to offset the new portions of the Gitchi Gami. Based on estimated costs of road decommissioning in Superior National Forest, \$1,000 per mile, post-designation costs are forecast to be \$8,600.¹²⁸ Because the trail is a State designated trail, these costs are attributed to MNDNR.

The Mesabi Trail

175. The Mesabi trail will connect Grand Rapids to Ely and total 135 miles in length.¹²⁹ Trail use will be similar to the Gitchi Gami. Ninety percent of the fourteen-foot corridor trail is, or will be built on existing railway corridors, and old and abandoned mine roads. The remaining ten percent, 13.5 miles, of new trail construction occurs in separate pieces connecting the existing corridor sections.
176. One ten-mile section of the trail from Hibbing to Buhl is open to winter use by snowmobiles, through an agreement with the local snowmobile club that maintains it in winter months. No additional miles are expected to be groomed.¹³⁰ As for the Gitchi Gami, the miles of trail not being built in existing corridors, 13.5 miles, is multiplied by the cost of decommissioning a road, \$1,000, and is presented as a total cost of \$13,500 to MNDNR.

¹²⁶ Personal Communication, Kevin Johnson, Division of Trails and Waterways. Minnesota Department of Natural Resources. March 2, 2006.

¹²⁷ Personal Communication, Kevin Johnson. March 2, 2006. The State Parks that will be crossed are: Gooseberry Falls, Tetegouche, Temperence River, Cascade, Judge Magney, and Split Rock Lighthouse.

¹²⁸ Provided by Mary Shedd, Wildlife Biologist, Superior National Forest, March 7, 2006.

¹²⁹ Personal Communication, Bob Manzoline, Director, St. Louis and Lake Counties Regional Railroad Authority. March 13, 2006.

¹³⁰ Ibid.

SECTION 6 | PUBLIC LANDS MANAGEMENT AND CONSERVATION PLANNING

177. This section describes lynx conservation associated with four types of activities: 1) development and implementation of lynx management plans; 2) research efforts related to lynx conservation; 3) grazing; and 4) wildlife management.

6.1 SUMMARY OF IMPACTS TO PUBLIC LANDS MANAGEMENT AND CONSERVATION PLANNING

Post-designation Impacts in areas proposed for designation

- Undiscounted: \$12.8 million
- Present value applying a seven percent discount rate: \$9.95 million (annualized \$940,000)
- Present value applying a three percent discount rate: \$11.4 million (annualized \$767,000)

Post-designation impacts in areas considered for exclusion

- Undiscounted: \$7.97 million
- Present value applying a seven percent discount rate: \$6.60 million (annualized 623,000)
- Present value at applying a three percent discount rate: \$7.32 million (annualized \$492,000)

6.1.1 PRE-DESIGNATION IMPACTS

178. To date, there have been 17 consultations considering lynx for land management activities in areas proposed for critical habitat, and six in areas considered for exclusion. All but one were related to land and resource management planning; the remaining one was related to lynx ecology research. Past consultations on grazing were conducted outside of the study area. The primary ongoing efforts related to public lands and conservation planning are the continued development of Montana Department of Natural Resources and Conservation's (MTDNRC) draft habitat conservation plan (HCP), and Washington Department of Natural Resources (WADNR) draft Lynx Habitat Management Plan. Pre-designation impacts include the development of these plans, lynx conservation research, and planning and administrative support for lynx management efforts. Pre-designation costs associated with these efforts are described in Exhibit 6-1.

EXHIBIT 6-1. PRE-DESIGNATION IMPACTS

UNIT	SUBUNIT	TOTAL PRE-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL PRE-DESIGNATION COSTS (PRESENT VALUE 3%)		TOTAL PRE-DESIGNATION COSTS (PRESENT VALUE 7%)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH
PROPOSED FOR CRITICAL HABITAT DESIGNATION		LOW	HIGH	LOW	HIGH	LOW	HIGH
Unit 1: Maine	Private Timber Lands	\$1,350,000	\$1,350,000	\$1,500,000	\$1,500,000	\$1,720,000	\$1,720,000
Unit 2: Minnesota	Superior National Forest	\$57,100	\$86,100	\$62,600	\$93,500	\$70,600	\$104,000
	State DNR lands	\$40,400	\$69,300	\$43,000	\$74,000	\$46,600	\$80,200
Unit 3: Northern Rockies	Montana Department of Natural Resources and Conservation	\$306,000	\$306,000	\$336,000	\$336,000	\$381,000	\$381,000
Unit 4: North Cascades	Washington Department of Natural Resources	\$1,000,000	\$1,000,000	\$1,130,000	\$1,130,000	\$1,310,000	\$1,310,000
TOTAL		\$2,760,000	\$2,820,000	\$3,070,000	\$3,130,000	\$3,530,000	\$3,600,000
PROPOSED FOR EXCLUSION							
Unit 2: Minnesota	Voyageurs National Park	\$41,100	\$41,100	\$45,900	\$45,900	\$53,000	\$53,000
Unit 3: Northern Rockies	Glacier National Park	\$909,000	\$1,210,000	\$982,000	\$1,310,000	\$1,090,000	\$1,450,000
Unit 4: North Cascades	North Cascades National Park	\$141,000	\$141,000	\$151,000	\$151,000	\$164,000	\$164,000
TOTAL		\$1,090,000	\$1,390,000	\$1,180,000	\$1,510,000	\$1,300,000	\$1,670,000

6.1.2 POST-DESIGNATION IMPACTS

179. Total post-designation impacts of lynx conservation efforts on forecast projects are summarized by subunit in Exhibit 6-2. These results rely on the assumption that all public and conservation lands will be managed consistent with lynx conservation as described in the LCAS following the designation of critical habitat for the lynx. The impacts therefore include the costs of developing lynx management plans, and associated implementation costs, such as monitoring and surveying. Quantified impacts also capture the costs of lynx conservation research projects on public and conservation lands. Additionally, this analysis describes the limited grazing activity on public lands; this activity, however, is not a major land use within the boundaries of the study area except in the North Cascades Unit, where Loomis State Forest is largely managed as grazing allotments.

EXHIBIT 6-2. POST-DESIGNATION IMPACTS

UNIT	SUBUNIT	TOTAL POST-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 3%)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 3%)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 7%)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 7%)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
PROPOSED FOR CRITICAL HABITAT DESIGNATION		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Unit 1: Maine	National Park Service	\$284,000	\$284,000	\$232,000	\$232,000	\$15,600	\$15,600	\$181,000	\$181,000	\$17,100	\$17,100
	Baxter State Park Authority	\$1,400,000	\$1,400,000	\$1,270,000	\$1,270,000	\$85,600	\$85,600	\$1,130,000	\$1,130,000	\$107,000	\$107,000
	Department of Conservation, Bureau of Parks and Lands	\$2,210,000	\$2,210,000	\$2,030,000	\$2,030,000	\$136,000	\$136,000	\$1,820,000	\$1,820,000	\$172,000	\$172,000
	Maine Department of Inland Fisheries and Wildlife	\$255,000	\$255,000	\$205,000	\$205,000	\$13,800	\$13,800	\$156,000	\$156,000	\$14,800	\$14,800
	Private Timber Lands	\$450,000	\$450,000	\$437,000	\$437,000	\$29,400	\$29,400	\$421,000	\$421,000	\$39,800	\$39,800
	Conservation NGO	\$1,610,000	\$1,610,000	\$1,460,000	\$1,460,000	\$98,300	\$98,300	\$1,310,000	\$1,310,000	\$123,000	\$123,000
Unit 2: Minnesota	Superior National Forest	\$10,400	\$20,800	\$10,200	\$20,400	\$686	\$1,370	\$9,950	\$19,900	\$939	\$1,880
	State DNR lands	\$3,240,000	\$3,250,000	\$2,970,000	\$2,980,000	\$200,000	\$200,000	\$2,670,000	\$2,680,000	\$252,000	\$253,000

UNIT	SUBUNIT	TOTAL POST-DESIGNATION COSTS (UNDISCOUNTED)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 3%)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 3%)		TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 7%)		TOTAL POST-DESIGNATION COSTS (ANNUALIZED 7%)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
PROPOSED FOR CRITICAL HABITAT DESIGNATION		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Unit 3: Northern Rockies	U.S. Fish and Wildlife Service	\$254,000	\$254,000	\$204,000	\$204,000	\$13,700	\$13,700	\$156,000	\$156,000	\$14,700	\$14,700
	U.S. Bureau of Land Management	\$226,000	\$226,000	\$179,000	\$179,000	\$12,000	\$12,000	\$132,000	\$132,000	\$12,500	\$12,500
	Montana Department of Natural Resources and Conservation	\$944,000	\$944,000	\$745,000	\$745,000	\$50,100	\$50,100	\$575,000	\$575,000	\$54,300	\$54,300
	Montana Department of Fish, Wildlife & Parks	\$343,000	\$343,000	\$288,000	\$288,000	\$19,300	\$19,300	\$232,000	\$232,000	\$21,900	\$21,900
	Montana University System	\$350,000	\$350,000	\$294,000	\$294,000	\$19,800	\$19,800	\$238,000	\$238,000	\$22,400	\$22,400
	Idaho State Land	\$230,000	\$230,000	\$182,000	\$182,000	\$12,200	\$12,200	\$135,000	\$135,000	\$12,800	\$12,800
	Conservation NGO	\$434,000	\$434,000	\$372,000	\$372,000	\$25,000	\$25,000	\$309,000	\$309,000	\$29,100	\$29,100
Unit 4: North Cascades	Washington Department of Natural Resources	\$557,000	\$557,000	\$517,000	\$517,000	\$34,700	\$34,700	\$471,000	\$471,000	\$44,500	\$44,500
TOTAL		\$12,800,000	\$12,800,000	\$11,400,000	\$11,400,000	\$766,000	\$767,000	\$9,950,000	\$9,970,000	\$939,000	\$941,000

UNIT	SUBUNIT	TOTAL POST-DESIGNATION COSTS (UNDISCOUNTED)	TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 3%)	TOTAL POST-DESIGNATION COSTS (ANNUALIZED 3%)	TOTAL POST-DESIGNATION COSTS (PRESENT VALUE 7%)	TOTAL POST-DESIGNATION COSTS (ANNUALIZED 7%)
PROPOSED FOR EXCLUSION						
Unit 2: Minnesota	Voyageurs National Park	\$1,080,000	\$981,000	\$65,900	\$874,000	\$82,500
Unit 3: Northern Rockies	Glacier National Park	\$5,720,000	\$5,310,000	\$357,000	\$4,860,000	\$459,000
	Bureau of Land Management	\$227,000	\$208,000	\$13,900	\$186,000	\$17,600
Unit 4: North Cascades	North Cascades National Park	\$531,000	\$462,000	\$31,000	\$391,000	\$36,900
	Lake Chelan National Recreation Area	\$413,000	\$353,000	\$23,700	\$291,000	\$27,500
TOTAL		\$7,970,000	\$7,320,000	\$492,000	\$6,600,000	\$623,000

6.2 METHODS AND ASSUMPTIONS

6.2.1 LYNX MANAGEMENT METHODS AND ASSUMPTIONS

180. Where information is available describing specific lynx management strategies in particular areas, this analysis quantifies the impacts of implementing the specific strategy. Where specific information regarding potential future lynx management efforts is not available, this analysis assumes that these land areas will undertake conservation efforts as outlined in the LCAS.¹³¹ Exhibit 6-3 presents conservation guidelines in the LCAS related to public lands management.

EXHIBIT 6-3. LCAS STANDARDS RELATED TO PUBLIC LANDS MANAGEMENT

LCAS STANDARDS
PROGRAMMATIC AND PROJECT PLANNING
1. Lynx habitat will be mapped using criteria specific to each geographic area to identify appropriate vegetation and environmental conditions.
2. Prepare a broad-scale assessment of landscape patterns that compares historical and current ecological processes and vegetation patterns.
WILDFIRE (PRESCRIBED BURNS, AND SUPPRESSION ACTIVITIES)
1. In the event of a large wildfire, conduct a post-disturbance assessment prior to salvage harvest, particularly in stands that were formerly in late successional stages, to evaluate potential for lynx denning and foraging habitat.
2. Design burn prescriptions to regenerate or create snowshoe hare habitat (e.g., regeneration of aspen and lodgepole pine). ¹³²
LAND EXCHANGES
1. Develop and implement specific management prescriptions to protect/ enhance key linkage areas.
2. Evaluate proposed land exchanges, land sales, and special use permits for effects on key linkage areas. ¹³³
GRAZING
1. Do not allow livestock use in openings created by fire or timber harvest that would delay successful regeneration of the shrub and tree components.
2. Manage grazing in aspen stands to ensure sprouting and sprout survival sufficient to perpetuate the long-term viability of the clones.
3. Within the elevational ranges that encompass forested lynx habitat, shrub-steppe habitats should be considered as integral to the lynx habitat matrix and should be managed to maintain or achieve mid seral or higher condition.
4. Within lynx habitat, manage livestock grazing in riparian areas and willow carrs to maintain or achieve mid seral or higher condition to provide cover and forage for prey species. ¹³⁴

¹³¹ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53.

¹³² Ruediger, B., et. al. 2000, page 7-7

¹³³ Ruediger, B., et. al. 2000, page 7-16.

¹³⁴ Ruediger, B., et. al. 2000, page 7-11.

181. This analysis applies a cost of \$6 per acre for development of lynx management plans; this estimate is a weighted average per acre estimate of established lynx management plans as highlighted in Exhibit 6-4. Exhibit 6-5 highlights the areas to which this estimated per acre cost is applied.

EXHIBIT 6-4. LYNX MANAGEMENT PLAN DEVELOPMENT COSTS

PLAN	AGENCY	NUMBER OF ACRES	PER ACRE COST
Maine Tribes ^{(1) (2)}	Penobscot Tribe and Passamaquoddy Tribe	83,988	\$12
Grand Portage Tribe ⁽³⁾	Grand Portage Tribe	47,725	\$3
Montana Department of Natural Resources and Conservation HCP ⁽⁴⁾	MTDNRC	147,843	\$1
Lynx Habitat Management Plan for DNR-Managed Lands ⁽⁵⁾	WADNR	126,212	\$14
Plum Creek Cascade Habitat Conservation Plan ⁽⁶⁾	Plum Creek	170,000	\$6
BLM Resource Management Plan ⁽⁷⁾	BLM Missoula Field Office	147,000	\$1
WEIGHTED AVERAGE PER ACRE COST			\$6
Sources:			
1. Passamaquoddy Tribe. 2003. Population assessment and forest management planning for the Canada lynx and other rare and endangered forest carnivores on Passamaquoddy Tribal lands in Maine. Tribal Landowner Incentive Program.			
2. Email communication from Mark McCollough, March 10, 2006. Penobscot Tribe grant for development of lynx plan will have the same costs as the Passamaquoddy plan, see (1).			
3. Email communication from Seth Moore, Biologist, Grand Portage Reservation, March 23, 2006.			
4. MTDNRC. 2005. Forested Trust Land Habitat Conservation Plan. Canada Lynx Conservation Strategy.			
5. WADNR. 2005. Draft Lynx Habitat Management Plan for DNR-Managed Lands.			
6. Plum Creek Timber Company. 1996. Plum Creek's Cascades Habitat Conservation Plan.			
7. Personal Communication, George Hirschenberger, Missoula Field Office, Bureau of Land Management, April 5, 2006.			

EXHIBIT 6-5. PUBLIC AND CONSERVATION LANDS WITHOUT EXISTING OR PROPOSED LYNX MANAGEMENT PLANS

UNIT	SUB AREA	LANDS INCLUDED	ACRES
PROPOSED FOR CRITICAL HABITAT DESIGNATION			
Unit 1: Maine	National Park Service	Appalachian Trail	10,054
	U.S. Fish and Wildlife Service		41
	Maine Department of Conservation, Bureau of Parks and Lands	State Parks, Management Units	346,676
	Maine Department of Inland Fisheries and Wildlife	2 Wildlife Management Areas	4,965
	Baxter State Park Authority	Baxter State Park	205,436
	The Nature Conservancy	Conservation lands (except for the St. John River area)	240,890
	The Forest Society of Maine	Conservation lands	
The Appalachian Mountain Club	Conservation lands		
Unit 2: Minnesota	Minnesota Department of Natural Resources	State Parks, State Forests, Wildlife Management Areas, Scientific and Natural Areas	507,473
Unit 3: Northern Rockies	U.S. Fish and Wildlife Service	Benton Lakes Wetland Management District	4,784
	Montana Department of Natural Resources Conservation	Trust land areas in critical habitat not covered by HCP	57,902
	Montana Department of Fish, Wildlife, and Parks	State Parks, Wildlife Management Areas	20,465
	Montana University System	Lubrecht Forest	21,656
	Idaho Department of Land*	State land	646
	Conservation NGO	Various parcels	36,201
CONSIDERED FOR EXCLUSION			
Unit 2: Minnesota	National Park Service	Voyageurs National Park	126,149
Unit 3: Northern Rockies	National Park Service	Glacier National Park	871,668
Unit 4: North Cascades	National Park Service	North Cascades National Park	53,135
	National Park Service	Lake Chelan National Recreation Area	32,665
<p>Source: Acreage: Maine Landownership Information. GIS data layer maintained by J.W. Sewall Company, Old Town, Maine. Last updated, December 9, 2005. Received December 22, 2005.</p> <p>Existence of management plans determined through contact with stakeholders in the subunits presented.</p> <p>* The Idaho Department of Land is in the early stages of developing a lynx management plan, but no draft currently exists. Personal Communication, Patrick Seymour, Idaho Department of Lands, March 10, 2006.</p>			

182. In addition to plan development costs, implementation costs are forecast for monitoring and surveying. Information from the Washington Department of Fish and Wildlife's (WADFW) 2001 Lynx Recovery Plan suggests costs of these efforts may be approximately \$45,230 per year for five years.¹³⁵

6.2.2 RESEARCH AND GRAZING ACTIVITY METHODS AND ASSUMPTIONS

183. Existing and planned lynx research activities are quantified based on available information. Where possible, costs are presented for the subunit in which the activity occurred. Absent this information, costs are presented for the subunit landowner that provided funding for the research.
184. A limited amount of grazing occurs within the study area. Absent specific information regarding how grazing activities may be affected by lynx conservation, this analysis provides information on the level of grazing activity in the study area, and the regional economic contribution of grazing activities.

