APPENDIX E2
Endangered Species Act Consultation

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U.S. Department of Energy

National Energy Technology Laboratory

December 18, 2006

Mr. Paul Burke
U.S. Fish & Wildlife Service
4101 East 80th Street
Bloomington, MN 55425

Re: Section 7 Consultation – Mesaba Energy Project

Dear Mr. Burke:

This letter is to initiate formal consultation under Section 7 of the Endangered Species Act for a proposed action by the U.S. Department of Energy (DOE). As you know, DOE has entered into a cooperative agreement with Excelsior Energy to provide a total of $36 million in cost-shared funding for the Mesaba Energy Project. A description of the proposed project, the specific area affected by the proposed action, the listed species or critical habitat that may be affected and other relevant information is enclosed. Additional information is available in the Joint Permit Application and Environmental Supplement submitted by Excelsior Energy to the Minnesota Department of Commerce. The URL for this documentation is as follows:
http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573
Note that the Minnesota Department of Commerce is a joint lead agency for the preparation of the Environmental Impact Statement for this project.

During the informal consultation process which began in September 2005, you and other representatives of your office indicated that the three species of concern were the bald eagle, grey wolf and Canada lynx. A summary of the record of communications between DOE and the U.S. Fish & Wildlife Service (FWS) was provided to you in an e-mail on September 7, 2006, as well as a report prepared by one of the contractors to Excelsior Energy regarding ecological habitat surrounding the preferred and alternative sites being considered by Excelsior Energy for the project. Based on the informal consultation process, DOE has made a determination that the proposed action may affect, but is not likely to adversely affect, the bald eagle and that the proposed action may affect the grey wolf and Canada lynx. Therefore, DOE is requesting a biological opinion from FWS regarding the potential effects on these two species.

Please let me know if I can provide any additional information. Thank you.

Sincerely,

Richard A. Hargis, Jr.
NEPA Document Manager

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
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IN REPLY REFER TO:
FWS/AFWE-TCFO

MAR - 6 2007

Richard A. Hargis, Jr.
NEPA Document Manager
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Mr. Hargis:

This responds to your December 18, 2006, letter regarding consultation under section 7 of the Endangered Species Act of 1973, as amended, for the proposed construction of the Mesaba Energy Project (applicant), in Itasca and St. Louis Counties, Minnesota. There are two sites under consideration for plant construction. The West Site is located in Itasca County, near the Town of Taconite, and the East Site is located about 60 miles to the northeast, in St. Louis County, near the Town of Hoyt Lakes, Minnesota. The West Site has been identified as the preferred alternative. The final project site will be selected at the close of the planning process.

By your letter, the U.S. Department of Energy (DOE) is requesting concurrence with the determination that the proposed action may affect but is not likely to adversely affect the federally-listed species the bald eagle (*Haliaeetus leucocephalus*). Further, the DOE has requested the initiation of formal consultation for the gray wolf (*Canis* lupus) and the Canada lynx (*Lynx canadensis*). The Service will consult with the DOE on the project as proposed for the preferred alternative, the West Site. The U.S. Fish and Wildlife Service (Service) has reviewed the information included with your letter and provides the following comments for your consideration

Since 2005, the DOE and the applicant staff have provided comprehensive coordination with the Service on this project, including direct communication through telephone and electronic mail contacts throughout the planning phases for this project. Both the DOE and the applicant are to be commended for this consultation effort.

The Service, in working closely with project staff, has assessed the proposed project's impact on the bald eagle. The bald eagle is broadly distributed across the greater project area, and eagle sightings in the immediate vicinity of the project action area (West Site) are common. The forest canopy provides diurnal roosts, and the neighboring streams and lakes provide forage habitat for the bald eagle. However, the nature of the proposed

project is such that roost and forage habitats are not likely to be reduced or diminished for eagles in the action area because only a small proportion of the project site has not already been substantially altered by historic mining activities. Further, there are no known eagle nests within the project site, or within 1,320 feet of the project site boundary. Thus, we concur the DOE determination that the proposed project is not likely to adversely affect the bald eagle.

The Service also concurs with the DOE determination that the proposed action may affect the Canada lynx and the gray wolf. The gray wolf and the Canada lynx are now found in the vicinity of the West Site. The greater challenge is in the apparent vulnerability of lynx and wolf to vehicle collisions when crossing roads. Specifically, any project that results in new roads, new road alignments, widened rights-of-way, or increased vehicle speeds, in habitat occupied by the Canada lynx and the gray wolf may affect these species.

By initiating formal consultation under section 7 of the Act, the Service will be required to prepare a biological opinion, which documents the specific elements of the proposed action and their impact on the listed species. Along with a determination as to whether the project would jeopardize the continued existence of the listed species, the biological opinion may also provide conservation recommendations, an incidental take statement, with reasonable and prudent measures and the terms and conditions of that statement.

The Service is limited to a time period of 135 days in which to provide your office with a final biological opinion for the project. This time period works to ensure a prompt response and a more predictable consultation environment for the project managers. This time period is supposed to begin upon the date of the letter requesting the initiation of formal consultation. However, the Service understands that the DOE and the applicant need to adhere to a project time line that requires a final biological opinion within 60 days. Due primarily to the efforts of the DOE and the applicant in project coordination to date, the Service believes that we can meet this deadline. Therefore, we will make every effort to provide a biological opinion dated on or before April 30, 2007, to be provided to the DOE, with copies to the applicant and other appropriate agencies.

We appreciate this opportunity to work with the DOE and the applicant in the conservation and recovery of federally-listed species. If you have any questions, or if we can be of further assistance, please contact Mr. Paul Burke, of this office, by calling (612) 725-3548, and at extension 205.