6.3 LYNX MANAGEMENT

185. This section quantifies the development and implementation of management plans incorporating lynx conservation measures.

6.3.1 UNIT 1: MAINE

6.3.1.1 Pre-Designation Impacts

186. Except for a portion of Nature Conservancy lands (see below), none of the public or conservation lands in Maine have developed lynx management plans; thus, no pre-designation impacts are estimated.

6.3.1.2 Post-Designation Impacts

187. The total post-designation cost of developing and implementing lynx management plans in Unit 1 is \$5.76 million in undiscounted dollars (a present value of \$4.60 million applying a seven percent discount rate or \$5.20 million applying a three percent discount rate).
188. Because no lynx plans are currently in place or proposed for all land parcels in Maine, post-designation impacts of lynx management plan development are estimated by applying the average cost for development of a lynx management plan, \$6 per acre, to the following lands:
- **National Park Service** - Management of the area owned by the National Park Service is limited to maintenance of the Appalachian Trail.
 - **Maine Department of Conservation** - State Parks and Public Reserved Lands are managed by the Department of Conservation, Bureau of Parks & Lands (Bureau).

¹³⁵ Stinson, D.W. 2001. Washington State Recovery Plan for the lynx. Washington Department of Fish and Wildlife, Olympia, Washington. 78pp. +5 maps.

The Bureau acquires lands, sometimes partially federally funded, to manage for conservation, and to consolidate areas it manages.

- **Maine Department of Inland Fisheries and Wildlife (IF&W)** - IF&W owns five Wildlife Management Areas within the study area, ranging from 90 to over 3,000 acres.
- **Baxter State Park Authority** - Baxter State Park is managed for primitive wilderness experiences with strict guidelines limiting the development of roads, trails, and campsites.¹³⁶ Trust for Public Land (TPL) is currently brokering a deal which includes the annexation of a 6,015 acre parcel to Baxter State Park.¹³⁷ The potential change in ownership could provide a conservation benefit for the lynx as this parcel currently allows snowmobiling and hunting; it is possible that those activities may be limited if the parcel is managed similarly to Baxter State Park.¹³⁸
- **The Nature Conservancy (TNC)** - The TNC Maine Chapter owns several parcels of land in Maine, including a 181,000 tract near the Canadian border.¹³⁹ Part of this land, the Upper St. John River area, has a management plan that contains lynx conservation efforts.¹⁴⁰ Costs of developing and implementing this plan are not available.¹⁴¹ There are no specific lynx management conservation measures governing other TNC lands in the study area; therefore, average per-acre costs are applied to all of the TNC lands.
- **The Forest Society of Maine** - The Forest Society owns 959 acres within the study area.
- **The Appalachian Mountain Club (AMC)** - The AMC maintains sections of the Appalachian trail in Maine. In 2003, the AMC purchased 37,000 acres of forestland known as the Katahdin Iron Works near Moosehead Lake.¹⁴² AMC is creating a 10,000-acre ecological reserve, and will sustainably manage the remaining acreage as working forest.¹⁴³ Costs of managing these lands for the benefit of the lynx are included in this analysis.

¹³⁶ Personal Communication with Jean Hookwater, Baxter State Park Naturalist, March 28, 2006.

¹³⁷ The Trust for Public Land, "Agreement Would Add 6K Acres to Baxter State Park (ME)" January 25, 2006. http://www.tpl.org/tier3_cd.cfm?content_item_id=20428&folder_id=259 (Accessed March 28, 2006).

¹³⁸ Personal Communication, Jean Hookwater, March 28, 2006.

¹³⁹ Personal Communication with Bill Patterson, The Nature Conservancy - Maine Chapter, February 23, 2006. Note that this acreage differs from the ownership provided in the Service's GIS layer of 76,724 acres.

¹⁴⁰ Stockwell, et al. 2004. The Nature Conservancy. Upper St. John River Forest: Forest Management Plan, April 25, 2003. Update: September 2004. p.5

¹⁴¹ Personal communication, Bill Patterson, February 24, 2006. The Managed Forest portion of this area is discussed in the Section 3 of this analysis.

¹⁴² Personal Communication, Gary Whiting. Project Director for the Maine Woods Initiative. Appalachian Mountain Club. April 6, 2006.

¹⁴³ <http://www.outdoors.org/conservation/wherewework/maine/mwi-conservation.cfm> (accessed April 3, 2006).

6.3.2 UNIT 2: MINNESOTA

6.3.2.1 Pre-Designation Costs

189. The total pre-designation costs of developing and implementing lynx management plans for areas proposed for designation in Unit 2 is estimated to be \$39,500 in undiscounted dollars for development of the Superior National Forest's Forest Management Plan and MNDNR staff time spent considering lynx management.^{144,145} Lynx conservation efforts outlined in Superior National Forest's Forest Management Plan are outlined in Exhibit 6-6

EXHIBIT 6-6. SUPERIOR NATIONAL FOREST - FOREST PLAN GUIDELINES FOR CANADA LYNX

SUPERIOR FOREST PLAN LYNX GUIDELINES
G-WL-2 - Provide for the protection of known active den sites during denning season.
G-WL-5 - Following a disturbance on NFS land greater than 20 contiguous acres (such as a blowdown, fire, insect or disease) that could contribute to lynx denning habitat, generally retain a minimum of 10% of the affected area on NFS land unless salvage or management-ignited fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity.
G-WL-7 - For newly constructed snow-compacting trails, effectively close or restrict to public access those trails and OML 1, OML 2, temporary, and unclassified roads that intersect the new trails unless these trails or roads are being used for other management purposes
G-WL-9 - Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely to lead to significant increases to lynx mortality or substantially impedes movement and dispersal. If the dirt and gravel roads described above are upgraded or paved in order to meet human health and safety or other environmental concerns and essential management needs, conduct a thorough analysis on effects to lynx and its habitat to determine minimum road design standards practical (including measurements to minimize traffic speeds), to minimize or avoid foreseeably contributing to increases in human activity or adverse impacts to lynx and its habitat.
Source: Superior National Forest, 2004 Final Forest Plan, pgs. 2-29 - 2-31.

6.3.2.2 Post-Designation Costs

190. The total post-designation cost of developing and implementing lynx management plans in areas proposed for designation in Unit 2 is \$3.23 million in undiscounted dollars (a present value of \$2.66 million applying a seven percent discount rate or \$2.96 million applying a three percent discount rate). The total cost for these activities in areas proposed for exclusion is \$949,000 in undiscounted dollars (a present value of \$747,000 applying a seven percent discount rate or \$851,000 applying a three percent discount rate).
191. These impacts are associated with development and implementation of lynx management plans by the following landowners:

¹⁴⁴ Personal Communication, Rich Baker, Minnesota Department of Natural Resources, February 8, 2006. These costs may be understated as additional staff time may be devoted to lynx efforts.

¹⁴⁵ Personal Communication, Mary Shedd, Wildlife Biologist, Superior National Forest, February 21, 2006.

- **Superior National Forest** - Implementation costs related to lynx conservation efforts in the Superior National Forest Plan are primarily related to changes in timber management practices, and are therefore quantified in Section 3 of this report.
- **Minnesota Department of Natural Resources** - MNDNR currently spends staff time to consider lynx conservation associated with its land management, and expect this to continue into the foreseeable future.¹⁴⁶
- **Voyageurs National Park** - Voyageurs National Park, considered for exclusion from critical habitat, recently consulted with the Service on its Draft Wildland Fire Management Plan in 2002. There were no modifications to this plan for the benefit of the lynx.

6.3.3 UNIT 3: NORTHERN ROCKIES

6.3.3.1 Pre-Designation Costs

192. The total pre-designation costs of developing and implementing lynx management in areas proposed for designation in Unit 3 are \$291,000. This is associated with the ongoing development of the MTDNRC Habitat Conservation Plan (HCP) for their forested trust lands; the lynx is one of the species covered by this HCP. Specific conservation efforts included in the draft lynx conservation strategy published by MTDNRC in October 2005 are illustrated in Exhibit 6-7. Spending on the HCP thus far has been for development of administrative rules, policy implementation, and critical habitat evaluation.¹⁴⁷
193. The total pre-designation costs for these activities in areas proposed for exclusion from critical habitat are \$14,300. These costs are associated with the participation of staff at Glacier National Park in the development of the LCAS. While Glacier National Park does not have a formal lynx management plan in place, it uses the LCAS guidelines in its management.

6.3.3.2 Post-Designation Costs

194. The total post-designation cost of developing and implementing lynx management plans in Unit 3 for areas proposed for critical habitat designation is \$2.78 million in undiscounted dollars (a present value of \$1.78 million applying a seven percent discount rate and \$2.26 million applying a three percent discount rate). The total post-designation cost for these activities in areas proposed for exclusion is \$5.45 million in undiscounted dollars (a present value of \$4.56 million applying a seven percent discount rate and \$5.03 million applying a three percent discount rate).

¹⁴⁶ Personal Communication, Rich Baker, February 8, 2006.

¹⁴⁷ Email communication from Mike O'Herron, Montana Department of Natural Resources and Conservation, February 14, 2006.

EXHIBIT 6-7. MTDNRC DRAFT LYNX CONSERVATION STRATEGY

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION DRAFT LYNX GUIDELINES
1. Minimize potential for disturbance to known active den sites.
2. Within preferred habitat types, map habitats potentially used by lynx, including winter foraging habitat, young foraging habitat, other suitable habitat, and temporary non-suitable habitat.
3. Provide stand structures or attributes that offer habitat for prey species, particularly in winter
4. Retain coarse woody debris and other denning attributes on managed sites.
5. Limit conversion of suitable lynx habitat to temporary non-suitable habitat per decade in geographic areas of notable importance for lynx (termed lynx management areas or [LMAs]).
6. Ensure that adequate amounts of foraging habitat are maintained in defined LMAs.
7. Provide for habitat connectivity on the landscape where vegetation and ownership patterns allow.
8. Provide assurances for maintenance of suitable lynx habitat on DNRC scattered lands outside LMAs.
Source: MTDNRC Forested Trust Land Habitat Conservation Plan (HCP), Canada Lynx Conservation Strategy. October 2005.

195. These impacts are associated with development and implementation of lynx management plans by the following landowners:

- **U.S. Fish and Wildlife Service - Benton Lakes Wetland Management District -** The mission of the District is to protect wetlands and surrounding grasslands for the benefit of waterfowl and other wildlife.
- **Montana Department of Natural Resources and Conservation -** As mentioned above, MTDNRC is developing a lynx HCP for their forested trust lands. Total forecast costs comprise continued development of the HCP and its implementation, as well as costs estimated for areas within the study area that are not covered by the draft HCP.
- **Montana Department of Fish Wildlife and Parks -** The Montana Department of Fish Wildlife and Parks (MTDFWP) manages certain State Parks, fishing access sites, and Wildlife Management Areas within the study area.¹⁴⁸ In the future, MTDFWP may purchase lands or hold easements from The Nature Conservancy (see below), but how these areas may be managed for the benefit of the lynx has not been determined.¹⁴⁹

¹⁴⁸ Personal Communication, Sue Dalbey, Montana Department of Fish, Wildlife, and Parks, provided via email, March 9, 2006.

¹⁴⁹ Personal Communication, Chaz Van Genderen, Montana Department of Fish, Wildlife, and Parks. March 7, 2006.

- **TNC** - The TNC Montana Chapter is in the process of purchasing 88,092 acres of Plum Creek timberlands and re-selling them to Federal, state, and private buyers.¹⁵⁰ These lands currently support a variety of activities including grazing, timber management, and recreation.
- **Montana University System** - The Montana University System operates Lubrecht Experimental forest within the study area.
- **Glacier National Park** - Glacier National Park is considered for exclusion from critical habitat. As the Park currently lacks an explicit lynx management plan, this analysis estimates the costs to the park of developing such a plan.
- **Bureau of Land Management** - BLM lands are considered for exclusion from critical habitat. The Butte District Field Office is in the process of updating their resource management plan in accordance with the guidelines outlined in the LCAS. Based on the costs incurred by the BLM Missoula District, the cost of adopting LCAS management into the Butte District's resource management plan, and carry out continued monitoring and surveying, is expected to be \$226,000.¹⁵¹

6.3.4 UNIT 4: NORTH CASCADES

6.3.4.1 Pre-Designation Costs

196. The total pre-designation cost of developing and implementing lynx management plans for areas proposed for critical habitat designation in Unit 4 is \$859,000. These costs are associated with the WADNR development of its Lynx Habitat Management Plan, which covers most of Loomis State Forest within the study area.
197. The total pre-designation cost for areas proposed for exclusion is \$1,800. These costs are for lynx management efforts in North Cascades National Park.

6.3.4.2 Post-Designation Costs

198. The total post-designation cost of developing and implementing lynx management plans for areas proposed for designation in Unit 4 is \$557,000 in undiscounted dollars (a present value of \$471,000 applying a seven percent discount rate or \$517,000 applying a three percent discount rate). The total post-designation cost for these activities in areas proposed for exclusion is \$944,000 in undiscounted dollars (a present value of \$682,000 applying a seven percent discount rate or \$815,000 applying a three percent discount rate).
199. These impacts are associated with development and implementation of lynx management plans by the following landowners:
- **Washington Department of Natural Resources** - Post-designation costs for continued development and implementation of WADNR's lynx management plan

¹⁵⁰ Personal Communication, Maria Mantas, The Nature Conservancy, February 23, 2006.

¹⁵¹ Personal Communication, George Herschenberger, Bureau of Land Management, Missoula Field Office. April 5, 2006. Cost is 15 months of staff time multiplied by \$5,000, the per-month employee cost BLM uses to develop its budgets.

will continue into 2007. The Loup Loup block, and some portions of Loomis State Forest were not included in the WADNR's plan because they are not considered to include lynx habitat. This analysis assumes per-acre costs similar to those already incurred for the WADNR plan development would be required for these areas.

- **North Cascades National Park, Lake Chelan National Recreation Area** - Both areas are managed as part of the North Cascades National Park Service Complex.

6.4 LYNX CONSERVATION RESEARCH

200. Exhibits 6-8 and 6-9 summarize pre- and post-designation impacts related to lynx research efforts.

EXHIBIT 6-8. PRE-DESIGNATION LYNX RESEARCH IMPACTS

UNIT	SUBUNIT	DESCRIPTION OF LYNX RESEARCH EFFORT	PRE-DESIGNATION ECONOMIC IMPACT (PRESENT VALUE 7%)
AREAS PROPOSED FOR DESIGNATION			
Unit 1: Maine	Maine Department of Inland Fisheries and Wildlife	Radio-tagging studies, snow-tracking, and associated administrative support and partnerships with landowners. ⁽¹⁾	\$1.72 million
Unit 2: Minnesota	Superior National Forest	Research such as lynx radio collaring and tracking has been conducted by the Natural Resources Research Institute on Superior NF and State lands. An estimated 10-15 percent of research activities occurred within the study area. These costs are borne by a variety of funding entities, including: U.S. Forest Service, U.S. Geological Survey, MN DNR, University of Minnesota, and the National Council for Air and Stream Improvement. ⁽²⁾	\$33,600 - \$67,000
	Minnesota Department of Natural Resources		\$33,600 - \$67,000
Unit 3: Northern Rockies	MTDNRC	Study of snowshoe hares on its lands to understand where lynx populations might occur. ⁽⁴⁾	\$18,600
Unit 4: North Cascades	WADNR	Lynx habitat research on the Loomis State Forest. Funded by the following entities: Seattle City Light; USFS Pacific Northwest Research Station; Washington Department of Fish and Wildlife; and, US Fish and Wildlife Service. ⁽⁶⁾	\$219,000
AREAS CONSIDERED FOR EXCLUSION			
Unit 2: Minnesota	Voyageurs National Park	Snow-tracking research to monitor lynx since 2000. ⁽³⁾	\$53,000
Unit 3: Northern Rockies	Glacier National Park	DNA Research project (2000-2001); Tracking surveys pilot project; Lynx telemetry study; Snowshoe Hare Study. ⁽⁵⁾	\$1.07 million - \$1.44 million
Unit 4: North Cascades	North Cascades National Park	Conducted inventory to document the presence and distribution of lynx, wolverine, fisher, and martin, and develop habitat models.	\$161,000

Notes:

- (1) Personal Communication with Ken Elowe, Ph.D., Maine Department of Inland Fisheries and Wildlife, February 24, 2006.
- (2) Personal Communication, Ron Moen, Ph.D., Natural Resources Research Institute. February 23, 2006, and April 7, 2006. Absent more specific information, costs are presented as split evenly between Superior NF and MN DNR lands where research occurs. Acreage in these areas in the study area is similar.
- (3) Personal Communication, Steve Windels, February 15, and 21, and March 3, 2006
- (4) Email communication from Mike O'Herron, February 13, 2006.
- (5) Personal communication from Steve Gniadek, January 11, 2006. Preliminary estimates.
- (6) Personal Communication, Roger Christophersen and Robert Kuntz, North Cascades National Park. March 2, 2006.
- (7) Personal Communication, Keith Aubry, Ph.D. Research Wildlife Biologist. United States Forest Service - Pacific Northwest Research Station, March 6, 2006.