Sincerely,

Tony Sullins

Tony Sullins
Field Supervisor

CC:

David Holmbeck

Mn/DNR – Grand Rapids

U.S. Department of Energy

National Energy Technology Laboratory

February 25, 2009

Mr. Tony Sullins
Field Supervisor
U.S. Fish & Wildlife Service
Twin Cities Field Office
4101 East 80th Street
Bloomington, MN 55425

Re: Section 7 Consultation – Mesaba Energy Project

Dear Mr. Sullins:

My last letter to your office dated August 15, 2008, transmitted a Biological Assessment (BA) for the Mesaba Energy Project, addressing potential impacts to the Canada lynx. In a subsequent telephone conversation on November 5, 2008, you indicated that, due to recent court decisions, the BA would need to also address potential impacts to the gray wolf. The BA has been revised as requested and DOE has made a determination that the proposed action may affect, but is not likely to adversely affect, Canada lynx or gray wolf or their critical habitat under either site alternative for the project. However, as you explained in our telephone conversation in November, the U.S. Fish and Wildlife Service would only consult on one site (in this case, Excelsior's preferred West Range site near Taconite, MN). Therefore, this letter is to request concurrence with DOE's determination for the West Range site. I understand that consultation would have to be re-initiated if the state site permit were to be issued for the alternate East Range site by the Minnesota Public Utilities Commission

Enclosed is a hard copy of the BA for your review. Please note that a separate copy has also been sent to Ms. Susan Oetker, at your New Mexico Field Office. I would appreciate a response from your office by April 3, 2009.

Please let me know if you have any questions or if I can provide any additional information.

Thank you.

Sincerely,

Richard A. Hargis, Jr.
Office of Major Demonstration Projects

Enclosure

c w/ Enclosure
Susan Oetker, USFWS

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
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May 1, 2009

Richard A. Hargis, Jr.
Office of Major Demonstration Projects
U.S. Department of Energy
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Mr. Hargis:

We have received your biological assessment (BA) dated February 25, 2009 for the West Range Site of the Mesaba Energy Project. This letter corrects a minor error (reference to Corps of Engineers) in my letter of April 22, 2009, and therefore supplants that earlier correspondence. This project consists of constructing a large, coal-based electric generating facility on 1,708 acres in the Iron Range of northern Minnesota in the City of Taconite, Itasca County. The project would include two power plants, as well as 6 miles of rail line, 13 miles of natural gas pipeline, 8.5 miles of high voltage transmission lines, road access, and wastewater treatment areas. The Department of Energy (DOE) has requested concurrence with a "may affect but not likely to adversely affect" determination for Canada lynx and gray wolf and has also determined the project is not likely to adversely modify proposed critical habitat for Canada lynx in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C., 1531 et seq.). A complete administrative record of this consultation is on file in this office.

Under section 7 of the Endangered Species Act, the DOE began consulting with the U.S. Fish and Wildlife Service in 2006 regarding federally-listed threatened species that may occur on or near the Mesaba Energy Project's action area. Both the Canada lynx (*Lynx canadensis*) and gray wolf (*Canis lupus*) may use this habitat. At the time work on this BA began, the gray wolf was a delisted species and so was not included in the original BA submitted to this office in July 2008. The delisting rule was vacated in December 2008 and regulatory protections once again applied to the wolf. As such, the DOE has analyzed both lynx and wolf in the final BA. No critical habitat for either species occurs on the West Range Site.

Canada lynx

Northeastern Minnesota lies at the southern edge of the lynx range in North America, and the action area is located near the southeastern edge of the lynx range (historical and present day) in Minnesota. Male and female Canada lynx home ranges in Minnesota are

approximately 34 and 8 square miles, respectively (Moen et al. 2006). The common causes of lynx mortality are starvation, inter-specific strife, hunting, trapping (including snaring), and vehicle collisions.

Long distance movements are characteristic of lynx (Mowat 2000). These movements may consist of a series of relatively short distance movements between patches of high snowshoe hare *(Lepus americanus)* abundance (Ward and Krebs 1985) or, if prey are not abundant, a search for such patches of more suitable habitat. Long distance movement may lessen in areas with good prey densities. Sub-adult lynx are also known to range widely even when prey are abundant (Quinn and Thompson 1987), presumably as an innate attempt to establish home ranges away from their natal areas. Lynx also make exploratory movements outside their home ranges (Squires et al. 2001) and are capable of moving extremely long distances (Mech 1977, Poole 1997, Squires et al. 2001). These movements may be necessary for lynx to persist in landscapes where potential habitat is not homogeneously distributed (Hoving et al. 2004).

Because of the proximity of the West Range Site to an area recently surveyed for lynx for a separate consultation with U.S. Army Corps of Engineers (Minnesota Steel project), the results of that survey may be indicative of lynx use of this project's West Range Site. The Minnesota Steel Mine site is approximately 5 miles east of the West Range Site, and it was surveyed January-March 2007. There were 614 miles of transects surveyed in 7 townships, including the West Range Site. During the winter of 2006, the contractor designed the survey, investigated historical records, canvassed local authorities regarding lynx activity, and scouted for potential lynx habitat and survey corridors in preparation for the track survey. During the winter of 2007, the winter lynx track survey was conducted on approximately 541 miles of transect within the 252 square mile survey area and on an additional 73 miles of transects in townships adjacent to the survey area (ENSR 2007). See ENSR (2007) for additional details regarding survey methods. The survey detected no Canada lynx tracks, but intercepted 56 bobcat *(Lynx rufus)* tracks.

The failure to detect any lynx tracks with a survey as intensive as that conducted by ENSR (2007) strongly indicates that lynx were not present in the survey area. In Maine, surveyors detected 100% of radio-collared lynx present in townships when at least 0.9 mile of transect were surveyed per square mile; at least one lynx was detected in townships that were known to be occupied by lynx when 0.6 mile of transect was surveyed per square mile (Vashon et al. 2003). ENSR (2007) surveyed 2.1 miles of transect per square mile and should have detected lynx if they were present. The prevalence of bobcat track intercepts in the survey area reflects the general predominance of this species in the vicinity of the proposed project (Fig. 3). Bobcats may compete with lynx where they overlap and this competition may result in segregation of the species geographically and at the scale of individual home ranges (Robinson 2006). The northwest corner of the township (T 56 N, R 24 W) was described as having the greatest potential for lynx use, and this includes the West Range Site.