EXHIBIT 6-9. POST-DESIGNATION LYNX RESEARCH IMPACTS

UNIT	SUBUNIT	DESCRIPTION OF LYNX RESEARCH EFFORT	POST-DESIGNATION ECONOMIC IMPACT (PRESENT VALUE 7%)
AREAS PROPOSED FOR DESIGNATION			
Unit 1: Maine	Maine Department of Inland Fisheries and Wildlife	Radio-tagging studies, snow-tracking, and associated administrative support and partnerships with landowners. ⁽¹⁾	\$421,000
	University of Maine		
Unit 2: Minnesota	Superior National Forest	Research such as lynx radio collaring and tracking has been conducted by the Natural Resources Research Institute on Superior NF and State lands. These costs are borne by a variety of funding entities (see table 6-9), but the bulk of future funding will come from MN DNR. ⁽²⁾	\$9,950 - \$19,900
	Minnesota Department of Natural Resources		\$9,950 - \$19,900
AREAS CONSIDERED FOR EXCLUSION			
Unit 2: Minnesota	Voyageurs National Park	Research lynx presence and habitat on its lands. ⁽³⁾	\$128,000
Unit 3: Northern Rockies	Glacier National Park	Snowshoe hare study ⁽⁴⁾	\$484,000
Notes:			
(1) Personal Communication with Ken Elowe, Ph.D., Maine Department of Inland Fisheries and Wildlife, February 24, 2006.			
(2) Personal Communication, Ron Moen, Ph.D., Natural Resources Research Institute. April 7, 2006.			
(3) Personal Communication, Steve Windels, February 15, and 21, and March 3, 2006			
(4) Personal communication from Steve Gniadek, January 11, 2006. Preliminary estimates.			

6.5 GRAZING

201. Livestock grazing is identified in the LCAS as a risk to Canada lynx productivity.¹⁵² Domestic livestock or wild ungulates may change the structure or composition of native plant communities, thus changing their ability to support lynx and their prey - the snowshoe hare - that forages on the same vegetation. "Livestock grazing may have the greatest potential to impact snowshoe hare habitat and populations, thus indirectly affecting lynx, in aspen stands and in high elevation riparian willow communities, and additionally in shrub-steppe habitats within fragmented forest areas."¹⁵³ Exhibit 6-3 lists the LCAS standards associated with grazing.
202. Grazing activities that have warranted consultation in the past include grazing allotment permit issuance, allotment reorganization, and fencing. Conservation efforts for the lynx associated with these activities have included: managing sheep and cows to prevent grazing concentration in areas that might contain lynx and snowshoe hare habitat and foraging habitat; using fencing instead of woody debris as a more permanent boundary between grazing areas and lynx and hare habitat; and monitoring and reporting on foraging conditions.
203. Limited levels of grazing are known to occur in Units 3 and 4 of the study area. While information is available on the level of grazing activity, the extent to which it occurs in areas that contain lynx or snowshoe hare foraging habitat is unknown. It is therefore uncertain whether fencing of the areas would be required.
204. This analysis provides information on the extent of grazing, the value of the animal units (cattle, or "AUMs"), and the regional economic contribution of grazing to the local economies.

6.5.1 UNIT 3: NORTHERN ROCKIES

205. Grazing occurs on approximately 65,700 acres of State Trust lands in Montana within the study area. These acres support approximately 11,000 AUMs under 119 leases (87 different lease holders).¹⁵⁴ Additionally, on TNC lands within the study area, there are 16 allotments totaling 21,566 acres, and supporting 1,958 AUMs.¹⁵⁵ The approximate current livestock production value of these AUM's is \$793,000.¹⁵⁶

¹⁵² The LCAS standards for grazing are listed in Exhibit 6-3.

¹⁵³ Ruediger, B., et. al. 2000, pp 2-12 to 2-13.

¹⁵⁴ Personal Communication, Kevin Chappell, Agriculture and Grazing Bureau Management Chief, Montana Department of Natural Resources and Conservation, March 20, 2006.

¹⁵⁵ Personal Communication, Steve Kloetzel, Land Steward, The Nature Conservancy - Montana Chapter, March 7, 2006. AUMs estimated as of summer 2005.

¹⁵⁶ U.S. Department of Agriculture National Agricultural Statistics Service. 2004. "Statistics of Cattle, Hogs, and Sheep" Chapter VII in Agricultural Statistics 2004. Available at: http://www.nass.usda.gov/Publications/Ag_Statistics/index.asp.

6.5.2 UNIT 4: NORTH CASCADES

206. There are seven grazing allotments on Loomis State Forest, and two on the Loup Loup block. Currently, grazing occurs on 101,027 acres (over 96 percent) of State lands in the study area. These areas annually support 13,570 AUM's on the Loomis State Forest, and 4,851 AUM's on the Loup Loup block.¹⁵⁷ The approximate current livestock production value of these AUM's is \$1,159,000.¹⁵⁸
207. Each permit has to have a Resource Management Plan (RMP), and be compliant with House Bill (HB) 1309.¹⁵⁹ HB 1309 contains guidelines and standards for land management and aquatic evaluation. The WADNR lynx management plan does not place any additional restrictions on grazing leases, beyond compliance with the bill. The RMP's are developed on a site-specific basis, and are designed to maintain the native plant communities and plant species diversity, but not to address the specific needs of individual species, including snowshoe hare, and lynx.¹⁶⁰
208. The Washington Cattlemen's Association (WCA) has expressed concern that designation of critical habitat on WADNR lands where they hold grazing permits may require additional effort on their part.¹⁶¹ Their primary concerns are that current management of grazing lands might change, and no longer allow the use of transitory range. Transitory range is composed of grasses and early successional species that grow in after a timber harvest, thinning, or fire. WCA estimates that within the study area, 10 to 15 percent of the grazing acres are currently in transitory range areas. The development of this kind of range would be governed by the WADNR's timber practices, or the unpredictable occurrences of fires. Ranchers in the area have been operating under the WADNR's requirement for RMPs since 2002, and to date, the lynx plan has not affected their grazing activities.¹⁶²

6.5.3 IMPLAN ANALYSIS OF REGIONAL ECONOMIC CONTRIBUTION OF GRAZING IN NORTHERN ROCKIES AND NORTH CASCADES UNITS

209. This analysis utilizes IMPLAN (as described in Section 5 of this analysis) to estimate indirect and induced impacts on the region in terms of output and jobs.
210. For purposes of the regional economic analysis, the study area in Montana includes Flathead, Missoula, Powell, Granite and Lewis and Clark Counties. In Washington, it is Okanogan County. Any restrictions in grazing activity would primarily affect the livestock-related sectors of the economy. Decreased operations in these industries may

¹⁵⁷ Personal Communication, Scott Fisher, Washington Department of Natural Resources, March 16, 2006.

¹⁵⁸ U.S. Department of Agriculture National Agricultural Statistics Service. 2004. "Statistics of Cattle, Hogs, and Sheep" Chapter VII in Agricultural Statistics 2004. Available at: http://www.nass.usda.gov/Publications/Ag_Statistics/index.asp.

¹⁵⁹ HB 1309. 1994. Ecosystem Standards for State-owned agriculture and grazing land. State of Washington Conservation Commission.

¹⁶⁰ Draft WA DNR lynx habitat management plan, pages 51-52.

¹⁶¹ Personal Communication, Jerry Barnes and Jack Field, Washington Cattlemen's Association. February 13, 2006.

¹⁶² Personal Communication, Jerry Barnes, April 4, 2006.

also result in secondary effects on related sectors in the study area. Some of these related sectors may be closely associated with livestock, such as feed grains and hay and pasture; while others may be less closely associated with the industry, such as the insurance sector. This analysis relies on regional economic modeling to estimate the economic contribution of these initial and secondary sectors.

211. Exhibit 6-10 presents the results of the IMPLAN analysis. The current contribution of livestock production is shown to total \$1,410,000 in Unit 3 (2006 dollars) in regional output and approximately 22.7 jobs across all sectors of the economy. In Unit 4 the current contribution of livestock production is shown to total \$2,200,000 in regional output and approximately 30.6 jobs. These contributions represent less than one percent of total output from the livestock industry: 0.01 percent in Montana, and 0.17 percent in Washington.

EXHIBIT 6-10. RESULTS OF IMPLAN ANALYSIS

UNIT	DIRECT EFFECT (OUTPUT)	INDIRECT AND INDUCED EFFECTS (OUTPUT)	TOTAL IMPACT (OUTPUT)	EMPLOYMENT (JOBS)	PERCENTAGE OF TOTAL PRODUCTION
3: Northern Rockies (MTDNRC)	\$787,000	\$623,000	\$1,410,000	22.7	0.01047%
4: North Cascades	\$1,150,000	\$1,050,000	\$2,200,000	30.6	0.17132%
*Regional economic impact measures represent one-time changes in economic activity (i.e., not present values).					

6.6 WILDLAND FIRE MANAGEMENT

6.6.1 BACKGROUND

212. Various agencies and private parties may conduct fire management activities within the study area. The LCAS identifies salvage logging after a wildfire as a potential risk to lynx, which use large downed woody debris as den sites. It also notes the changes in vegetative composition of habitats for snowshoe hare and lynx that follow a fire, and recommends designing burn prescriptions to minimize any habitat losses (see Exhibit 6-3). The following fire management project planning guidelines are also given in the LCAS, designed to reduce risk to lynx:

- Design burn prescriptions to promote response by shrub and tree species that are favored by snowshoe hare.
- Design burn prescriptions to retain or encourage tree species composition and structure that will provide habitat for red squirrels or other alternate prey species.

- Consider the need for pre-treatment of fuels before conducting management ignitions.
- Avoid constructing permanent firebreaks on ridges or saddles in lynx habitat.
- Minimize construction of temporary roads and machine fire lines to the extent possible during fire suppression activities.¹⁶³

213. There have been 18 formal and 17 informal past consultations in states within the study area for fire management, with the majority occurring on National Forest lands. These consultations were primarily for public lands vegetation management and fuels reductions, fire management plans, and silvicultural activities.

6.6.2 WILDLAND-URBAN INTERFACE AREAS WITHIN THE STUDY AREA

214. The following section presents data identifying the areas of Wildland-Urban Interface (WUI) where fire management activities are most likely to occur. WUI are areas where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires.¹⁶⁴
215. This analysis relies on data developed by the University of Wisconsin that integrates U.S. Census and USGS National Land Cover Data to map WUI areas according to the Federal Register definition of WUI (Federal Register 66:751, 2001).¹⁶⁵
216. WUI areas are composed of both “interface” and “intermix” communities. In both communities, housing must meet or exceed a minimum density of one structure per 40 acres. Intermix communities are places where housing and vegetation intermingle. Intermix areas are characterized by continuous wildland vegetation and more than 50 percent vegetation. Interface communities are areas with housing in the “vicinity” of contiguous vegetation, that is, areas with less than 50 percent vegetation but within 1.5 miles of an area over 1,325 acres (500 ha) that is more than 75 percent vegetated.
217. In estimating the WUI areas that overlap with the study area, this analysis excluded the following non-WUI areas: wildland intermix, uninhabited with vegetation, uninhabited and no vegetation, wildland with no vegetation, low density with no vegetation, medium density with no vegetation, high density with no vegetation, and very low density with vegetation.¹⁶⁶

¹⁶³ Ruediger, B., et. al. 2000, p. 7-7

¹⁶⁴ “The Wildland-Urban Interface,” University of Wisconsin, Department of Forest Ecology & Management, Spatial analysis for conservation and sustainability (SILVIS) Lab, Online at: http://silvis.forest.wisc.edu/projects/WUI_Main.asp, Accessed on: June 1, 2006.

¹⁶⁵ “The Wildland-Urban Interface,” University of Wisconsin, Department of Forest Ecology & Management, Spatial analysis for conservation and sustainability (SILVIS) Lab, Online at: http://silvis.forest.wisc.edu/projects/WUI_Main.asp, Accessed on: June 1, 2006.

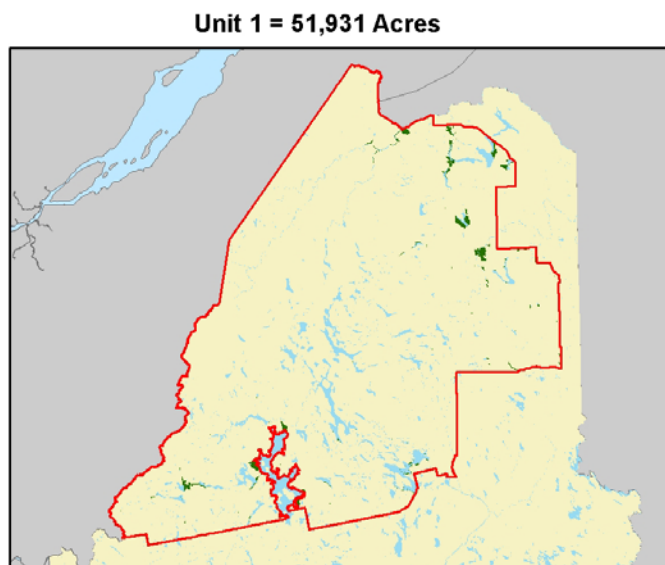
¹⁶⁶ “The Wildland-Urban Interface,” University of Wisconsin, Department of Forest Ecology & Management, Spatial analysis for conservation and sustainability (SILVIS) Lab, Online at: http://silvis.forest.wisc.edu/projects/WUI_Main.asp, Accessed on: May 26, 2006.”

218. Based on an analysis of the WUI data, overlap of the study area with WUI areas totals 265,666 acres, or approximately two percent of the acres within the study area. Exhibit 6-12 illustrates (in dark green) the areas of WUI in Units 1 and 2.

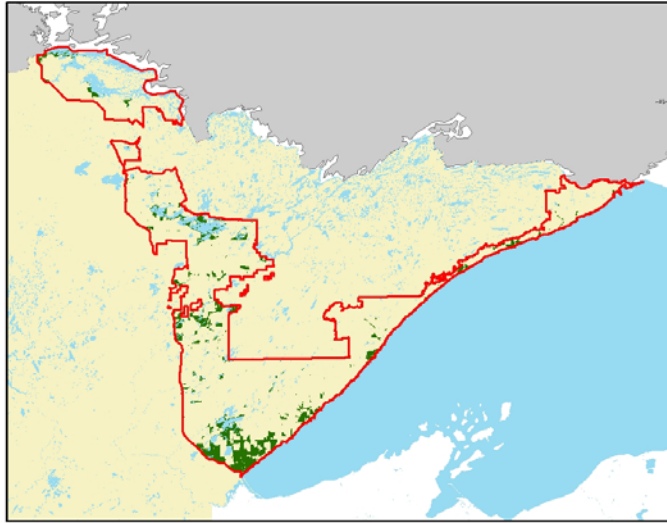
EXHIBIT 6-11. WILDLAND-URBAN INTERFACE AREAS IN THE STUDY AREA

UNIT	STUDY AREA (ACRES)	OVERLAP WITH WUI (ACRES)	OVERLAP AS A PERCENT OF CRITICAL HABITAT ACRES IN UNIT
Unit 1: Maine	6,495,031	51,931	1%
Unit 2: Minnesota	2,066,494	194,374	9%
Unit 3: Northern Rockies	2,226,773	19,361	1%
Unit 4: North Cascades	193,457	0	0%
TOTAL	10,981,756	265,666	2%
Sources: 1) "The Wildland-Urban Interface," University of Wisconsin, Department of Forest Ecology & Management, Spatial analysis for conservation and sustainability (SILVIS) Lab, Online at: http://silvis.forest.wisc.edu/projects/WUI_Main.asp , Accessed on: May 26, 2006. 2) IEC GIS analysis of the study area.			

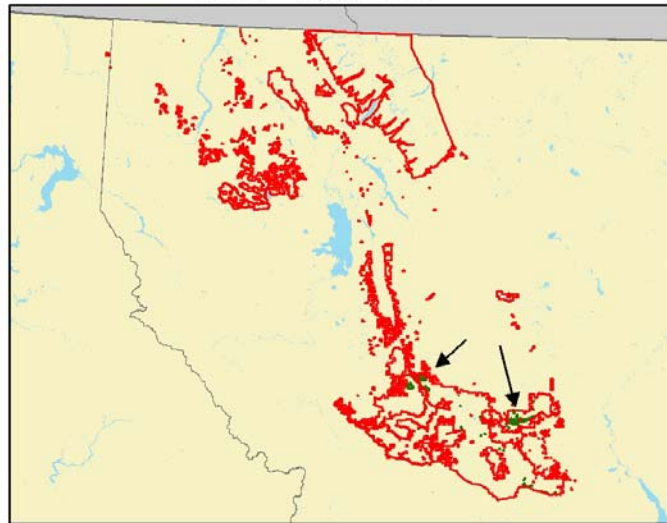
EXHIBIT 6-12. WUI AREAS IN UNITS 1 AND 2



Unit 2 = 194,374 Acres



Unit 3 = 19,361 Acres



SECTION 7 | TRANSPORTATION, UTILITIES, AND MUNICIPAL ACTIVITIES

219. This section evaluates the effect of lynx conservation efforts on transportation, utility, and municipal activities in the study area. These activities represent a potential threat to the species or its habitat by increasing the likelihood of vehicle and species collisions, restricting movement via habitat fragmentation, or causing direct habitat loss.¹⁶⁷ This section first summarizes the estimated economic impacts, and then provides an activity-specific analysis of pre- and post-designation economic impacts of lynx conservation efforts.

7.1 SUMMARY OF IMPACTS

220. Forecast impacts to transportation, utility and municipal projects from 2006 – 2025 include:

Pos-designation impacts in areas proposed for designation

- Undiscounted: \$34.9 million - \$55.1 million
- Present value applying a seven percent discount rate: \$20.6 million - \$31.5 million (annualized \$1.9 million - \$2.9 million)
- Present value applying a three percent discount rate: \$27.1 million - \$42.3 million (annualized \$1.8 million - \$2.8 million)

Post-designation impacts in areas considered for exclusion

- Undiscounted: \$706,000 - \$962,000
- Present value applying a seven percent discount rate: \$400,000 - \$545,000 (annualized at \$37,800 - \$51,500)
- Present value at applying a three percent discount rate: \$541,000 - \$737,000 (annualized at \$36,400 - \$49,600)

221. Since 2000, all transportation, utility, and municipal projects incorporating lynx conservation efforts within the states containing the proposed critical habitat were in Minnesota and Montana. These projects, however, all occurred outside of the study area. Consequently, no pre-designation costs of lynx conservation are estimated for transportation projects, utilities, or municipal projects.

¹⁶⁷ Ruediger, B., et. al. 2000. Canada lynx conservation assessment and strategy 2nd Edition. August 2000 (as amended Oct. 23-24, 2001, May 6-8, 2003 and Nov. 12-13, 2003). USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53. page 32.

222. Total post-designation impacts of lynx conservation efforts on forecast projects are summarized in Exhibit 7-2; administrative costs of consultations are described in Appendix A of this analysis.
223. Of the total post-designation costs, approximately 71 percent are attributed to transportation activities, and 29 percent are attributed to utility and municipal activities. Post-designation transportation costs are based on known, upcoming projects (such as Highway 53 in St. Louis County, MN and Clearwater Junction on State Highway 83 in Missoula County, MT) and forecast numbers of projects based on state long-range transportation plans and the location and frequency of past projects.
224. FERC-licensed dams scheduled for permit renewal within the next twenty years are included as forecast utility and municipal projects. The number of other types of future utility and municipal projects is forecast based on the location and frequency of past similar activities within the study area.

EXHIBIT 7-1. FORECAST NUMBERS OF TRANSPORTATION, UTILITIES, AND MUNICIPAL PROJECTS

TRANSPORTATION, UTILITIES AND MUNICIPAL ACTIVITIES IN AREAS PROPOSED FOR DESIGNATION				
UNIT	LANDOWNER TYPE	NUMBER OF FORECAST TRANSPORTATION PROJECTS	FERC LICENSED DAMS UP FOR RENEWAL (2006-2025)	FORECAST 404 & 401 PERMITTED UTILITY ACTIVITIES
Maine	Private Timber Lands	13	0	0
	Unknown Landowner	47	2	0
Subtotal		60	2	0
Minnesota	Superior National Forest	6	0	164
	Minnesota Dept. of Natural Resources	4	5	68
	Private Timber Lands	0	1	0
	Unknown Landowner	6	9	224
Subtotal		16	15	456
Northern Rockies	Montana Dept. of Natural Resources	0	0	4
	Montana Fish, Wildlife, and Parks	1	0	0
	Montana University System	0	0	16
	Private Timber Lands	0	0	4
	Conservation NGO	0	0	4
	Unknown Landowner	2	0	160
Subtotal		3	0	188
Total		79	17	644
TRANSPORTATION, UTILITIES AND MUNICIPAL ACTIVITIES IN AREAS CONSIDERED FOR EXCULSION				
Northern Rockies	Glacier National Park	1	0	28
Total		1	0	28
Forecast projects are rounded to the nearest whole number ; costs, however, are spread across subunits proportionate to the amount of existing road mileage therein.				

EXHIBIT 7-2. ESTIMATED IMPACTS TO TRANSPORTATION, UTILITIES, AND MUNICIPAL ACTIVITIES

TRANSPORTATION, UTILITIES AND MUNICIPAL ACTIVITIES IN AREAS PROPOSED FOR DESIGNATION											
UNIT	LANDOWNER TYPE	UNDISCOUNTED COSTS		PRESENT VALUE (7%)		PRESENT VALUE (3%)		ANNUALIZED COSTS (7%)		ANNUALIZED COSTS (3%)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Maine	Private Timber Lands	\$3,700,000	\$6,600,000	\$2,100,000	\$3,750,000	\$2,840,000	\$5,060,000	\$198,000	\$353,000	\$191,000	\$340,000
	Unknown Landowner	\$13,000,000	\$23,100,000	\$7,370,000	\$13,100,000	\$9,960,000	\$17,700,000	\$695,000	\$1,140,000	\$669,000	\$1,190,000
Subtotal		\$16,700,000	\$29,800,000	\$9,470,000	\$16,900,000	\$12,800,000	\$22,800,000	\$894,000	\$1,590,000	\$860,000	\$1,530,000
Minnesota	Superior National Forest	\$3,720,000	\$5,750,000	\$1,880,000	\$2,830,000	\$2,700,000	\$4,150,000	\$177,000	\$267,000	\$182,000	\$279,000
	Minnesota Dept. of Natural Resources	\$2,360,000	\$3,700,000	\$1,160,000	\$1,770,000	\$1,700,000	\$2,600,000	\$109,000	\$167,000	\$114,000	\$178,000
	Private Mining Lands	\$9,480	\$9,480	\$5,370	\$5,370	\$7,620	\$7,620	\$507	\$507	\$488	\$488
	Private Timber Lands	\$18,500	\$23,500	\$10,500	\$13,300	\$14,200	\$18,000	\$990	\$1,260	\$953	\$1,211
	Unknown Landowner	\$5,910,000	\$8,150,000	\$3,590,000	\$4,67,000	\$4,650,000	\$6,280,000	\$339,000	\$443,000	\$312,000	\$421,000
Subtotal		\$12,000,000	\$17,600,000	\$6,630,000	\$9,120,000	\$9,070,000	\$13,000,000	\$623,000	\$879,000	\$610,000	\$879,000
Northern Rockies	U.S. Fish and Wildlife Service	\$14,000	\$19,000	\$8,090	\$11,000	\$11,000	\$15,000	\$763	\$1,040	\$735	\$1,000
	U.S. Bureau of Land Management	\$10,000	\$13,000	\$13,800	\$7,840	\$7,760	\$10,600	\$576	\$740	\$521	\$712
	Montana Dept. of Natural Resources	\$118,000	\$162,000	\$66,700	\$91,700	\$90,200	\$124,000	\$6,300	\$8,660	\$6,060	\$8,340
	Montana Fish, Wildlife, and Parks	\$2,280,000	\$2,290,000	\$2,270,000	\$2,280,000	\$2,280,000	\$2,280,000	\$215,000	\$215,000	\$153,000	\$153,000
	Montana University System	\$221,000	\$306,000	\$126,000	\$174,000	\$170,000	\$235,000	\$11,900	\$16,400	\$11,400	\$15,800
	Private Timber Lands	\$61,000	\$84,000	\$34,600	\$47,800	\$47,000	\$64,600	\$3,260	\$4,510	\$3,140	\$4,340
	Conservation NGO	\$75,800	\$105,000	\$43,000	\$59,300	\$58,100	\$80,100	\$4,060	\$5,590	\$3,900	\$5,380
	Unknown Landowner	\$3,390,000	\$4,680,000	\$1,920,000	\$2,650,000	\$2,600,000	\$3,580,000	\$182,000	\$250,000	\$175,000	\$240,000
Subtotal		\$6,180,000	\$7,650,000	\$4,480,000	\$5,320,000	\$5,260,000	\$6,390,000	\$423,000	\$502,000	\$354,000	\$430,000
Total		\$34,900,000	\$55,10,000	\$20,600,000	\$31,500,000	\$27,100,000	\$42,300,000	\$1,940,000	\$2,980,000	\$1,820,000	\$2,840,000

UNIT	LANDOWNER TYPE	UNDISCOUNTED COSTS		PRESENT VALUE (7%)		PRESENT VALUE (3%)		ANNUALIZED COSTS (7%)		ANNUALIZED COSTS (3%)	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
TRANSPORTATION, UTILITIES AND MUNICIPAL ACTIVITIES IN AREAS CONSIDERED FOR EXCULSION											
Minnesota	Voyageurs National Park	\$80	\$80	\$45	\$45	\$61	\$61	\$4	\$4	\$4	\$4
	Tribal Lands	\$25,700	\$25,700	\$14,600	\$14,600	\$19,000	\$19,720	\$1,380	\$1,380	\$1,330	\$1,330
Subtotal		\$25,800	\$25,800	14,600	14,600	\$19,000	\$19,781	\$1,380	\$1,380	\$1,330	\$1,330
Northern Rockies	Glacier National Park	\$670,000	\$923,000	\$380,000	\$523,000	\$514,000	\$707,000	\$35,900	\$49,400	\$34,500	\$47,500
	BLM: Butte Resource Area	\$10,100	\$13,800	\$5,740	\$7,840	\$7,760	\$10,600	\$542	\$740	\$521	\$712
Subtotal		\$680,000	\$936,000	\$386,000	\$531,000	\$521,000	\$717,000	\$36,400	\$50,100	\$35,000	\$48,200
Total		\$706,000	\$962,000	\$400,000	\$545,000	\$541,000	\$737,000	\$37,800	\$51,500	\$36,400	\$49,600
<p>Note: Totals may not sum due to rounding. Refer to Appendix A for information regarding administrative costs associated with consultation on transportation, utility, and municipal activities.</p> <p>Forecast project numbers are rounded to the nearest whole number; costs, however, are spread across subunits proportionate to the amount of existing road mileage therein.</p>											

7.2 METHODS AND ASSUMPTIONS

225. To estimate lynx conservation costs associated with transportation and utility projects, this analysis applies five steps.

1. **Forecast the number of transportation and utility projects over the next twenty years.** Estimates of project numbers were based on a combination of: a) direct communication with FHWA, State DOTs, USCOE, FEMA, and FERC to identify the number and locations of planned projects,; and b) the frequency and location of past projects.
2. **Determine potential lynx conservation efforts associated with transportation and utility projects and associated costs.** This analysis assumes lynx conservation efforts outlined in the LCAS specific to transportation and utilities projects will be adopted. For transportation activities, these conservation efforts include remote monitoring, construction of habitat continuity measures (highway underpasses and overpasses), bridge lengthening, erecting attendant fencing, and development of maps and associated databases highlighting "key habitat linkages". For utility and municipal activities, conservation efforts include remote monitoring. Estimated costs of these conservation efforts are based on communication with affected agencies and are described in Exhibit 7-3. Of note, many of these conservation efforts were implemented for the benefit of multiple species, and not solely for the lynx.
3. **Estimate the probability of a future project incorporating the various lynx conservation efforts.** The probability of a project requiring the various lynx conservation efforts described in Exhibit 7-3 is based on the frequency of these conservation efforts being incorporated into past transportation projects that considered the lynx.
4. **Calculate costs per project.** Exhibit 7-4 describes the per project costs of transportation activities, calculated by multiplying the costs of conservation efforts by their probability of occurrence.
5. **Derive estimated impacts by subunit.** Subunit level impacts are estimated by multiplying the expected level of activity by per project costs.

EXHIBIT 7-3. LYNX CONSERVATION EFFORTS ASSOCIATED WITH TRANSPORTATION ACTIVITIES

CONSERVATION EFFORT		ESTIMATED COST
1	Erect wildlife crossing structures (highway underpass). ^{a, c, d}	\$112,000- \$219,000 (per project) ^{1,2}
2	Erect wildlife crossing structures (highway overpass). ^a	\$1.7- \$2.3 million (per project)
3	Erect attendant fencing (based on an average of 6 miles per project). ^{a, c, d}	\$165,000 (per project) ^{1,3}
4	Implement monitoring of wildlife crossings before, during, and after construction of the project and use findings to guide and adapt the design, maintenance, and potential modification of the crossing structures constructed during the project and in the future. ^{a, c}	\$52,000- \$74,000 (per project) ¹
5	Prepare monitoring plan that documents the number and type of dead and injured wildlife and develop program for evaluating levels of wildlife use at a subset of the existing interstate highway bridges and culverts. ^b	
6	One year after the completion of a three-year monitoring of wildlife use of the crossings, provide the Service with a comprehensive final report based on compilation of all data gathered during the monitoring effort. ^d	
7	Upon locating dead or injured lynx, notification must be made within 24 hours to Service field office. ^{a,b}	
8	Employ motion-detecting cameras or track boxes to help determine location and time of lynx crossing. ^c	\$13,000- \$18,000 (per project)
9	In coordination with the Service, maps and associated databases will be developed to illustrate important wildlife linkage zones, high priority conservation opportunities, highway segments that may be problematic for wildlife crossings, and opportunities for new crossings enhancements. ^b	\$1,000,000 (for each Unit over 20 years) ^{1,4}
10	Bridge Lengthening. ^c	\$83,000- \$277,000 (per bridge) ^{1,2,5}

Notes: Conservation efforts numbered 1 through 6 and 10 are implemented for the benefit of multiple species, and not solely for the the lynx.

Sources:

a U.S. Fish and Wildlife Service. Biological Opinion for proposed reconstruction of US Highway 93 in Missoula and Lake counties, Montana. October 19, 2001.

b U.S. Fish and Wildlife Service. Biological Opinion for ongoing effects of median barriers already installed along Interstate 90 east of Lookout Pass in Mineral County, Montana. March 29, 2004.

c U.S. Fish and Wildlife Service. Biological Opinion for proposed Trunk Highway 53 project located in St. Louis County, Minnesota. February 4, 2005.

d U.S. Fish and Wildlife Service. Biological Opinion for proposed upgrade of a segment of Trunk Highway 1 in Lake County, Minnesota. December 23, 2004.

1 Written communication with Pat Basting, Wildlife Biologist, MTDOT, March, 15, 2006

2 Written Communication with Mike Tardy, Assistant Engineer for Program Delivery, District 1, MNDOT, February 22, 2006.

3 This figure is based on the \$85,000 cost to erect attendant fencing for the Clearwater Junction North Project in Missoula, Montana. According to the 2006-2008 State Transportation Improvement Program, the project is 1.64 miles long.

4 MTDOT is integrating GIS technology in their species monitoring efforts over the next ten years. The effort could cost as much as \$500,000, however, it should be noted that this is a statewide effort rather than a per project effort. This analysis estimates that total costs related to GIS mapping will be \$1,000,000 over the next twenty years.

5 Assigned to project cost estimates where bridges are known to exist in the project area.

EXHIBIT 7-4. SUMMARY OF PER PROJECT COST ESTIMATES FOR TRANSPORTATION ACTIVITIES

CONSERVATION EFFORT	LOW COST	HIGH COST	PROBABILITY OF INCORPORATION*	PER PROJECT LOW (2006\$)	PER PROJECT HIGH (2006\$)
Wildlife Crossing (Overpass)	\$1.7 million	\$2.3 million	0.07	\$121,000	\$164,000
Wildlife Crossing (Underpass)	\$112,000	\$219,000	0.21	\$24,000	\$46,900
Attendant Fencing	\$312,000	\$312,000	0.07	\$66,800	\$66,800
Maps and Databases	\$250,000	\$250,000	0.85	\$53,500	\$53,500
Monitoring	\$57,000	\$74,000	0.78	\$12,200	\$15,900
Bridge Lengthening	\$83,000	\$277,000	0.71	\$17,700	\$59,300
Total	\$2.1 million	\$3 million		\$261,000	\$479,000
* Probability of incorporation based on review of 14 transportation projects that include lynx and wildlife conservation efforts.					

7.3 TRANSPORTATION ACTIVITIES

226. Transportation activities affecting lynx or its habitat include bridge construction, repair, or replacement, and road construction, repair, widening, or improvements. These activities reduce connectivity within the boreal forest landscape and increase the species' vulnerability to vehicle collision. Lynx are highly mobile and frequently cross roads during dispersal, exploratory movements, or travel within home ranges. Highway projects may also directly affect the amount of feeding and denning habitat for the species by converting natural forests into road surface, rights-of-ways, or associated facilities such as maintenance areas or gravel pits.¹⁶⁸
227. Approximately 235 miles of road falls within Unit 1, 705 miles in the Unit 2, and 204 miles in Unit 3. No major roads intersect with Unit 4.

7.3.1 PRE-DESIGNATION ECONOMIC IMPACTS TO TRANSPORTATION ACTIVITIES

228. The lynx consultation history includes nine biological opinions on transportation projects in Maine, Minnesota, Montana, and Washington States; none of these were within the study area. These consultations involved the Federal Highway Administration (FHWA), Minnesota Department of Transportation (MNDOT), and Washington State Department of Transportation (WADOT), and addressed the construction, expansion and repair of highways, bridges and rail projects.
229. In general, the Service has sought to monitor wildlife crossings along major roads and identify and implement a variety of conservation efforts for the lynx. Where projects are

¹⁶⁸ Ruediger (2000). Page 142.

known to occur in suitable lynx habitat, wildlife monitoring via tracking beds and remote cameras has been employed as well as the installation of infrastructure to promote habitat continuity (i.e. highway underpasses, overpasses, and culverts). In some areas, large GIS-based mapping efforts have been undertaken to prioritize the location of highway crossings to support habitat connectivity and reduce lynx mortality.

7.3.2 POST-DESIGNATION ECONOMIC IMPACTS TO TRANSPORTATION ACTIVITIES

230. Previous lynx conservation efforts have not resulted in constraints on size or location of past transportation projects as a result of lynx conservation and therefore no impacts on traffic congestion are estimated. This analysis assumes that post-designation transportation activities may experience impacts related to lynx conservation similar as described in Exhibit 7-3, but that these activities will not be precluded so as to impair regional mobility.

231. The following discussion characterizes expected levels of activity for transportation projects by unit.

Unit 1: Maine

232. The Maine Department of Transportation (MEDOT) has a total of nine upcoming projects within the boundaries of proposed critical habitat over the next three years.¹⁶⁹ Based on the estimated frequency of projects over the next three years, this analysis assumes that there will be 60 transportation projects within the Maine critical habitat unit over the next 20 years (nine projects every three years). These projects range from replacing a culvert or strut to completely rebuilding particular stretches of highway. Two projects fall within the Private Timber Lands subunit (both in the town of St. John) and seven projects fall within the Unknown Landowner subunit (three projects falling in Wallagrass, two in Allagash, one in Cross Lake, and another in Winterville). This analysis assumes that each forecast project will incorporate lynx conservation efforts as described in Exhibit 7-3 and fall within the same subunits of currently known projects. Therefore, over the next 20 years, this analysis assumes there will be 13 projects within Private Timber Lands and 47 projects within the Unknown Landowner subunit.