Although lynx are unlikely to be resident species in the action area or nearby, individuals may move into the action area while making the types of long-range movements

described above. In these cases, the project impacts may reduce the ability of these lynx to move through the action area and may increase movements parallel to the SE-NW orientation of the Mesabi Iron Range in the vicinity of the action area. This type of effect on lynx movement is a potential outcome of the proposed action. It is unlikely, however, that this would result in any detectable adverse impacts on the survival or reproduction of any Canada lynx due primarily to the evidently marginal importance of the action area for lynx.

Collision with vehicles is also recognized as a documented cause of lynx mortality in Minnesota. Vehicle traffic to and from the project site would include the following:

- Road access to the project site
- Rail access to the project site
- Road traffic within the project site

In previous actions, the Service has anticipated incidental take of lynx as a result of increased vehicular traffic in close proximity to areas containing or likely to contain lynx home ranges. Approximately 0.5 miles of road would be constructed to connect County Road 7 to the West Range Site, and increased vehicular traffic would result from the approximately 185 full time workers employed by the plant. This increased traffic will occur in areas where lynx are not likely resident and away from areas identified as suitable or potentially suitable for lynx (ENSR 2007). Therefore, the likelihood of the proposed action resulting in the death or injury of any Canada lynx due to a vehicle collision is discountable.

A review of the scientific literature found no references to the impact of air quality on Canada lynx. Since the existing regulatory program for air quality sets standards for human health and safety, we will assume that the project-related air quality impacts will not adversely affect Canada lynx.

In conclusion, the action area is located near the edge of lynx range, does not contain extensive areas of suitable lynx habitat, and a comprehensive survey using established methods (e.g., see Squires et al. 2004) and qualified observers failed to record a single lynx in and around the action area in 2007 and during a preliminary investigation in 2006. Increased vehicular traffic will not occur near any area where lynx have been recently verified or near any areas identified as suitable or potentially suitable for lynx (ENSR 2007). Although project activities may affect lynx potentially moving through the action area due to the destruction of forested habitat, it is unlikely that these effects to movement will result in reduced survival or reproduction of any lynx. In summary, although the proposed action is likely to result in some effects to lynx, the Service finds that those effects are likely to be insignificant or discountable and, thus, are not likely to adversely affect any Canada lynx. Insignificant effects relate to the size of the impact and should never reach the scale where take[1] occurs. Discountable effects are those

[1] Under the Endangered Species Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. Therefore, we concur with the DOE determination that the proposed action may affect, but is not likely to adversely affect Canada lynx.

Gray wolf

The gray wolf population in Minnesota has hovered around 3,000 over the last decade (Erb 2008), exceeding the recovery goal of 1,400. Wolves occur throughout northern Minnesota, and the Chippewa National Forest has some of the highest numbers of wolf observations (Erb 2008). The West Range Site is approximately 6 miles from the Chippewa National Forest.

Wolf density is heavily dependent on prey availability (Fuller 1989). Conservation of primary wolf prey, such as white-tailed deer, is clearly a high priority for the Minnesota DNR, which typically manages ungulates to ensure a harvestable surplus for hunters, nonconsumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, the agency must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels when necessary.

The primary effects of the project on wolves would result from habitat loss and increased vehicle traffic. Approximately 618 acres of habitat would be lost at the West Range Site. Deer, moose, and beaver, the primary prey species for wolf, are closely associated with forage from young upland forest less than 10 years old. Currently, the Chippewa and Superior National Forests provide ample habitat for prey species, and densities of these species (particularly deer) have been high; therefore, prey availability is not likely to threaten wolves in the western Great Lakes population.

Human settlement and roads are considered to be major determinants in wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Mech 1995, Gogan et al. 1997). The Recovery Plan recommends that density of higher standard roads remain below one mile/mile^2 to limit the extent of associated effects to wolves.

The density of roads in the vicinity of the West Range Site is 1.1 miles/mile^2, and after project construction, the density would be 1.2 miles/mile^2. The increased traffic associated with these roads will occur in areas where wolf are not likely resident (i.e., close to human habitation and activity). Therefore, the likelihood of the proposed action resulting in the death or injury of any wolf due to a vehicle collision is discountable. The activities associated with the Mesaba Energy Project are not likely to lead to additional poaching or introduced disease.

This precludes further action as required under section 7 of the Endangered Species Act of 1973, as amended. If new information becomes available that indicates federally listed

species may be affected in a manner or to an extent not previously considered, such as if evidence of lynx activity increases significantly in the action area, consultation must be reinitiated.

If you have any questions or if we can be of further assistance please contact me directly at (612)725-3548, extension 201.

Sincerely,

Tony Sullins
Field Supervisor

Prepared for:
Excelsior Energy, Inc.
Minnetonka, Minnesota

Biological Assessment for the Proposed Mesaba Energy Project

Final

ENSR Corporation
February 2009
Document No.: 12341-001-0300

ENSR | AECOM

Appendix E

Prepared for:
Excelsior Energy, Inc.
Minnetonka, Minnesota

Biological Assessment for the Proposed Mesaba Energy Project

Final

Prepared By: Stuart L. Paulus, Ph.D.
Tyler Creech
Bryan Chevillet

ENSR Corporation
February 2009
Document No.: 12341-002-0300

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Appendix E

Executive Summary

Excelsior Energy Inc. (Excelsior) has proposed to construct a large, coal-based electric generating facility in the Iron Range of northeastern Minnesota as part of its Mesaba Energy Project. The U.S. Department of Energy (DOE), through its Clean Coal Power Initiative program, is providing $36 million in funding for the Project as part of a national energy strategy to improve the environment while providing low-cost electricity from domestic coal sources. The DOE is also serving as the lead federal agency for the preparation of an Environmental Impact Statement (EIS) for the proposed Project; the U.S. Army Corps of Engineers and U.S. Forest Service are cooperating federal agencies. The EIS is being jointly sponsored by DOE and the Minnesota Department of Commerce.

The first two phases of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively; collectively, the "Project") would entail the construction and operation of two nominal 600-megawatt$_{(net)}$ Integrated Gasification Combined Cycle (IGCC) generating units (hereafter, the "IGCC Power Station") at one of two alternative Project sites. The two sites – one designated as Excelsior's preferred site, the other as its alternate – were proposed in accordance with State rules implementing the Power Plant Siting Act (*see* Minnesota Rule § 7849). The preferred West Range Site is in Itasca County within the city of Taconite, and the alternate East Range Site is in St. Louis County within the city of Hoyt Lakes, Minnesota. In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

Both sites are dominated by second-growth forest habitats – deciduous and mixed (deciduous and coniferous) forest at the West Range Site, and mixed forest at the East Range Site. Shrub swamp, wooded swamp, shallow marsh, and bog wetlands also can be found within the sites. Current and historic mining and other industrial operations are common in the area, and mine pits and tailings basins can be found near both sites.

The land upon which the IGCC Power Station equipment, raw material and by-product storage areas, administrative offices, electric switchyards, parking lots, and connecting roadways would be constructed is referred to as the "IGCC Power Station Footprint" or simply, the "Footprint." The large buffer area within which the Footprint would be located is referred to as the "Buffer Land." Project-related infrastructure constructed outside the Footprint and Buffer Land would include access roads, rail lines, high voltage transmission lines, natural gas pipelines, process water and potable water supply lines, and domestic wastewater disposal lines.

Section 7 of the federal Endangered Species Act (ESA) requires that federal agencies "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." This Biological Assessment (BA) is prepared in accordance with the ESA and analyzes potential effects to federally listed threatened and endangered species, and species proposed for listing, and their designated critical habitats, as a result of the proposed project. Although the final site would be selected by the Minnesota Public Utility Commission, both sites are considered in this BA.

The Canada lynx (lynx) and gray wolf (wolf), federally threatened species, are listed species that may use the proposed Project sites. In the Great Lakes region, the lynx is found primarily in mixed forest habitats where snowshoe hare are common. The Project sites are located near the western edge of the lynx's range in the region, and lynx density is believed to be higher near the East Range Site, which lies closer to core lynx range than the West Range Site. Lynx were sighted within 2 miles of both Project sites in 2003.

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies. On November 9, 2006, the USFWS designated 317 square miles (mi^2) as critical habitat in Voyageurs National Park. Voyageurs National Park is approximately 50 miles northwest of the proposed project sites. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (2008a) a proposed rule that included a proposed

revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of January 31, 2009.

Gray wolves are the largest wild members of the dog family (Canidae). Wolves are carnivorous predators that prefer a diet of medium and large mammals. Wolf prey species in Minnesota include white-tailed deer, moose, beaver, and snowshoe hare. Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

In response to their vastly declining numbers range wide, the gray wolf was determined to be endangered in 1967 under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the ESA, and the Minnesota population was reclassified to threatened in 1977. In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS) to more effectively manage the species. The Minnesota population is a designated portion of the Eastern DPS. In 1978, critical habitat was designated for the Eastern DPS of gray wolf. That rule identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3. Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The East Range Site is within Zone 2, while the West Range site is outside the designated critical habitat area.

Impacts associated with Project habitat loss and disturbance, and collisions with vehicles and trains, could impact lynx and gray wolf. Using worst case assumptions, approximately 618 acres of wildlife habitat would be lost within the West Range Site and associated utility and transportation corridors; approximately 929 acres of habitat would be lost within the East Range Site and its associated corridors. Noise, light, and glare from the generating facility could cause lynx and wolves to avoid either area. Lynx and gray wolf could be hit by vehicles or trains. Other potential impacts include human encroachment in the backcountry, and increased interspecific competition facilitated by snow compaction.

The Project would contribute to cumulative impacts to lynx and gray wolf through habitat loss, and fragmentation and disruption of wildlife travel corridors across the Iron Range. Other proposed and existing projects that would contribute to cumulative impacts include Minnesota Steel Industries, LLC (Minnesota Steel) mining and steelmaking activities, Nashwauk Public Utilities Commission Gas Pipeline, Itasca County Road 7 realignment, Itasca County short-line railroad near the West Range Site, and NorthMet Mine and Mesabi Nugget Plant near the East Range Site. Future actions are predicted to impact approximately 5,509 acres of habitat and two wildlife travel corridors in the vicinity of West Range Site, and approximately 4,846 acres of habitat and two corridors in the vicinity of the East Range Site.

Given the large amount of similar habitat in the region, the existence of alternate wildlife travel corridors, the potential for conservation and mitigation measures, and the low predicted density of lynx and gray wolf near the Project sites, the Project **may affect, but is unlikely to adversely affect** Canada lynx or gray wolf or their critical habitat under either alternative.

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1.0 Introduction

Excelsior Energy Inc. (Excelsior) proposes to construct a large, coal-based electric generating facility in the Iron Range of northeastern Minnesota as part of its Mesaba Energy Project. The first two phases of the Mesaba Energy Project ("Mesaba One" and "Mesaba Two," respectively; collectively, the "Project") would entail the construction and operation of two nominal 600-megawatt$_{(net)}$ Integrated Gasification Combined Cycle (IGCC) generating units (hereafter, the "IGCC Power Station"). Two potential sites for the facility have been identified: a preferred West Range Site in southeastern Itasca County within the city limits of Taconite, and an alternate East Range Site in central-eastern St. Louis County within the city limits of Hoyt Lakes (Figure 1.1). In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

These sites were proposed in accordance with State rules implementing the Power Plant Siting Act (*see* Minnesota Rule § 7849). Construction of the generating facility and associated utility and transportation infrastructure would require the clearing of forest, grassland, and wetland habitats, and would impact wildlife in the vicinity of the Project area.