Unit 2: Minnesota

233. The FHWA and MNDOT will be reconstructing a segment of Trunk Highway 53, expanding it from two to four lanes. The proposed action may further fragment habitat and increase road hazards for lynx within the study area. MNDOT plans to modify the project such that two culverts will be changed to four bridge structures (\$1.5 million) and six bridges will be lengthened by 25 feet each (\$500,000).¹⁷⁰

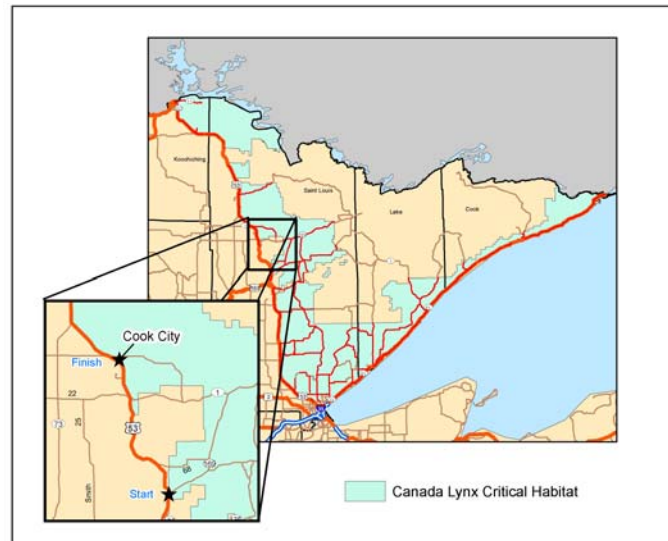
234. Although the project begins and ends within the study area, as highlighted in Exhibit 7-5, approximately half of the project falls outside of the study area boundaries. Therefore,

¹⁶⁹ Based on list of upcoming projects. Written correspondence from MEDOT, April 4, 2006; April 6, 2006.

¹⁷⁰ Written communication with Mike Tardy, Assistant Engineer for Program Delivery, District 1, Mn/DOT, received February 22, 2006.

this analysis only quantifies costs of conservation efforts for the portion of the project that falls within the study area.

EXHIBIT 7-5. MNDOT RECONSTRUCTION OF TRUNK HIGHWAY 53



235. The Northeast Minnesota Long Range Plan outlines MNDOT transportation projects from 2008 to 2030.¹⁷¹ Although these projects are ultimately limited by funding availability, MNDOT has planned a series of projects for Trunk Highway 61 and Trunk Highway 169, two major roads passing through the study area.
236. Trunk Highway 61 runs along the North Shore of Lake Superior from Duluth to the Canadian border at Grand Portage. Assuming full funding to meet MNDOT performance based measures by 2030, 15 separate projects are planned to increase safety along the Trunk Highway 61 corridor from Two Harbors to Grand Marais.¹⁷² These projects are broadly described as preventative safety measures that include road reconstruction to widen shoulders and "measures... to meet other Mn/DOT reconstruction design standards". MNDOT has also agreed to build segments of the Gitchi-Gami State Trail in their right-of-way when reconstructing adjacent road segments. This analysis assumes each of these 15 projects will be subject to a range of lynx conservation efforts.
237. MNDOT is also planning a reconstruction of Trunk Highway 169 from the north junction of Trunk Highway 53 to the west junction of Trunk Highway 1. Plans include shoulder

¹⁷¹ Published by the Minnesota Department of Transportation (District 1), Northeast Minnesota Area Transportation Partnership, and the Arrowhead Regional Development Commission, August, 2005.

¹⁷² Northeast Minnesota Long Range Transportation Plan (2008-2030), Minnesota Department of Transportation (District 1), Northeast Minnesota Area Transportation Partnership, and the Arrowhead Regional Development Commission, August, 2005.

widening and the construction of passing lanes.¹⁷³ This analysis also assumes this project will be subject to the range of lynx conservation efforts.

Unit 3: Northern Rocky Mountains

238. Of the three upcoming projects falling within the study area from 2006 to 2008, only one is expected to require species conservation efforts: the minor reconstruction of Clearwater Junction on Montana State Highway 83 just north of State Highway 200. The Montana Department of Transportation (MTDOT) will undertake the minor road reconstruction and incorporate one wildlife overpass and one wildlife underpass with associated fencing. These habitat continuity efforts service lynx, other threatened and endangered species like the Grizzly bear and Gray wolf, and other wildlife species including white-tailed deer, mule deer, elk, black bear, mountain lion, and coyote. The estimated costs for conservation efforts on the Clearwater Junction Project range from \$2.0 million to \$2.8 million. The estimated cost for the highway overpass is \$1.7 - \$2.3 million; the underpass, \$200,000 - \$300,000; attendant fencing, \$55,000 - \$85,000; and the jump-outs, \$25,000 - \$60,000.¹⁷⁴
239. This analysis assumes that two projects within the study area, the repaving of State Highway 200 in Lincoln County and minor reconstruction of State Highway 271, will not incorporate conservation efforts. The LCAS cites that the paving of gravel roads is of "special concern" as is often done to facilitate an increase in traffic and speed.¹⁷⁵ Because State Highway 200 is already paved, this analysis assumes the repaving project will not pose a net increase threat to the species or its habitat. The LCAS also states that daily traffic volumes of 2,000-3,000 can be "problematic" while over 4,000 vehicles or more per day is considered to have "serious impacts in terms of both mortality and habitat fragmentation".¹⁷⁶ The average daily traffic on State Highway 271 is less than 400 vehicles and is therefore also assumed not to pose a threat to the lynx or its habitat.¹⁷⁷
240. The Clearwater Junction project, to commence in 2007, is the only transportation project in Unit 3 expected to experience impacts of lynx conservation. As this is the only project forecast to represent a conservation threat to the lynx from 2000 to 2008, this analysis extrapolates that there may be three more projects undertaken by the MT DOT over the next twenty years. These three forecast projects are assumed to incorporate the conservation efforts described in Exhibit 7-2. As specific locations of potential future projects are unknown, this analysis distributes forecast impacts across subunits proportionally to the length of roads existing therein.

¹⁷³ Ibid.

¹⁷⁴ Ibid.

¹⁷⁵ LCAS. Pg. 89.

¹⁷⁶ LCAS. Pg. 31.

¹⁷⁷ The MTDOT has not planned lynx-related conservation measures on State Highway 271 because of low traffic volumes. Personal communication with Pat Basting, MDOT Biologist, March 31, 2006.

Unit 4: North Cascades

241. There are no transportation-related activities forecast in the North Cascades Unit over the next 20 years. Currently, State Highway 20 is the only major road near the boundaries of the study area. The Washington State Department of Transportation (WADOT) has stated that any work in this area would be limited to preserving existing assets on State Route 20 and it does not have any new highway development plans for the North Cascades area.¹⁷⁸ Therefore, this analysis assumes there will be no construction of new roads or bridges that would pass through proposed critical habitat.

7.4 UTILITY AND MUNICIPAL ACTIVITIES

242. Utility and municipal activities may constitute a conservation threat to the lynx by disrupting connectivity of lynx habitat. Utility corridors located adjacent to highways and railroads can further widen the right-of-way and increase the likelihood of impeding lynx movement.¹⁷⁹ Other municipal activities like dam construction and inundation (influenced by size, type, and surrounding land use) may also interrupt movement of the lynx.¹⁸⁰

7.4.1 PRE-DESIGNATION ECONOMIC IMPACTS TO UTILITY AND MUNICIPAL ACTIVITIES

243. Of the past ten section 7 consultations related to utility and municipal activities since the lynx listing in 2000, only one consultation has been formal. The formal consultation involved the Federal Energy Regulatory Commission (FERC) and Allele Inc. and addressed the renewal of an operating license for the Winton Hydroelectric Project in northern Minnesota. Part of the renewal application was a recreation plan for the attendant reservoir. The Service concluded that the recreation plan would not likely jeopardize the continued existence of the lynx and therefore did not require any project modification for the benefit of the species.¹⁸¹
244. The nine other informal consultations involved Federal Emergency Management Agency (FEMA), United States Army Corps of Engineers (USACE), and FERC and related to activities including substation construction, pipeline maintenance, and transmission line route construction.
245. None of these past projects resulted in the implementation of lynx conservation efforts. This analysis therefore includes the administrative costs of consultation only; these costs are described in Appendix A.

¹⁷⁸ Written communication with Pat Morin, Systems Analysis and Priority Programming Manager, Washington State Department of Transportation, March 27, 2006.

¹⁷⁹ LCAS Pg. 32.

¹⁸⁰ Ibid., Pg. 28.

¹⁸¹ Winton Hydroelectric FERC Project No. 473 Public Recreation, Safety and Human Health Plan. Allele, Inc. (d.b.a. Minnesota Power, March 29, 2005; Personal communication with Susan Rogers, U.S. Fish and Wildlife, Endangered Species Coordinator, March 31, 2006.

7.4.2 POST-DESIGNATION ECONOMIC IMPACTS TO UTILITY AND MUNICIPAL ACTIVITIES

246. Past utility and municipal activities have not been burdened with lynx conservation efforts. This analysis assumes that the LCAS is the best available science to indicate the types of lynx conservation efforts that may be incorporated in future projects. The LCAS, however, does not provide specific conservation efforts for these types of projects but lists the following guidelines:
- If activities are proposed in lynx habitat, develop stipulations for limitations on the timing of activities and surface use and occupancy at the leasing stage; and
 - Minimize snow compaction when authorizing and monitoring developments.
 - Encourage remote monitoring of sites that are located in lynx habitat, so that they do not have to be visited daily.¹⁸²
247. Accordingly, this analysis assumes forecast utilities and municipal projects will incur costs associated with remote monitoring. Per-project remote monitoring costs are based on those incurred by a past transportation project.¹⁸³ The estimated range of this conservation effort, \$13,000 and \$18,000, is applied to all forecast utility and municipal projects described below.

Utility and Municipal Projects

248. Utility projects that may occur within the study area include FEMA-funded projects and other large projects which would require a Clean Water Act 401 or 404 permit from the U.S. Army Corps of Engineers (USACE).
249. FEMA offices and their state counterparts in Maine, Minnesota, Montana, and Washington have indicated that there are no known upcoming FEMA-funded projects within the study area.¹⁸⁴ In the event of a natural disaster occurrence within the boundaries of the study area, it is possible that FEMA-funded projects will consider lynx conservation. Only two FEMA-related projects have occurred within study area since 2000, and neither incorporated project modifications following consultation regarding the lynx. Absent information on how often natural disasters may occur within the study area, this analysis assumes that they may occur with the same frequency as the recent past. This analysis therefore estimates there will be eight FEMA projects over the next 20 years within Unit 2: Minnesota. This analysis only includes the administrative costs of considering FEMA projects as described in Appendix A because: a) the nature of these projects are relatively unknown; b) past FEMA projects have not resulted in lynx conservation efforts; and c) the LCAS does not specifically address lynx conservation in the context of such projects.

¹⁸² LCAS, pg 7-12.

¹⁸³ Costs specific to remote monitoring provided by MDOT on March 13, 2006.

¹⁸⁴ Written communication with Arthur Cleaves, Director of the Maine Emergency Management Agency, February 2, 2006; Written communication with Monique Lay, Earthquake Program Manager at the Montana Disaster and Emergency Services Division, February 24, 2006; Written communication with Mark Eberlein, Region X Regional Environmental Officer, May 3, 2006.

250. Approximately 161 permitted utility and municipal projects occurred from 2000 to 2005 in the study area. Of these, five projects triggered informal consultation. This analysis assumes that all future 401 and 404 permitted projects will consider lynx conservation. Absent specific information regarding the nature of future utility and municipal projects, this analysis assumes that they may occur with the same frequency and in the same relative location (defined by subunit) as in recent years. Based on 2000-2005 estimates, this results in a projected 644 USACE-permitted projects occurring within the study area over the next twenty years; 456 in Unit 2 and 188 in Unit 3.

Dams

251. Dam construction and inundation is considered to be a movement barrier for lynx and can directly fragment habitat.¹⁸⁵ In addition, an increase in water-based recreation and associated lakeshore development along reservoirs can interrupt large, isolated tracts of habitat, reduce habitat quality for snowshoe hare, and increase the potential for lynx/human interaction.¹⁸⁶ There are a number of FERC licensed dams coming up for relicensing over the next 20 years within the study area. As the operating licenses for these dams come up for renewal, changes in the operation of the dam, altering the amount of inundated acreage, downstream flows, or development of recreation plans, could alter lynx habitat.
252. According to the National Inventory of Dams database, maintained by the USACE, there are 16 dams up for their FERC license renewal within the study area in the next 20 years; 14 in Minnesota and two in Maine.¹⁸⁷ All 14 hydroelectric dams in Minnesota are owned by the Allete Inc., a parent company of Minnesota Power, and will be due for license renewal in 2025. Because these dams are comparable to the Winton Hydroelectric Project (also owned by Allete Inc.) in size and storage capacity, this analysis assumes that each of the 14 dams in Unit 2, and the Brassua and Squa Pan dams in Maine, will consider lynx conservation at the time of relicensing. This analysis applies the costs of remote monitoring (\$13,000 to \$18,000) to each dam project in 2025.

¹⁸⁵ Ruediger (2000), page 28.

¹⁸⁶ Ruediger (2000), page 40.

¹⁸⁷ Expiration dates for FERC-licensed dams provided by Alan Mitchnick, Senior Technical Expert, Federal Energy Regulatory Commission, received March 6, 2006.

SECTION 8 | MINING OPERATIONS

253. This section describes the economic impacts to mining activities in the study area. This section is divided into five parts: 1) a summary of impacts to the mining industry related to lynx conservation; 2) a description of methods and assumptions applied in the analysis; 3) an overview of the economic importance of the mining industry in those states containing the study area, including locations of existing and potential future mines; 4) a discussion of pre-designation economic impacts; and 5) detailed discussion of mining operations that may be affected by critical habitat for the lynx.
254. Cleared lands do not contain the primary constituent elements of lynx habitat as defined in the Proposed Rule.¹⁸⁸ Existing surface mines are therefore not included in the study area; thus, this analysis focuses on expansions of existing mines and development of new mines.

8.1 SUMMARY OF POTENTIAL IMPACTS TO MINING ACTIVITIES

255. Forecast impacts to mining activities from 2006 to 2025 include:

Post designation impacts in areas proposed for designation

- Undiscounted: \$430,000
- Present value applying a seven percent discount rate: \$403,000 (annualized \$38,000)
- Present value applying a three percent discount rate: \$418,000 (annualized \$28,100)

256. Exhibit 8-1 presents a summary of pre- and post-designation economic impacts to mining activities related to lynx conservation. Except for the administrative costs of consultation, no mining projects outside of Minnesota have historically been impacted by lynx conservation. Total pre-designation costs of lynx conservation efforts are estimated to have ranged from \$85,000 to \$140,000 for winter track surveys at the planned NorthMet Mine in Unit 2.
257. Minimizing surface disturbance and conducting lynx monitoring and research are identified as the primary conservation needs of the lynx related to mining activities. Future surface mining expansion and development projects have only been identified within Unit 2; specifically, three new or expanded mining projects are forecast to occur

¹⁸⁸ U.S. Fish and Wildlife Service, Proposed Designation of Critical Habitat for the Contiguous United State Distinct Population Segment of the Canada Lynx, 70 FR 68294, November 9, 2005.

on leased lands of Superior National Forest in Unit 2. This analysis quantifies post-designation impacts of lynx conservation to these mining projects as described in Exhibit 8-1.

258. While no other future mining developments or expansions were identified in other units, this analysis characterizes the current mining industry in these geographic areas. Specifically, the study area includes sand and gravel mining operations (450 identified in Unit 2, five in Unit 1, and one in Unit 3). These existing operations are not included in the proposed critical habitat according to the Proposed Rule as they lack the primary constituent elements to support the lynx. These sites disturb a relatively small surface area, zero to 50 acres, and are more readily reclaimed than large-scale open pit mines.¹⁸⁹ Additionally, these types of mines are not specifically identified in the Proposed Rule or the LCAS as a threat, and therefore no guidance is provided regarding how lynx conservation may be incorporated. While past consultations have occurred on sand and gravel mining activities, they did not result in any conservation efforts for the species. This analysis therefore includes information on the sand and gravel mining industry across the study area, but does not quantify impacts to the industry.
259. The primary uncertainty in this analysis stems from the limited information on the types of conservation efforts the Service may recommend or other conservation actions that may be undertaken following designation. Conservation efforts such as surveys, monitoring, and re-siting stockpiles to minimize surface disturbance are quantified in this analysis as described in Exhibit 8-1.

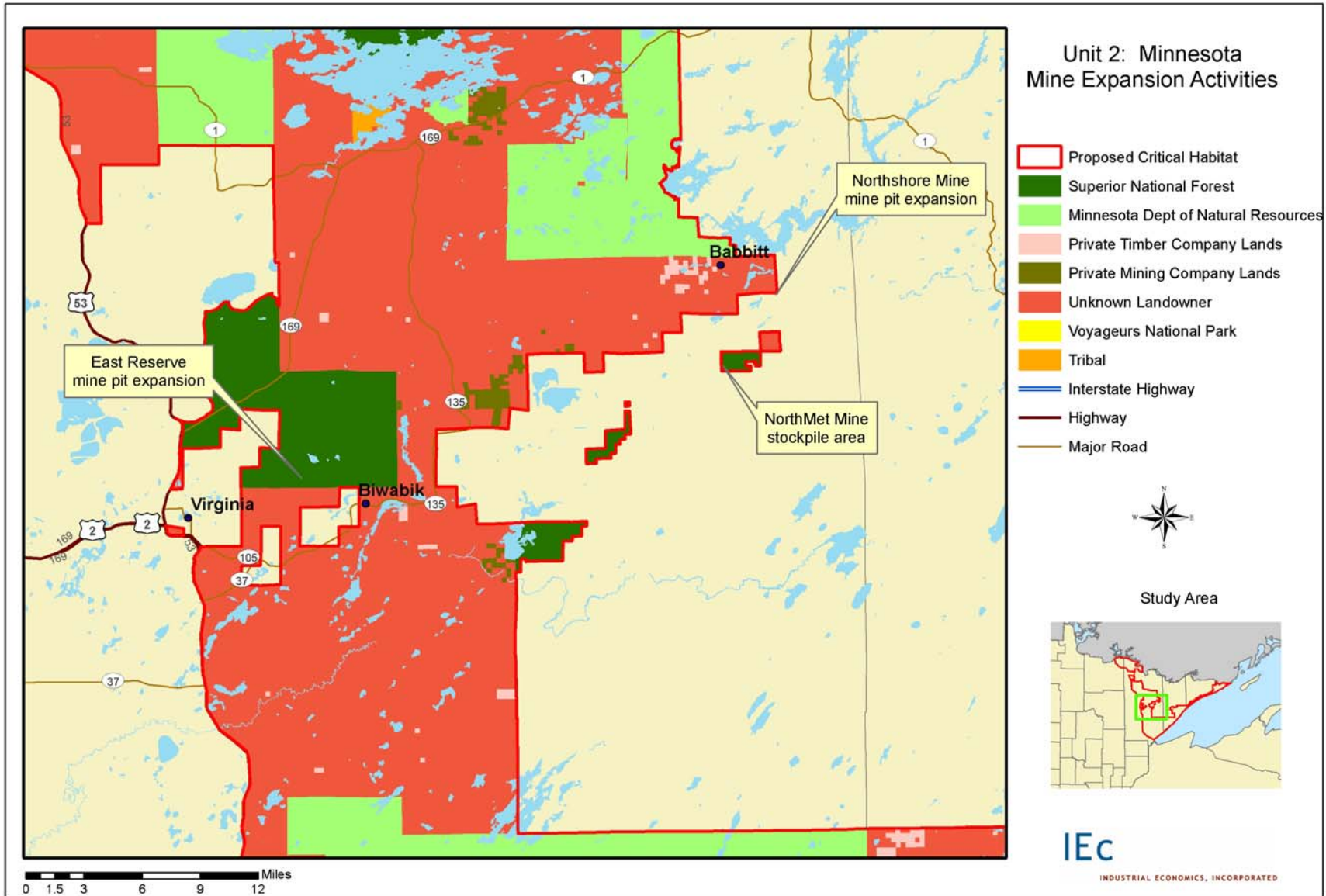
EXHIBIT 8-1. SUMMARY OF POST-DESIGNATION IMPACTS TO MINING ACTIVITIES

PROJECT*	POST-DESIGNATION IMPACTS				
	UNDISCOUNTED	PRESENT VALUE (7%)	PRESENT VALUE (3%)	ANNUALIZED (7%)	ANNUALIZED (3%)
NorthMet Mine	\$40,000	\$37,400	\$38,800	\$3,530	\$2,610
East Reserve Mine	\$375,000	\$350,000	\$364,000	\$33,100	\$24,500
Habitat Fragmentation Study (for multiple mining projects)	\$15,000	\$15,000	\$15,000	\$1,400	\$1,000
Total	\$430,000	\$403,000	\$418,000	\$38,000	\$28,100
Note: Impacts summarized in this table do not include the value of forecast new mining pits, but represent the impacts of lynx conservation efforts associated with these projects.					
* All projects are located in the Superior National Forest subunit of critical habitat Unit 2.					

¹⁸⁹ Personal communication with Ryan Harris, MT DEQ Energy Minerals Bureau, Reclamation Specialist, February 28, 2006 and with Mark Stebbins, Maine DEP Pit and Quarry Coordinator, March 6, 2006.

260. Two of the three forecast projects in Minnesota involve expansions of mine pits into the study area. The LCAS does not describe how pit mining operations may be modified for the benefit of the lynx or offer information on a threshold level of surface disturbance that may introduce a conservation threat for the lynx. As a result, this analysis is unable to determine whether impacts outside of the direct costs of lynx conservation efforts described in Exhibit 8-1 are likely, or to define the expected magnitude of these impacts should they occur. To allow for an understanding of the economic activities that could be at risk if modifications to these projects are required, this analysis provides data on the location of mining activities, as well as on the economic value of these operations. Specifically, these two future pits, East Reserve Mine and Northshore Mine, are located in the Superior National Forest subunit; the estimated values of these mines to the mining companies are \$819 million and \$45 million respectively.

EXHIBIT 8-2. MINES LOCATED IN UNIT 2



8.2 METHODS AND ASSUMPTIONS

261. The LCAS and Proposed Rule identify mining activities as a potential threat to the lynx and its habitat. The LCAS states: "(m)ining may directly impact habitat and can promote recreational activities into certain areas, possibly influencing the distribution of lynx and other predators."¹⁹⁰ Mines create a surface footprint through open pits, stockpiles, tailings basins, or access roads. Existing surface mines that fall into this category are, however, not proposed critical habitat and are not included in this analysis.
262. This analysis focuses on expansions of existing mines and developments of new mines as mining activities that may be impacted by lynx conservation in the future.
263. Because mining activities have not been impacted by lynx conservation in the past, this analysis uses the LCAS as the best available information regarding how mining activities may be modified for the benefit of the lynx and its habitat. In cases where mine expansions are planned, the LCAS stipulates consideration of lynx conservation:
- If activities are proposed in lynx habitat, develop stipulations for limitations on the timing of activities and surface use and occupancy at the leasing stage.
 - Minimize snow compaction when authorizing and monitoring developments. Encourage remote monitoring of sites that are located in lynx habitat, so that they do not have to be visited daily.
 - Develop a reclamation plan (e.g., road reclamation and vegetation rehabilitation) for abandoned well sites and closed mines to restore suitable habitat for lynx.
 - Close newly constructed roads (built to access mines or leases) in lynx habitat to public access during project activities. Upon project completion, reclaim or obliterate these roads.¹⁹¹
264. The limited consultation history and general nature of these conservation recommendations makes it difficult to determine with precision the project modifications that may be undertaken at mine sites for the benefit of the lynx. As a result, this analysis considers the four types of conservation guidelines described in the LCAS as follows:
- **Develop stipulations for limiting timing of activities and surface use.** This analysis identifies portions of mining operations that may be relocated outside of critical habitat to minimize surface disturbance, such as stockpiles, and quantifies the costs of land acquisition to relocate these sites. The mining pits themselves are not movable, however, as they must occur where the iron ore deposits exist. This analysis therefore provides information on the value of the deposits that are planned for extraction for context; the full value of the projects is not assumed to be lost and is therefore not included in the total estimated impacts.
 - **Species monitoring of project sites.** This analysis quantifies species and habitat studies associated with the mining projects within the study area.

¹⁹⁰ Ruediger, Bill, et al. 2000, p. 28.

¹⁹¹ *Ibid*, p. 86.

- **Reclamation of abandoned mines.** Since before the listing of the lynx, regulations have existed in each state containing proposed critical habitat that mandate the reclamation of mine sites post-production.¹⁹² Absent information about how reclamation of these sites may be changed for the benefit of the lynx, this analysis does not assume reclamation activities will be impacted by lynx conservation.
- **Closing mining roads to the public.** None of the mine projects within the study area allow for public access. This LCAS conservation recommendation is therefore not expected to impact mining projects.

265. The locations of mine and mineral deposits relative to the study area were identified using geographic data from multiple sources: the USGS Mineral Resources Data System (MRDS),¹⁹³ state geographic data, and communications with state geologists. State geologists noted that the MRDS was outdated in each state and did not accurately characterize the locations of mines and deposits. Additional state-specific data were therefore consulted to identify mining operations across the study area.

8.3 ECONOMIC PROFILE OF POTENTIALLY AFFECTED MINING INDUSTRIES

266. Active mines exist in Units 1, 2, and 3. Small scale stone quarries and gravel pits are the predominant mining activity across the study area, with the exception of large, open pit metal mines in Minnesota.

8.3.1 UNIT 1: MAINE

267. All active mining operations in the study area are small-scale crushed stone quarries and sand and gravel pits. Currently, approximately 40 sand and gravel pits and two stone quarries are actively operating within the study area.¹⁹⁴ Gravel pits are 25 acres, on average, while the typical size of a quarry is 10-15 acres.¹⁹⁵ Most sites are on private, dry land that has been cleared expressly for the intent of mining operations.¹⁹⁶ Approximately 20 to 25 new gravel pits open each year in Maine, along with roughly five new quarries. The estimated value of Maine's construction sand and gravel and crushed

¹⁹² The following regulations govern mine reclamation in the four units in this analysis: Maine Statutes Title 38 Ch 3 § 490, accessed at <http://janus.state.me.us/legis/statutes/38/title38sec490.html>; Minnesota Rule 6130.36, accessed at <http://www.revisor.leg.state.mn.us/arule/6130/3600.html>; Montana Code Annotated 2005 Title 82 Ch 4 Reclamation, accessed at http://data.opi.state.mt.us/bills/mca_toc/82_4_3.htm; and Revised Code of Washington , Title 78 Ch 4 § 091 Surface Mining, accessed at <http://apps.leg.wa.gov/RCW/default.aspx?cite=78.44.091>.

¹⁹³ U.S. Geological Survey, 2005, Mineral Resources Data System, 2006. This database contains the information previously provided in the Mineral Resource Data System of USGS and the Mineral Availability System/Mineral Industry Locator System (MAS/MILS) of the U.S. Bureau of Mines, which is now part of USGS.

¹⁹⁴ Mining permit data provided by Maine Geological Survey and Maine Department of Environmental Protection.

¹⁹⁵ Personal communication with Mark Stebbins, Maine DEP Pit and Quarry Coordinator, March 6, 2006.

¹⁹⁶ *Ibid.*

stone production was approximately \$65 million in 2003.¹⁹⁷ The majority of new mining activity takes place in southern Maine outside of the study area.

8.3.2 UNIT 2: MINNESOTA

268. The estimated value of Minnesota's non-fuel mineral production in 2003 was \$1.23 billion, which ranked 11th in the United States.¹⁹⁸ Iron ore pellet production makes up the majority, 79 percent, of this production. The state ranks first as the producer of iron ore, accounting for 78 percent of the total domestic iron ore shipment in 2003.¹⁹⁹ Minnesota's iron ore mining industry primarily extracts taconite, a low-grade iron ore, which is processed into taconite pellets for steel production.²⁰⁰ All current taconite mining and exploration in the state occurs in the Mesabi Range, which extends in a narrow band, approximately 90 miles across from Grand Rapids in Itasca County to Babbitt in St. Louis County. Approximately one-third of the Mesabi Range, at the eastern end, is located either within or adjacent to the study area in Unit 2.
269. The six existing taconite producing mines in Minnesota employed 3,130 workers and produced 41.3 million tons of usable crude ore in 2004.²⁰¹ Taconite mines contribute approximately \$100 million annually in state tax revenue.²⁰²
270. Two taconite mines currently operate on lands that partially overlap with the study area in Superior National Forest in Unit 2: the Laurentian Mine, operated by Mittal Steel; and the Northshore Mine, operated by Northshore Mining Company, a subsidiary of Cleveland Cliffs. These mines had a production capacity in 2004 of 2.8 and 4.7 million metric tons, respectively, representing 6.8 and 11.4 percent of the taconite industry in the state.²⁰³ The production value of the Laurentian and Northshore operations in 2004 was \$106 million and \$178 million, respectively.²⁰⁴
271. The iron ore industry in Minnesota has been strong in recent years. As highlighted in Exhibit 8-3, the price per metric ton of iron ore has risen sharply since 2001, driven by the increased global demand for construction steel.²⁰⁵ Sustained demand and the

¹⁹⁷ Maine Geological Survey/U.S. Geological Survey, "The Mineral Industry of Maine," U.S. Geological Survey Minerals Yearbook, 2003, minerals.usgs.gov/minerals/pubs/state/me.html.

¹⁹⁸ Minnesota DNR Division of Lands and Minerals/U.S. Geological Survey, "The Mineral Industry of Minnesota," U.S. Geological Survey Minerals Yearbook, 2003, minerals.usgs.gov/minerals/pubs/state/mn.html.

¹⁹⁹ *Ibid.*

²⁰⁰ Minnesota DNR website, accessed at <http://www.dnr.state.mn.us/education/geology/digging/taconite.html>.

²⁰¹ Jorgenson, John. U.S. Geological Survey Mineral Commodity Summary: Iron Ore, 2004. http://minerals.usgs.gov/minerals/pubs/commodity/iron_ore.

²⁰² Personal communication with Dennis Martin, Senior Geologist, MNDNR Division of Lands and Minerals between February 17 and April 6, 2006.

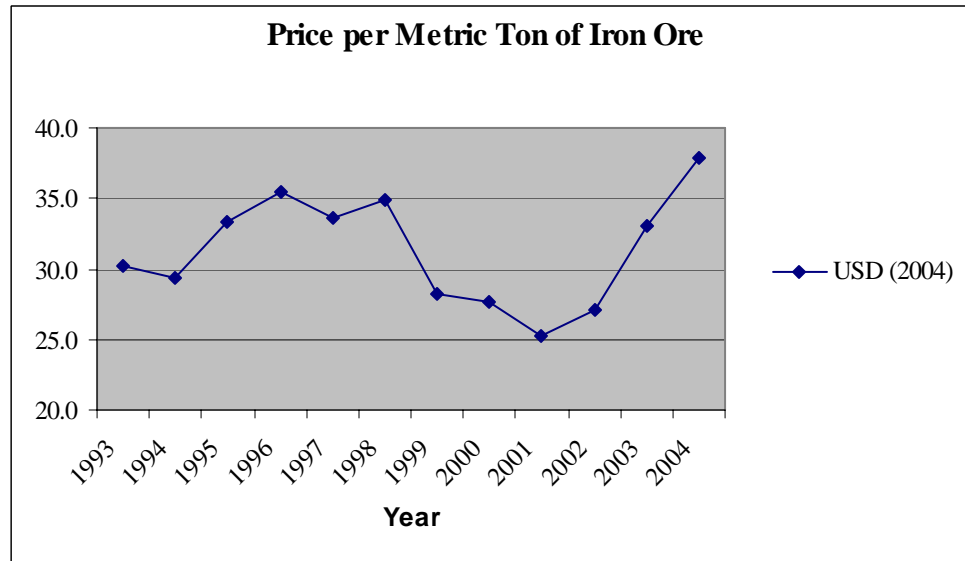
²⁰³ Iron Mining Association of Minnesota. Production capacity information, http://www.taconite.org/who_we_are/producing.html, February 22, 2006.

²⁰⁴ Production values calculated by multiplying 2004 company production capacity times 2004 commodity price of iron ore.

²⁰⁵ Jorgenson, John. U.S. Geological Survey Mineral Commodity Summary: Iron Ore, 2004. http://minerals.usgs.gov/minerals/pubs/commodity/iron_ore.

development of new steel production plants in the Great Lakes area that utilize innovative processing technology are expected to lead to an expansion in the domestic taconite mining industry.²⁰⁶

EXHIBIT 8-3. HISTORICAL PRICE OF IRON ORE IN MINNESOTA²⁰⁷



272. Additionally, small scale mining operations exist in Unit 2. Sand and gravel pits and crushed stone operations are actively producing in the study area.²⁰⁸ One peat operation is currently active. The State leases approximately 11,750 acres within the study area for mineral development, however, no mines are currently active or expected on State lands during the time period of this analysis.²⁰⁹

8.3.3 UNIT 3: NORTHERN ROCKY MOUNTAINS

273. All active mining operations in the potential lynx critical habitat area in Unit 3 are small-scale crushed stone quarries, sand and gravel pits, or placer mines operating on private lands.²¹⁰ Many of these operations qualify as "small mines" according to the Small Miners Exclusion Provision of the Metal Mines Reclamation Act. Plum Creek Timber Company is the largest quarry permittee in the study area, holding several permits for stone quarries on company lands in the Kalispell area that it leases to smaller operators.²¹¹

²⁰⁶ *Ibid.*

²⁰⁷ Jorgenson, John. U.S. Geological Survey Mineral Commodity Summary: Iron Ore, 2004. http://minerals.usgs.gov/minerals/pubs/commodity/iron_ore. Prices inflated using 2004 Consumer Price Index.

²⁰⁸ Personal communication with Dennis Martin, Senior Geologist, MNDNR Division of Lands and Minerals between February 17 and April 6, 2006.

²⁰⁹ Geographic data on active state minerals leases provided by Minnesota DNR, Division of Lands and Minerals, updated in March 2006.

²¹⁰ Personal communication with Ryan Harris, MT DEQ Energy Minerals Bureau, Reclamation Specialist, February 28, 2006.

²¹¹ *Ibid.*

One of these is for a roughly 50 acre site, while the rest are considerably smaller. Several small quarries operate in the southern portion of the study area.²¹²

274. The estimated value of Montana's non-fuel mineral production in 2003 was \$492 million, which ranked 26th in the U.S.²¹³ The last mine permit in the state for a major metals mine was issued in 1989.²¹⁴

8.3.4 UNIT 4: NORTH CASCADES

275. No active mining operations were identified within Unit 4.

8.4 PRE-DESIGNATION ECONOMIC IMPACTS ON MINING ACTIVITIES

276. Since the listing of the lynx in 2000, the Service has conducted four formal and nine informal consultations regarding mining projects in states containing proposed critical habitat that considered the lynx. Minnesota had the most consultations (nine), followed by Washington (three), and Montana (one).
277. Only one consultation resulted in conservation efforts for the lynx, an informal consultation concerning the NorthMet Mine near Babbitt in 2005. The NorthMet project is planned by the PolyMet Mining Corporation. The planned development of open pit mines producing primarily copper and nickel will take place on 3,000 acres, including 1,100 acres of wetlands and waters, and would be completed over 20 years. As a result of consultation, the Service recommended that PolyMet conduct a study of species' population density in this area. PolyMet conducted a track survey in the winter of 2005-2006 at a cost of \$70,000 (2005 dollars).²¹⁵ Additionally, PolyMet conducted a lynx survey previous to the NorthMet project in winter 2000, at an estimated present value cost between \$15,000 and \$70,000 (2000 dollars).²¹⁶

8.5 POST-DESIGNATION ECONOMIC IMPACTS ON MINING ACTIVITIES

278. This analysis is principally concerned with the planned expansions and new developments of mining operations in the study area. How development of mine pits could be modified to be conservative of the lynx is uncertain, as relocation is not a viable alternative. Absent information on project modifications, this analysis reports the full

²¹² *Ibid.*

²¹³ Minnesota DNR Division of Lands and Minerals/U.S. Geological Survey, "The Mineral Industry of Minnesota," U.S. Geological Survey Minerals Yearbook, 2003, minerals.usgs.gov/minerals/pubs/state/mn.html.

²¹⁴ Personal communication with Robin McCulloch, Associate Research Engineer, Montana Bureau of Mines and Geology, February 14, 2006.