The U.S. Department of Energy (DOE), through its Clean Coal Power Initiative program, is providing $36 million in funding for the Project as part of a national energy strategy to improve the environment while providing low-cost electricity from domestic coal sources. The DOE is also serving as the lead federal agency for the preparation of an Environmental Impact Statement (EIS) for the proposed Project; the U.S. Army Corps of Engineers and U.S. Forest Service are cooperating federal agencies. The EIS is being jointly sponsored by DOE and the Minnesota Department of Commerce.

Section 7 of the federal Endangered Species Act (ESA; Act) requires that federal agencies "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." The purpose of this Biological Assessment (BA) is to evaluate the effects of the proposed Project on federally listed threatened and endangered species, species proposed for listing, and their critical habitats, as a result of the proposed Project. This BA is prepared in accordance with Section 7 of the federal ESA of 1973, as amended (19 United States Code [U.S.C.] 1536[c], 50 Code of Federal Regulations [CFR] 402.14[c]). The purpose of the Act is to provide a means for conserving the ecosystems upon which threatened and endangered species depend, and to provide a program for protecting these species. The ESA defines an endangered species as a species that is in danger of extinction throughout all or a major portion of its range. A threatened species is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a major portion of its range. A species proposed for listing is a species for which the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) has sufficient information on its biological status and threats to propose it as endangered or threatened. Critical habitat is a specific area or type of area that is considered to be essential for the survival of a species, as designated by the USFWS or NMFS under the ESA.

The consultation process is designed to assist federal agencies in complying with the ESA. Consultation can either be informal or formal, depending on the determination of effects in the BA. If the BA concludes that the Project "is not likely to adversely affect" listed species or critical habitat, the lead federal agency (DOE for the Project) has the discretion to choose either informal or formal consultation. If informal consultation is chosen, the agency asks for written concurrence by the USFWS and/or NMFS for the BA's conclusion. Informal consultation is complete if a concurrence letter is obtained from both agencies. If the BA concludes that the Project is "likely to adversely affect" listed species or critical habitat, the agency must request formal consultation. When formal consultation is requested by the agency, the USFWS and/or NMFS prepare and issue a Biological Opinion (BO) which completes the consultation.

Using information obtained in the BA, the USFWS and/or NMFS provide an opinion in the BO on whether the Project is: 1) "likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a "jeopardy" biological opinion), or 2) "not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a "no jeopardy" biological opinion). If the USFWS or NMFS issue a "jeopardy" opinion, it must include any "reasonable and prudent alternatives" to the Project that would avoid jeopardy. If the USFWS or NMFS issues a "no jeopardy" opinion, it may include discretionary "conservation recommendations," which are steps the USFWS and NMFS believe could be taken to further minimize potential effects on listed species or critical habitat.

The Canada lynx (lynx; *Lynx canadensis*) and gray wolf (wolf; *Canis lupus*), federally threatened species, are listed species that may use the proposed Project sites. In the Great Lakes region, the lynx is found primarily in mixed deciduous-coniferous forest habitats where snowshoe hare (*Lepus canadensis*) are common. The Project sites are located near the western edge of the lynx's range in the region, and lynx density is believed to be higher near the East Range Site, which lies closer to core lynx range than the West Range Site. Lynx were sighted within 2 miles of both Project sites in 2003. Wolves are widespread across northern Minnesota and have been seen in the vicinity of both Project sites. Wolf prey species in Minnesota include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), beaver (*Castor canadensis*), and snowshoe hare. Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

2.0 Description of the Proposed Action

A detailed description of the proposed Project is provided in Chapter 2 of the Mesaba Energy Project Draft Environmental Impact Statement (Draft EIS) dated November 2007 (U.S. Department of Energy and Minnesota Department of Commerce 2007). A summary of the Project is as follows.

2.1 Overview

Excelsior plans to construct and operate a coal-based IGCC electric generating facility as part of its Mesaba Energy Project. Using IGCC technology, the facility would convert coal, petroleum coke, or a mixture of these feedstocks into a fuel called syngas, which would then be burned to power a combustion turbine generator and a stream turbine generator working in tandem to produce electricity. Two sites within northeastern Minnesota's Taconite Tax Relief Area are being considered for the location of the IGCC Power Station. The preferred West Range Site is in Township 56 North, Range 24 West, and within the city limits of Taconite in Itasca County (Figure 2.1). The alternate East Range Site would be located in Townships 58 and 59 North, Range 14 West and within the city limits of Hoyt Lakes in St. Louis County (Figure 2.2). In each case, corridors extending beyond city limits have been established to connect the IGCC Power Station to important regional infrastructure elements.

The land upon which the IGCC Power Station equipment, raw material and by-product storage areas, administrative offices, electric switchyards, parking lots, and connecting roadways would be constructed is referred to as the "IGCC Power Station Footprint" or simply, the "Footprint." The large buffer area within which the Footprint would be located is referred to as the "Buffer Land." Buildings constructed on the selected site would include a combustion turbine generator building, steam turbine generator building, air separation unit building, heat recovery steam generator, rod mill feed bins, control room, administration room, warehouse/maintenance shop, water treatment buildings, weather enclosures for equipment, power distribution centers, and visitor's center (Figure 2.3). Project-related infrastructure constructed outside the Footprint and Buffer Land would include access roads, rail lines, high voltage transmission lines, natural gas pipelines, process water and potable water supply lines, and domestic wastewater disposal lines.