²¹⁵ Personal communication with Jim Scott, Assistant Project Manager, PolyMet Mining Corp. between March 7 and March 16, 2006.

²¹⁶ PolyMet Assistant Project Manager Jim Scott was unable to cite costs for the winter track survey conducted in 2000. Therefore, this analysis bases a low end cost estimate on the cost of the planned habitat fragmentation survey, per information provided by John Ahlness, District Engineer, USACE Regulatory Branch in St. Paul, Minnesota between March 1 and 2, 2006. The high end estimate is the cost of the track survey PolyMet conducted in 2005-2006.

value of these mining expansions.²¹⁷ These projects occur on leased lands within Superior National Forest in Unit 2.

8.5.1 UNIT 1: MAINE

279. Currently no metal mines are active in Unit 1. The greatest mineral potential in Unit 1 are the gold deposits found near Bald Mountain in Aroostook County west of Caribou. Blackhawk, a Toronto-based mining company, leased Bald Mountain for exploratory purposes and applied for a mining permit in the late 1990s. Due to a decline in the price of gold, Blackhawk withdrew its permit application.²¹⁸ No other mining company has explored development of this site in the past five to six years.

8.5.2 UNIT 2: MINNESOTA

280. Three mining companies in Unit 2 have projects planned within the study area for the lynx: PolyMet Mining Corp., Northshore Mining Company, and Mittal Steel. The planned projects are relatively shallow open pit mines.

Potential Impacts to NorthMet Mine

281. NorthMet Mine, which is being developed for copper and nickel extraction, is not currently operational. PolyMet Mining Corp. expects the permitting process to be completed by mid to late 2007, with a projected mine opening date in late 2008.²¹⁹ The mine site is located almost entirely between two non-contiguous areas of proposed critical habitat. Approximately 40 acres within proposed critical habitat is planned as a stockpile site.²²⁰ Additionally, PolyMet plans to widen an existing haul road to a width of 200 feet.²²¹ A small section of this road, approximately one mile in length, passes through proposed critical habitat. Whether this road widening will require lynx conservation efforts is uncertain as plan details are not available. The planned mining expansion area is located within the Superior National Forest subunit of the study area.
282. To relocate the stockpile site, PolyMet would be forced to acquire equivalent acreage outside of the study area, at an estimated cost of \$1,000 per acre.²²² This analysis assumes that this land acquisition cost would be borne in 2007, the year prior to the opening of NorthMet Mine.

Northshore Mine

283. Northshore Mining Company is in the process of obtaining a permit from the U.S. Army Corps of Engineers (USACE) to expand an existing taconite mine pit by filling a 20 acre

²¹⁷ Expansion values based on figures provided by the mining companies. Information to independently verify these values is unavailable.

²¹⁸ Personal communication with Robert Marvinney, Director and Senior Geologist, Maine Geological Survey, March 3, 2006.

²¹⁹ Personal communication with Jim Scott, Assistant Project Manager, PolyMet Mining Corp. between March 7 and March 16, 2006.

²²⁰ *Ibid.*

²²¹ *Ibid.*

²²² *Ibid.*

wetlands area.²²³ Based on the current dollar value for taconite pellets, the expected return of the project to Northshore is estimated at \$2.25 million per acre.²²⁴ The value to Northshore of extracting taconite from the 20 acre portion of the mine pit in the study area is therefore \$45 million.

Potential Impacts to East Reserve

284. Mittal Steel plans to develop the East Reserve taconite deposit, located adjacent to the currently active Laurentian Mine within the Minorca Mine complex. The East Reserve is located almost entirely within the study area in the Superior National Forest subunit. Mittal Steel owns and leases portions of the planned expansion area.²²⁵ The Manager of Safety and Environment stated that if Mittal does not carry out this expansion, the Laurentian Mine will shut down in five to six years.²²⁶ If the project receives approval, the East Reserve Mine will be able to produce for 20 years and the Laurentian Mine for another nine to ten years.
285. The East Reserve site consists of planned mine pits, haul roads, and stockpiles. This analysis quantifies the cost to Mittal Steel of relocating the stockpiles to a site outside of the study area to minimize surface disturbance. The planned footprint of the stockpiles is 375 acres.²²⁷ To relocate the stockpile site, Mittal would need to acquire equivalent acreage outside of the study area, at an estimated cost of \$1,000 per acre.²²⁸ This analysis assumes that this land acquisition cost would be borne in 2007, the year in which the East Reserve is planned to begin production.
286. The planned footprint of mining pits at the East Reserve site is 364 acres.²²⁹ Assuming the value of the taconite deposit at the East Reserve site is comparable to the taconite deposit at the Northshore site, the value of the 364 acre mine is expected to be approximately \$819 million (\$2.25 million per acre). Communication with Northshore indicates that if the deposits were not developed, it would cost Mittal Steel \$60 per metric ton to import taconite pellets for their steel production operations.²³⁰ The production capacity of the East Reserve is estimated to be 48.4 million metric tons.²³¹

²²³ Personal communication with Dave Skolaskinski, District Manager on Environmental Affairs and Mark Buckley, Area Manager of Technical Services, of Northshore Mining Company between March 6 and April 5, 2006.

²²⁴ *Ibid.*

²²⁵ Personal communication with Gus Josephson, Manager of Safety and Environment, Mittal Steel, March 7, 2006.

²²⁶ *Ibid.*

²²⁷ Ispat Inland East Reserve Scoping Environmental Assessment Worksheet, May 2005, p. 5.

http://files.dnr.state.mn.us/input/environmentalreview/eastreserve/scoping_eaw.pdf

²²⁸ Personal communication with Jim Scott, Assistant Project Manager, PolyMet Mining Corp. between March 7 and March 16, 2006.

²²⁹ Personal communication with Gus Josephson, Manager of Safety and Environment, Mittal Steel, March 7, 2006.

²³⁰ Personal communication with Jim Scott, Assistant Project Manager, PolyMet Mining Corp. between March 7 and March 16, 2006.

²³¹ Production planning estimates provided by Jim Scott, Assistant Project Manager of PolyMet Mining Corp., assuming a 20 year lifespan of the East Reserve Mine.

Habitat Fragmentation Study

287. Three mining companies with mine sites in the Mesabi Range plan to contribute funds to a wildlife habitat fragmentation and wildlife migration corridor cumulative impact assessment in 2006. The \$15,000 cost of the study will be equally shared by PolyMet Mining Company, Mittal Steel and Minnesota Steel.²³²

Other Mining Projects

288. Two processing plants plan to begin operations near the town of Biwabik on lands adjacent to the study area. These are operated by Mesabi Nugget, which plans to develop the world's first commercial iron nugget plant, and by PolyMet Mining, which acquired portions of the former Cliffs Erie ore processing facilities.²³³ The land footprint of these plant sites does not overlap the study area. Mesabi Nugget, which has fully obtained permits for the facility and begun the construction process, has no current plans to expand the site beyond the planned footprint.²³⁴ PolyMet has no plans to expand the footprint of the existing Cliffs Erie plant site over the next twenty years.²³⁵
289. Northshore Mining Company pumps tailings from its processing plant in Silver Bay to Mile Post 7 Tailings Basin. This basin, which has a current footprint of between three and four square miles, is located entirely within the study area.²³⁶ The basin is expanding in a continuous and linear manner into the surrounding forested hillsides. The tailings basin was studied in the EIS published in 1977 and Northshore holds a permit for the full expansion of the site. The footprint of the basin will increase by approximately one square mile over the next 50 to 70 years. Future wetlands permitting is not likely for another 25 years. In the absence of this facility, tailings would most likely need to be pumped to South Dakota, the cost of which would be prohibitive.²³⁷
290. United Taconite, like Northshore Mining Company, is also a subsidiary of Cleveland Cliffs operating on lands near the study area. United Taconite has long range plans to develop an ore deposit southeast of the town of Virginia within the study area in an area bounded by Highway 53 to the west, Highway 105 to the north, and Highway 37 to the south. This site has already experienced development pressures and so is unlikely to contain the PCEs for lynx.²³⁸ Additionally, the time frame and specific plans for this project are unknown.

²³² Personal communication with Jon Ahlness, District Engineer, USACE Regulatory Branch in St. Paul, MN, March 2, 2006. Minnesota Steel is developing a mine site near the town of Naushwauk, approximately 20 miles west of the study area.

²³³ Executive Summary on Mesabi Nugget website accessed at <http://mesabinugget.com/execsummary/> on March 16, 2006.

²³⁴ Personal communication with Larry Lehtinen, President, Mesabi Nugget, LLC, March 20, 2006.

²³⁵ Personal communication with Jim Scott, Assistant Project Manager, PolyMet Mining Corp. between March 7 and March 16, 2006.

²³⁶ Personal communication with Dave Skolaskinski, District Manager on Environmental Affairs and Mark Buckley, Area Manager of Technical Services, of Northshore Mining Company between March 6 and April 5, 2006

²³⁷ *Ibid.*

²³⁸ *Ibid.*

8.5.3 UNIT 3: NORTHERN ROCKY MOUNTAINS

291. Currently no metal mines are active in Unit 3. Two-thirds of the proposed critical habitat area, predominantly in the northern portion, lack mineral potential.²³⁹ Copper deposits exist in the southern portion of the study area along State Highway 200.²⁴⁰

8.5.4 UNIT 4: NORTH CASCADES

292. No metal mines are currently active in Unit 4.²⁴¹ The eastern portion of the study area in Washington is a prospective mining area for silver and copper.²⁴² Ample sand and gravel deposits exist in both the state-owned lands and private inholdings in the Loomis area. Private inholdings on Loomis Block lands have patented mining claims.²⁴³ No new expansions or developments were identified, however. The western portion of the unit has a low potential for mining development due to the inaccessibility of the terrain.

²³⁹ Personal communication with Robin McCulloch, Associate Research Engineer, Montana Bureau of Mines and Geology, February 14, 2006.

²⁴⁰ *Ibid.*

²⁴¹ Personal communication with Dave Norman, WADNR Assistant State Geologist, February 15, 2006.

²⁴² Personal communication with Teodora Minkova, WADNR Ecologist, February 8, 2006.

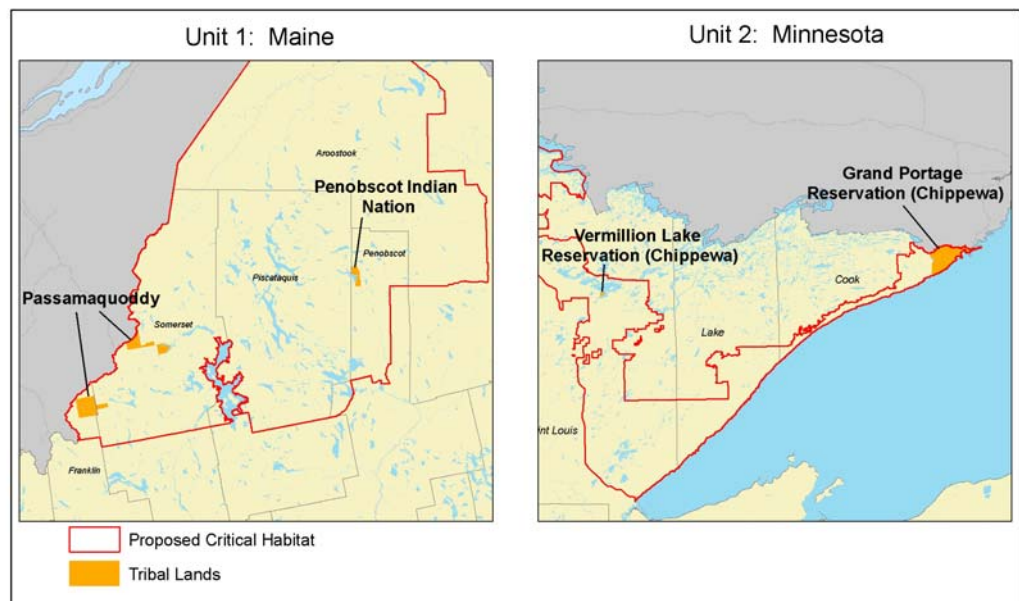
²⁴³ Personal communication with Scott Fisher, WADNR Regional Biologist, February 13, 2006.

SECTION 9 | TRIBAL ACTIVITIES

9.1 INTRODUCTION

293. Four Native American Indian Tribes have lands included in the study area. In Maine, the potentially affected Tribes include the Passamaquoddy Tribe and the Penobscot Indian Nation. In Minnesota, affected tribal lands include two Reservations of the Chippewa band: Grand Portage Indian Reservation and Vermillion Lake Indian Reservation. All of the tribal lands are considered for exclusion from the lynx critical habitat designation in the proposed rule. In addition, the Aroostook Band of Micmacs in Maine expects to purchase land within the study area.

EXHIBIT 9-1. TRIBAL LANDS WITHIN THE STUDY AREA



294. Over the next 20 years, forecast impacts related to tribal activities include:

Post-designation impacts in areas considered for exclusion

- Undiscounted: \$1.29 million - \$4.28 million
- Present value applying a seven percent discount rate: \$781,000 - \$201 million (annualized at \$73,700 - \$190,000)
- Present value at applying a three percent discount rate: \$1.02 million - \$268 million (annualized at \$68,300 - \$180,000)

295. This section first provides a summary of economic impacts associated with lynx conservation efforts on tribal lands in the study area. It then provides information on the background and socioeconomic status of the potentially affected Tribes. Finally, it discusses in detail lynx conservation efforts funded by these Tribes.

9.2 SUMMARY OF IMPACTS TO TRIBES

9.2.1 PRE-DESIGNATION IMPACTS

296. A total of 13 informal consultations considering impacts to the lynx have been conducted regarding activities undertaken by these Tribes since 2000. To date, only the Passamaquoddy Tribe has experienced impacts related to lynx conservation efforts, totaling approximately \$13,200 in 2005 from lynx tracking survey efforts.

9.2.2 POST-DESIGNATION IMPACTS

297. Forecast post-designation impacts are detailed in Exhibit 9-2. Three Tribes expect to incur costs related to in-kind contributions for lynx tracking surveys to be completed under Tribal Landowner Incentive Program grants from the Service. In addition, lynx conservation may impact timber harvest and recreation activities on Tribal lands.

9.3 BACKGROUND AND SOCIOECONOMIC STATUS OF POTENTIALLY AFFECTED TRIBES

298. The Tribes with lands in the study area are sovereign nations. Secretarial Order 3206 recognizes that Tribes have governmental authority and the desire to protect and manage their resources in the manner that is most beneficial to them. Each of the Tribes has its own natural resource programs and staff, and three of these Tribes are currently undertaking or have applied for grants to conduct lynx research on their lands. The results of this research will be incorporated into the Tribes' natural resource management plans. In addition, as trustee for land held by the United States for Indian Tribes, the Bureau of Indian Affairs (BIA) provides technical assistance to the Tribes on forest management planning and oversees certain programs on tribal lands.

EXHIBIT 9-2. POST-DESIGNATION IMPACTS TO TRIBES (2006 - 2025)

CRITICAL HABITAT UNIT	TRIBE	LYNX CONSERVATION EFFORT	UNDISCOUNTED	PRESENT VALUE 3% ⁽¹⁾	PRESENT VALUE 7% ⁽¹⁾
Unit 1: Maine	Passamaquoddy Tribe	Lynx tracking surveys and development of habitat maps and management	\$39,800	\$38,600	\$37,200
		Restrictions on pre-commercial thinning ⁽¹⁾	\$0 - \$1,800,000	\$0 - \$744,000	\$0 - \$620,000
	Penobscot Indian Nation	Three-year survey for lynx and development of management plan	\$53,000	\$51,500	\$49,600
		Restrictions on pre-commercial thinning ⁽¹⁾	\$0 - \$284,000	\$0 - \$223,000	\$0 - \$97,800
		Restrictions on snowmobiling trails	\$0 - \$13,500	\$0 - \$10,000	\$0 - \$7,090
	Aroostook Band of Micmacs	Restrictions on pre-commercial thinning	Not quantified.		
	<i>Subtotal Unit 1</i>			\$92,800 - \$2,190,000	\$90,100 - \$1,070,000
Unit 2: Minnesota	Grand Portage Indian Reservation	Two-year survey for lynx and incorporation into management plan	\$37,000	\$36,500	\$35,800
		Restrictions on timber harvest activity, including added planning effort	\$91,600 - \$990,000	\$70,200 - \$759,000	\$51,900 - \$561,000
		Restrictions on snowmobiling trails	\$1,070,000	\$820,000	\$606,000
	Vermillion Lake Indian Reservation	Impacts to potential development along lakeshore	Not quantified.		
	<i>Subtotal Unit 2</i>			\$1,200,000 - \$2,100,000	\$926,000 - \$1,610,000
Notes: Totals may not sum due to rounding. See Appendix F for annualized impacts.					
(1) Note, pre-commercial impacts in Maine are calculated over 100-year time period. Twenty years of annualized costs are included in the estimates reported here.					

299. Socioeconomic data, provided in Exhibit 9-3, demonstrates the economic vulnerability of the Tribes; their economies are characterized by high unemployment, low income, and high poverty rates.

EXHIBIT 9-3. 2000 SOCIOECONOMIC INFORMATION - AFFECTED TRIBES

AREA/TRIBAL LANDS	POPULATION	UNEMPLOYMENT RATE ⁽¹⁾	PER CAPITA INCOME	POVERTY RATE ⁽²⁾
National Level Information				
USA	281,421,906	5.8%	\$21,587	12.4%
State Level Information				
Maine	5,100,958	4.8%	\$23,198	10.9%
Minnesota	1,274,923	4.1%	\$19,533	7.9%
Tribal Level Information				
Aroostook Band of Micmacs (ME) ⁽³⁾	9,756	7.8%	\$14,707	19.0%
Bois Forte Reservation (includes Vermillion Lake Reservation, MN)	657	7.9%	\$11,790	29.0%
Grand Portage Indian Reservation (MN)	557	10.7%	\$15,782	21.7%
Passamaquoddy Tribe (ME) ⁽⁴⁾	1,316	21.1%	\$9,975	31.3%
Penobscot Indian Nation (ME) ⁽⁵⁾	584	13.3%	\$13,558	23.6%
Notes:				
(1) Unemployment rate represents the number of unemployed persons as a percentage of total civilian labor force.				
(2) Poverty rate represents the percent of individuals below the applicable poverty threshold level. Poverty thresholds are the same for all parts of the country, but vary depending on the applicable family size, age of householder, and number of related children under 18. Poverty thresholds are shown at http://www.Census.gov/hhes/poverty/threshld/thresh99.html .				
(3) Taken from Census 2000 profile for Aroostook Band of Micmac Tribal Designated Statistical Area, ME.				
(4) There are no residents of the Passamaquoddy trust lands included in the study area. Information presented here represents combined population estimates and population weighted averages for residents of the two Passamaquoddy Reservations: Indian Township and Point Pleasant.				
(5) Taken from Census 2000 profile for Penobscot Reservation and Off-trust land.				
Sources: U.S. Census Bureau, Census 2000, http://censtats.census.gov/pub/Profiles.shtml .				

9.4 UNIT 1: MAINE

300. Tribal lands in the study area in Maine include forested trust lands of two Tribes, the Passamaquoddy and the Penobscot. For both of these Tribes, the Reservation lands where the majority of the tribal members live are in eastern Maine, outside of the study area. The Tribes primarily manage lands for timber and recreation purposes. In addition to the Passamaquoddy and Penobscot, the Aroostook Band of Micmacs expects to acquire land within the study area.

9.4.1 AROOSTOOK BAND OF MICMAC

301. The Aroostook Band of Micmac has received a grant for the purpose of acquiring high quality habitat in order to preserve the upper reaches of the Aroostook River within the study area. The Tribe is actively looking for land to buy and the grant from the Service is

good until September 2006.²⁴⁴ Any property purchased in this area will likely be managed in part for timber harvest, as well as conservation purposes. The Tribe indicates that they will conduct forestry practices in this area to benefit lynx.²⁴⁵ As the amount and location of these lands are not known, this analysis does not attempt to estimate potential impacts of lynx conservation to timber harvests on these lands.

9.4.2 PASSAMAQUODDY TRIBE

302. Passamaquoddy tribal land included in the study area encompasses 46,287 acres in northwestern Maine, near the western border with Canada. These lands are in a remote area about four hours drive from the Reservation lands where the majority of the Tribe resides in northeastern Maine outside of the study area.

Pre-designation impacts

303. The Passamaquoddy Tribe is performing lynx conservation efforts under a Tribal Landowners Incentive Program grant from the Service. This grant covers an ongoing three-year tracking survey. Tracking survey work is in its second winter and, because of weather conditions, has been expanded to cover four seasons, with completion currently expected in 2008. Results of this survey will be used to create a Forest Management Plan, focusing on two umbrella species: pine marten (uses late successional forest) and lynx (uses early successional forest) to achieve goals for overall management.²⁴⁶ The Tribe is responsible for an in-kind contribution of \$53,000, which includes staff time for survey work and writing the Forest Management Plan.²⁴⁷ Pre-designation impacts related to this contribution total \$13,250.
304. Three informal section 7 consultations for activities on Passamaquoddy tribal lands have occurred since the lynx was listed. In 2003, the Service reviewed the Passamaquoddy Fire Management Plan, and recommended that prescribed burns be conducted outside of the lynx denning period (May 1 through July 10). In 2004, the Service conducted an intra-Service review of the tribal landowners incentive grant to fund lynx research, with no project modification associated. Also in 2004, the Service consulted informally with regard to a proposed timber sale in Lowelltown; this timber sale was delayed two years as a result of the need to consult for lynx, resulting in minor economic impacts to the Tribe.²⁴⁸

Post-designation impacts

305. The Tribe's lynx research and planning efforts are expected to continue through 2008. The post-designation impacts related to these efforts total \$39,750 (undiscounted value).

²⁴⁴ Personal communication with Fred Corey, Aroostook Band of Micmac, March 3, 2006.

²⁴⁵ Ibid.

²⁴⁶ Personal communication with John Sewell, February 27, 2006.

²⁴⁷ McCollough, Mark and John Sewell. Tribal Landowners Incentive Program Grant Proposal, Title: Population assessment and forest management planning for the Canada lynx and other rare and endangered forest carnivores on Passamaquoddy Tribal lands in Maine prepared September 10, 2003.

²⁴⁸ Personal communication with Dale Covey, Passamaquoddy Forestry Dept., March 30, 2006.

In addition, administrative efforts related to consultation for the lynx are expected to continue at a rate similar to the past levels, with approximately 12 informal consultations expected over the next 20 years (quantified in Appendix A).

306. Post-designation impacts from lynx conservation efforts could also result from potential changes to silviculture activities on Passamaquoddy lands; these impacts are of concern for the Passamaquoddy Tribe. The lands included in the study area are primarily managed to generate revenues for the Tribe through timber harvest. If the Tribe is unable to utilize pre-commercial thinning methods as planned on its 46,287 acres within study area, this could result in impacts of up to \$1.8 million (undiscounted value) over 20 years. This impact is based on average per-acre benefits of pre-commercial thinning calculated in a study conducted by the University of Maine.²⁴⁹
307. In addition to timber activities, hunting occurs on these lands, primarily during moose season from September through November. If hunting activity were to be restricted for lynx conservation efforts, tribal member hunting activity and revenues collected from non-tribal members could be affected.

9.4.3 PENOBSCOT INDIAN NATION

308. The Penobscot tribal land included in the study area includes 7,306 acres in Maine, on Lake Matagamon near the northeastern corner of Baxter State Park. This area, known as the Matagamon area or parcel P6-R8, is in a remote area across the state from the Reservation lands where tribal members reside outside of the study area.

Pre-designation impacts

309. Two informal section 7 consultations for activities on Penobscot tribal lands occurred in 2004. An intra-Service consultation with respect to a tribal wildlife grant to the Penobscot Nation for development of a management strategy for moose and white tailed deer did not result in any project modifications. This consultation notes that “in general, creating moose foraging habitat will create good Canada Lynx habitat.”²⁵⁰ A second informal consultation, relating to a timber sale, does not specify any project modifications, but outlines timber harvest techniques that may be beneficial to the lynx, including LCAS measures. The Tribe indicates that this timber sale was not modified for lynx conservation purposes.²⁵¹ Thus, to date, the Penobscot have not experienced impacts other than administrative impacts quantified in Appendix A.

²⁴⁹ Wagner, Robert G., Bowling, Ernest, and Seymour, Robert. 2003. Assessing Silviculture Research Priorities for Maine Using Wood Supply Analysis. Technical Bulletin 186. February 2003 Maine Agricultural and Forest Experiment Station. The University of Maine. Accessed at <http://library.umaine.edu/cfru/pubs/CFRU309.pdf> on March 14, 2006. Additional model runs provided by Ernest Bowling, JW Sewall Co., June 16, 2006.

²⁵⁰ U.S. Fish and Wildlife Service. 2004. Ref: 04-208 MEFO Intra-Service Section 7 Biological Evaluation Form. Ecological Services, Tribal Wildlife Grant Program, Penobscot Nation, “Development of a management strategy for moose and white-tailed deer on Penobscot Nation trust lands.” February 27, 2004.

²⁵¹ Personal communication with Russell Roy, Penobscot Forestry Department, March 8, 2006.

Post-designation impacts

310. Administrative efforts related to consultation for the lynx are expected to continue at a rate similar to the past level of informal consultation effort, with approximately eight informal consultations expected over the next 20 years, as quantified in Appendix A.
311. The Penobscot Tribe has applied for a Tribal Landowners Incentive grant from the Service to conduct lynx habitat and population analysis. Information collected in this study will be incorporated into the Tribe's land use plans. The grant would fund two full-time positions to conduct the research over a three-year period. The Tribe's in-kind contribution includes technical support provided by the Tribe's Natural Resources Department.²⁵² This project will result in impacts of \$53,000 (undiscounted value).²⁵³
312. Post-designation impacts resulting from lynx conservation efforts are also forecast based on potential changes to silviculture activities. The lands included in the study area are primarily managed to generate revenues for the Tribe through timber harvest. Penobscot forestry staff estimate that approximately 50 acres of pre-commercial thinning could be conducted on average annually on the nearly 7,000 acres of tribal lands in the study area. If this activity was not allowed, the Tribe would anticipate some level of lost future revenues from future timber harvests. The Penobscot could lose up to \$284,000 over a 20 year period (undiscounted value) if they were not allowed to undertake pre-commercial thinning. This impact is based on average per-acre benefits of pre-commercial thinning calculated in a study conducted by the University of Maine.²⁵⁴
313. Snowmobiling occurring on Penobscot tribal lands could also be affected; see Section 6 for a detailed description of how these impacts are calculated. Based on a potential restriction on expansion of snowmobile trails under the LCAS, the analysis forecasts impacts due to increased congestion on trails. Based on the approximately six miles of state snowmobile trails that cross Penobscot lands within the study area, impacts are estimated to range from no impact to \$13,500 (undiscounted value) over 20 years.

9.5 UNIT 2: MINNESOTA

9.5.1 GRAND PORTAGE INDIAN RESERVATION

314. The Grand Portage Reservation encompasses over 47,725 acres in northeastern Minnesota, all of which is included in the study area. The Reservation is bordered by Lake Superior to the southeast. Grand Portage Reservation is a member reservation of the Minnesota Chippewa Tribe.

²⁵² Personal communication with John Banks, Penobscot Natural Resources Department, March 1, 2006.

²⁵³ Based on the grant proposal the Tribe will be contributing approximately \$53,000 in in-kind support for this project. Email communication from Mark McCollough, March 10, 2006.

²⁵⁴ Wagner, Robert G., Bowling, Ernest, and Seymour, Robert. 2003. Assessing Silviculture Research Priorities for Maine Using Wood Supply Analysis. Technical Bulletin 186. February 2003 Maine Agricultural and Forest Experiment Station. The University of Maine. Accessed at <http://library.umaine.edu/cfru/pubs/CFRU309.pdf> on March 14, 2006. Additional model runs provided by Ernest Bowling, JW Sewall Co., June 16, 2006.

Pre-designation impacts

315. There have been eight informal consultations considering lynx for activities on Grand Portage Reservation. These informal consultations related to the following: four 2002 municipal water and sewer projects, a 2004 road re-construction project in already developed areas, a 2004 grant for repairing water systems, planting rice and monitoring rice growth and streams, a 2005 wildlife grant for Lake Sturgeon habitat research and delineation, and a 2005 building project for a residential road and development of 23 lots as part of the West Village development. None of these consultations have resulted in project modifications. Thus, to date, the Grand Portage Chippewa Band has not experienced impacts related to lynx conservation efforts other than administrative impacts quantified in Appendix A.

Post-designation impacts

316. Administrative efforts related to consultation for the lynx are expected to continue at a rate similar to the past level of informal consultation effort on Grand Portage Reservation, with approximately 32 informal consultations expected over the next 20 years. Administrative costs of consultation are quantified in Appendix A of this analysis.
317. Grand Portage Reservation was recently awarded a Tribal Landowners Incentive Program grant to identify lynx habitat on the Reservation over a two-year project. The project will involve looking at aerial photography to determine cover type for areas on the Reservation where there have been lynx sightings, and radio collaring and tracking surveys. Surveys were begun in 2006, and the results of this project will be incorporated into the Reservation's natural resources plan. Impacts to the Tribe resulting from its in-kind contributions for this project are expected to total \$37,000 (undiscounted value).²⁵⁵
318. To date, timber activities on Grand Portage Reservation have not been modified for lynx. The Tribe is concerned that if critical habitat for lynx were to be designated on their lands, all of their timber activity could potentially be affected. To manage for lynx, Grand Portage has indicated that they would expect to change their practices as follows: they may have to limit timber harvest on some portion of their lands in order to provide lynx habitat, and the age class and types of trees that are harvested may change. In addition, timber harvest would require more planning and administrative effort than previously.²⁵⁶ Based on an average of 800 mbf harvested each year, impacts are forecast to be \$91,600 – \$990,000 over the next 20 years (undiscounted value). This range represents uncertainty in potential harvest limitations.²⁵⁷
319. Snowmobiling activity, including plans to increase the amount of trails on the Reservation, is likely to be impacted if critical habitat is designated. There are

²⁵⁵ Personal communication with Seth Moore, March 24, 2006.

²⁵⁶ Ibid.

²⁵⁷ Email communication from Seth Moore, Fish and Wildlife Biologist, Grand Portage Band of Chippewas, March 23, 2006.

The range of timber impacts estimated by the Tribe is based on reductions of volume from 10 percent to 30 percent, given their average harvest of 800 Mbf/year. Note, this impact could be understated if the Tribe were to increase its harvest; they have indicated that their goal is to increase timber harvest to 4,000 MBF per year.

approximately 100 miles of snowmobile trails on Grand Portage Reservation. The Tribe anticipates 16 percent annual growth in snowmobiling, with an equal growth in associated expenditures. Based on previous studies, the Tribe estimates that 1,200 visitors per year come to Grand Portage Reservation to go snowmobiling, with an estimated spending of \$279 per visitor.²⁵⁸ Assuming that no growth in snowmobiling would occur, impacts to the Tribe from lost snowmobiling activity would be approximately \$1,070,000 over the next 20 years (undiscounted value).

320. In addition, the Tribe is concerned that critical habitat for lynx may threaten their ability to manage for the benefit of culturally important species. In particular, the Tribe utilizes prescribed burning to benefit blueberries, and manages timber sales to benefit moose; both of these activities require section 7 consultation. Moose were an important species for subsistence and are of cultural significance, as are blueberries.

9.5.2 VERMILLION LAKE INDIAN RESERVATION

321. The Vermillion Lake Reservation encompasses 1,041 acres in northeastern Minnesota, all of which is included in the study area. Vermillion Lake Reservation is a part of the Bois Forte Reservation, which is a member reservation of the Minnesota Chippewa Tribe. The Bois Forte Reservation includes three separate sections within northern Minnesota: Nett Lake, Vermillion Lake and Deer Creek. The Vermillion Lake area is a populated and developed area; little of the study area in that area is undisturbed.²⁵⁹
322. The record does not indicate that there have been any consultations for lynx related to activities on Vermillion Lake Reservation in the past. The primary activity that could be affected by lynx conservation efforts on Vermillion Lake Reservation lands is potential development of lakeshore property. Residential development is expected to occur along the Vermillion Lake, with approximately 60 more year-round homes and up to 70 seasonal cabins possible.²⁶⁰ It is unknown what modifications or mitigation measures may be recommended to benefit lynx or its habitat. As the area being considered is lakeshore property that is in an already developed area, lynx conservation efforts are unlikely to impact these projects.

²⁵⁸ Ibid.

²⁵⁹ Personal communication with Corey Strong, Bois Forte Reservation, February 6, 2006.

²⁶⁰ Ibid.

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PERSONAL AND WRITTEN COMMUNICATIONS

- Appalachian Mountain Club
 - Appalachian Trail Conservancy
 - Aroostock Band of Micmacs
 - Baxter State Park Authority
 - Bois Forte/Vermillion Lake Reservation
 - Butte Busters Snowmobile Organization
 - Clayton Lake Woodlands
 - Cleveland-Cliffs, Inc.
 - Cook County Commissioners
 - Federal Energy Regulatory Commission
 - Federal Emergency Management Division (Region X)
 - F.H. Stoltze Land & Lumber Company
 - Forest Capital Partners
 - Forest Society of Maine
 - Glacier National Park
 - Grand Portage Band of Chippewa
 - Huber Resources
 - Idaho Department of Lands
 - Idaho Panhandle National Forest
 - Iron Mining Association of Minnesota
 - James W. Sewall Company
 - JD Irving
 - Katahdin Forest Management
 - Lake County, MN Land Commissioner's Office
 - Land for Maine's Future
 - Louis and Lake Counties Railroad Authority
 - Louisiana Pacific
 - Lubrecht Forest
 - Maine Appalachian Trail Club
 - Maine Bureau of Parks and Lands
 - Maine Department of Conservation
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- Maine Department of Environmental Protection
 - Maine Department of Inland Fisheries and Wildlife
 - Maine Department of Transportation
 - Maine Emergency Management Agency
 - Maine Forest Products Council
 - Maine Forest Service
 - Maine Geological Survey
 - Maine Land Use Regulatory Commission
 - Maine Office of Geographic Information Systems
 - Maine Revenue Service
 - Maine Snowmobile Association
 - Mesabi Nugget LLC
 - Minnesota Department of Natural Resources
 - Minnesota Department of Transportation
 - Minnesota Forest Industries
 - Minnesota United Snowmobilers' Association
 - Mittal Steel Company
 - Montana Bureau of Mines and Geology
 - Montana Department of Environmental Quality
 - Montana Department of Fish, Wildlife and Parks
 - Montana Department of Natural Resources and Conservation
 - Montana Department of Transportation
 - Montana Disaster and Emergency Services
 - Montana Oil and Gas Conservation Commission
 - Montana Wood Products Association
 - Natural Resources Research Institute
 - North Cascades National Park
 - North Maine Woods
 - Northshore Mining Company
 - Okanogan County Assessor's Office
 - Okanogan County Farm Bureau
 - Parametrix
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- Passamaquoddy Tribe
- Penobscot Indian Nation
- Plum Creek
- PolyMet Mining Company
- Potlatch Corporation
- Seven Islands Land Company
- St. Louis and Lake Counties Railroad Association
- St. Louis County Land Department
- St. Louis County Assessor's Office
- St. Louis County Planning Department
- Steel Rives, LLP
- Superior National Forest
- The Nature Conservancy (Maine and Montana Chapter)
- UPM Blandin
- U.S. Army Corps of Engineers (Seattle District; Omaha District; St. Paul District; New England District)
- U.S. Bureau of Land Management
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Geological Survey
- University of Maine
- University of Minnesota
- University of Montana
- Voyageurs National Park
- Wagner Forest Management
- Washington Cattlemen's Association
- Washington Department of Fish and Wildlife
- Washington Department of Natural Resources
- Washington State Department of Transportation
- Washington State Snowmobile Association
- White Mountain National Forest