The IGCC Power Station would be constructed in two phases. In the first phase, a nominal net 600-megawatt (MWe_{net}) IGCC-based large electric generating facility would be designed and constructed with $36 million of DOE co-funding and operated for a 1-year demonstration testing period. In phase two, a second identical electric generating facility would be constructed on the same site but would be financed privately. The two electric generating facilities would be known as Mesaba One and Mesaba Two. Each facility is expected to be operational for more than 30 years.

Key Project features and capacities include:

- Two nomimal 600-$MWe_{(net)}$ IGCC-based electric generating facilities utilizing ConocoPhillips E-gas™ technology and requiring up to 17,100 tons of coal feedstock per day.
- An enhanced Zero Liquid Discharge (ZLD) wastewater treatment system to eliminate discharge of all industrial wastewaters.
- 6 miles of rail line at the West Range Site or 3.4 miles at the East Range Site to connect the site to existing rail lines and provide sufficient track for the unobstructed unloading of coal and petroleum coke feedstocks.
- 13.2 miles of natural gas pipeline to connect the West Range Site to an existing Great Lakes Gas Transmission Company line, or approximately 29 miles of pipeline to connect the East Range Site to an existing Northern Natural Gas Company pipeline.
- High voltage transmission lines (HVTLs) connecting the West Range Site to the Blackberry Substation (located approximately 8.5 miles south-southeast) or connecting the East Range Site to the Forbes Substation (located approximately 30 miles west-southwest).
- Potable water and domestic wastewater lines connecting the West Range Site to the City of Taconite's drinking water and wastewater treatment systems, or connecting the East Range Site to the City's of Hoyt Lakes' drinking water and wastewater treatment systems.

2.2 Feedstock Requirements

The IGCC Power Station would require coal and/or petroleum coke as feedstock for electricity generation. Excelsior estimates that the facility would use a maximum of 17,100 tons of coal feedstock per day, and intends to import these feedstocks by rail in dedicated unit trains. The primary feedstock is expected to be sub-bituminous coal imported from the Powder River Basin in Wyoming, although Illinois No. 6 bituminous coal may also be used.

2.3 Power Generation

Excelsior has chosen to use ConocoPhillips E-gas™ technology for the Project because it is a fuel-flexible technology that allows the use of bituminous coal, sub-bituminous coal, petroleum coke, or blends of these substances as feedstock. In the E-gas™ process, feedstock is crushed and slurried with water, then combined with 95 percent pure oxygen in a pressurized vessel called a gasifier to create a fuel called synthesis gas (syngas). After the syngas is cooled and contaminants are removed, it is burned in a combustion turbine connected to an electric generator, creating electricity. The heated exhaust gases from the combustion turbine are then forced through a heat recovery steam generator to produce steam. The steam is routed to a steam turbine connected to a second electric generator, producing additional electricity.

The primary by-products from the gasification process are elemental sulfur and an inert, glass-like slag, both of which are marketable products. Sulfur could be sold worldwide as a raw material for fertilizer or as a feedstock

for the production of sulfuric acid. Slag could be sold for use as an asphalt aggregate, construction backfill, or landfill cover, and would likely be marketed locally. Slag produced by petroleum coke gasification may also be sold for metals recovery. Depending on the feedstock being used, the facility would produce up to 160 tons of elemental sulfur and up to 800 tons of slag per day. Sulfur would be sold and transported offsite via rail, while slag would likely be transported via trucks to local markets.

2.4 Process Water Management

The IGCC Power Station would require water for use in the steam cycle, for production of coal slurry to use as feed for the gasifier, and for various cooling processes. Predicted water demands for the West Range and East Range Sites would be expected to be similar due to their similar configuration. Average annual water demand is predicted to be approximately 7,000 gallons per minute (gpm), with peak water demand of 10,000 gpm. Primary water sources for the Project at the West Range Site would be the Canisteo Mine Pit, approximately 0.8 miles southwest of the proposed IGCC Power Station Footprint; Lind Mine Pit, approximately 6.6 miles southwest; Arcturus Mine Pit, approximately 2 miles east-southeast; Gross-Marble Mine Pit, approximately 2.9 miles east-southeast; Hill-Annex/Hill-Trumble Mine Pit, approximately 3.6 miles east; and Prairie River, approximately 6.9 miles southwest (Figure 2.4). Currently, the Arcturus, Gross-Marble, and Hill-Annex/Hill-Trumble mine pits are interconnected and referred to as the Hill-Annex Mine Pit Complex. Alternate West Range Site water sources include the Mississippi River and groundwater wells.

Primary water sources for the IGCC Power Station at the East Range Site would be the 2WX Mine Pit, approximately 0.8 miles northwest of the IGCC Power Station; 2E Mine Pit, approximately 2 miles north-northeast; 2W Mine Pit, approximately 1.6 miles north; 6 Mine Pit, approximately 3 miles west; 9S Mine Pit, approximately 4.2 miles west; Donora Mine Pit, approximately 4.2 miles west-northwest; Stevens Mine Pit, approximately 2.6 miles northwest; Knox Mine Pit, approximately 1.8 miles northwest; 5N Mine Pit, approximately 5 miles northeast; and Colby Lake, approximately 0.9 miles south-southwest (Figure 2.5).

Wastewaters at the IGCC Power Station that would be eliminated with the use of the enhanced ZLD system include the following:

- Cooling tower blowdown (water discharged from cooling towers and steam generators to control buildup of dissolved and suspended solids),
- Reject water from the boiler feed water demineralizers,
- Stormwater associated with industrial activity, and
- Contact cooling/scrubbing waters generated by the gasification process.

In the enhanced ZLD system, the wastewaters would be heated using steam or vapor compression, creating nearly-pure water vapor and leaving a concentrated brine to be further processed in a rotary drum dryer/crystallizer. The end products of the ZLD system would be high quality water distillate, which would be recycled for other water uses in the plant, and solid filter cake material, which would be collected for proper disposal. The Project would not discharge any industrial wastewaters to surface waters or ground water.

2.5 Air Emissions

The primary air emission point at the IGCC Power Station would be the Combustion Turbine Generator/Heat Recovery Steam Generator stack. Other air emission sources include flares, tank vent boilers, fugitive emission leaks, material handling systems, auxiliary boilers, cooling towers, emergency generators, and emergency fire water pump engines.

Predicted annual emissions of air pollutants at either site include 1,390 tons of sulfur dioxide (SO_2), 2,872 tons of nitrogen oxides (NO_x), 2,539 tons of carbon monoxide (CO), 0.03 tons of lead, and 197 tons of volatile organic compounds (VOCs). Additionally, the West Range and East Range Sites would emit 493 and 709 tons of particulate matter less than 10 microns in diameter (PM_{10}), respectively. Under Prevention of Significant Deterioration (PSD) regulations, both sites would be a major source of SO_2, NO_x, CO, PM_{10}, and VOCs. Class I area impacts analysis, which considers whether proposed major emitting facilities would have a significant adverse impact on air quality in national parks and wilderness areas, indicates that Project impacts would be below allowable increments for all pollutants. The Class II PSD increment analysis which considers impacts to most other areas that meet National Ambient Air Quality Standards indicates that the Project would be in compliance with all state increment limits.

Because the Project falls under PSD regulations, an analysis of Best Available Control Technologies (BACT) was conducted. Control technologies proposed as BACT include:

- Good combustion practice for NO_x, SO_2, CO, VOCs, and PM_{10} (tank vent boiler, emergency diesel generators, fire pumps, and auxiliary boiler)
- Use of natural gas as backup/start-up fuel (gasifiers and combustion turbines)
- Routing Claus system exhaust gas to gasifiers
- Diluent injection of nitrogen to reduce NO_x formation (combustion turbines)
- High efficiency drift eliminators for particulate matter emissions from cooling towers
- Good flare design for NO_x, SO_2, CO, VOCs, and PM_{10}
- Pre-combustion gas cleanup/use of scrubbed syngas for NO_x, SO_2, CO, VOCs, PM_{10}, sulfuric acid (H_2SO_4), and lead (combustion turbines)
- Limited hours of operation for NO_x, SO_2, CO, VOCs, and PM_{10} (emergency diesel generators, fire pumps, and auxiliary boiler).
- Use of low-sulfur diesel for NO_x, SO_2, CO, VOCs, and PM_{10} (emergency diesel generators and fire pumps)
- Use of natural gas as fuel (auxiliary boiler)
- Activated carbon bed(s) for mercury.

2.6 Connected Actions

2.6.1 Railroad

Railroad access to the facility would be necessary to import feedstock for the generating station and to export marketable sulfur. Currently, Burlington Northern Santa Fe Railway (BNSF) and Canadian National Railway (CNR) operate rail lines near the proposed facility sites. Construction of 2 miles of new track would be necessary to connect the West Range Site to an existing rail line shared by BNSF and CNR. Approximately 1.2 miles of this new alignment would overlap with track planned for the Minnesota Steel project. An additional 4 miles of loop track would be constructed within the site (Figure 2.6). The East Range Site would require less than 0.25 mile of new track to connect to an existing CNR rail line, plus an additional 3.2 miles of loop track within the site (Figure 2.7).

Addressing comments provided by the U.S. Army Corps of Engineers' in response to concerns related to avoiding and minimizing wetland impacts, Excelsior identified one option for the rail loop on the West Range Site, The optional rail loop would involve encircling the hill immediately to the northeast of Mesaba One. Given the reduced wetland impacts of this option, it is likely to emerge as the preferred approach for serving the IGCC Power Station.

2.6.2 Roads

Construction of a new section of road connecting the IGCC Power Station to existing roads would be necessary to allow vehicle access to the facility. The distance between the West Range Site and Itasca County Road (CR) 7, a two-lane highway paralleling the south and west sides of the West Range Site, varies between 0.25 and 0.5 miles . At one time, Itasca County officials had indicated a desire to reroute CR 7 to provide safer access to the West Range Site and Minnesota Steel property. Addressing comments provided by the U.S. Army Corps of Engineers' in response to concerns related to avoiding and minimizing wetland impacts, Excelsior identified a reduced-wetland-impact option for accessing the West Range Site. The optional access can be gained via a road approximately 3,200 feet in length and exiting CR 7 in a perpendicular direction to the north about 3,400 feet west of the access road.

The original access for the East Range Site was a looped roadway built off CR 666 to provide two access points to the facility. The length of the looped roadway was approximately 1.8 miles. However, as with the West Range Site, an optional access to the East Range Site was identified in order to avoid and minimize wetland impacts. For the East Range Site, optional access can be gained through use of only one road approximately 4,400 feet in length exiting CR 666 in a perpendicular direction to the west at about the same point as the southern arm of the loop road originally proposed.

Given the reduced wetland impacts of the two options, they are likely to emerge as the preferred approach for accessing the IGCC Power Station.

2.6.3 Natural Gas Supply Line

Although the IGCC Power Station is designed to use coal-derived syngas for electricity generation, the facility would also use natural gas during facility startup and as a backup fuel. This would require the construction and operation of a new natural gas pipeline connecting the facility to an existing pipeline system. At the West Range Site, Excelsior would construct one new 16-inch or 24-inch outside diameter (OD) gas line along 12.3 miles of new rights-of-way (ROW) (13.2 miles of total ROW are required) to connect to an existing 36-inch OD Great Lakes Gas (GLG) pipeline south of the site (Figure 2.8).

On April 3, 2008, the City of Nashwauk received a natural gas pipeline route permit for a pipeline that parallels the Project's natural gas pipeline ROW for virtually the entire distance from the GLG pipeline to the proposed IGCC Power Station Footprint. If Excelsior purchases its natural gas from the City of Nashwauk via the City's pipeline, Excelsior would not construct its own pipeline and thus could avoid pipeline construction-related impacts (i.e., the total habitat impacts discussed in Section 6.0 would decrease by approximately 143 acres).

The East Range Site has a 10-inch OD Northern Natural Gas (NNG) pipeline along its eastern boundary serving the nearby Cliffs Erie, Limited Liability Corporation (LLC; Cliffs Erie) plant, but this line has inadequate capacity to provide natural gas to the IGCC Power Station. Approximately 29 miles of new 16-inch OD pipeline would be looped within the existing NNG pipeline ROW to supply the East Range Site with natural gas (Figure 2.9). No new habitat impacts would be expected to occur outside the existing ROW.

2.6.4 Electrical Power Transmission Lines

Construction of new high voltage transmission line (HVTL) corridors would be required to connect the IGCC Power Station to existing substations of the power grid. The Blackberry substation, approximately 8.5 miles south-southeast of the West Range Site, would be the point of intersection with the power grid for the West Range Site (Figure 2.8). The Forbes substation, approximately 29 miles west-southwest of the East Range Site, would be the point of interconnection for the East Range Site (Figure 2.9). Several alternative ROWs for HVTL corridors at both sites have also been proposed.

2.6.5 Potable Water and Domestic Wastewater Lines

Personnel at the Project site would require potable water. Excelsior estimates that water demand would be approximately 30,000 gallons per day (gpd) during construction of the facility and 7,500 gpd once the facility is operational. At the West Range Site, Excelsior plans to construct a pipeline and receive water from the city of Taconite's water treatment system. Taconite's system currently lacks the capacity to provide water to the Project site at peak demand during construction, but the city has plans to improve the system to meet Project site needs. If these improvements were not made in time, Excelsior would construct an on-site water treatment system to provide the remaining water needed during the construction phase. A proposed alternative is to obtain all potable water via an on-site water treatment system. At the East Range Site, Excelsior plans to construct a pipeline and receive water from the city of Hoyt Lakes water treatment facility, which has the capacity to meet Mesaba Energy Project needs even at peak demand. A proposed alternative is to construct an on-site water treatment system.

Disposal of domestic wastewater would also be required at the facility. At the West Range Site, Excelsior plans to construct 10,000 feet of 12-inch OD gravity sewer, a pump station, and 2,400 feet of force main to connect the site to the main pump station of the Coleraine-Bovey-Taconite Wastewater Treatment Facility in the city of Taconite. A proposed alternative is to construct an on-site wastewater treatment facility that would discharge treated effluent to Little Diamond Lake, approximately 1.1 miles south of the generating facility, or Holman Lake, approximately 1.7 miles south of the generating facility. At the East Range Site, Excelsior plans to construct 9,500 feet of 12-inch OD gravity sewer, a pump station, and about 2,500 feet of 4-inch OD force main to connect the site to the city of Hoyt Lakes wastewater treatment facility. A proposed alternative is to construct an on-site wastewater treatment facility that would discharge treated effluent to Colby Lake, approximately 0.7 miles south of the generating facility.

3.0 Description of the Area that May Be Affected by the Project

A detailed description of the affected environment in the proposed Project area is provided in Chapter 3 of the Draft EIS. A summary of the Project area environment is as follows:

3.1 West Range Site and Corridors

The West Range Site comprises approximately 1,708 acres in the city of Taconite in Itasca County. The site is located on granite bedrock of the Giants Range batholith, covered by sand and gravel deposits from the most recent glaciation. In some areas of the site, organic soils have developed. The gasification facility would be constructed on the glacial till of the Nashwauk Moraine Association. Elevation within the proposed IGCC Power Station Footprint and Buffer Land ranges from approximately 1,340 to 1,480 feet above mean sea level. Outside of two high voltage transmission lines traversing the length of the site from north to south and another line from east to west in the northern areas of the site, the site is currently undisturbed by residential, commercial, or industrial development. Timber has been harvested historically and in recent years on the site (Figure 3.1), but the site may serve as a refuge for lynx and gray wolf.

The most common upland habitat within the West Range IGCC Power Station footprint is northern mesic hardwood forest (Tables 3-1 and 3-2). The canopy is dominated by 8- to 18-inch diameter at breast height (dbh) yellow birch (*Betula alleghaniensis*) and sugar maple (*Acer saccharum*), with a subcanopy comprised of small oaks (*Quercus* spp.) and maples (*Acer* spp.), honeysuckle (*Lonicera* spp.), ironwood (*Ostrya virginiana*), hazel (*Corylus* spp.), and serviceberry (*Amelanchier* spp.). Northern wet-mesic boreal hardwood-conifer forest is the second most common habitat within the site, and is dominated by paper birch (*Betula papyrifera*) with interspersed balsam fir (*Abies balsamea*) and occasional white pine (*Pinus strobus*), green ash (*Fraxinus pennsylvanica*), and sugar maple. The subcanopy includes immature red maple (*Acer rubrum*), basswood (*Tilia americana*), and aspen (*Populus* spp.). Other less common habitats within the site include monotypic, even-aged aspen stands and old fields in existing ROW. Collectively, these habitats include 1,368 acres within the West Range Site, of which 171 acres would be directly impacted by facility construction (Table 3.1). The majority of terrestrial habitat impacted within the site would be northern mesic hardwood forest.

Proposed utility/transportation corridors associated with the West Range Site pass through a variety of land cover types including several types of forests and grasslands. Approximately 270 acres of forest and grassland habitat exist within the preferred alternative utility/transportation corridors and would be impacted by the Project (Table 3.3). Deciduous forest is the most common land cover in these corridors, followed by mixed wood forest. The intensity and duration of these impacts would vary; some impacted acres would be within temporary ROW and regrowth of vegetation would begin immediately after construction activities cease, while other impacted would be in permanent ROW and vegetation clearing would be permanent.

Approximately 386 acres of wetlands have been delineated within the site and its associated utility and transportation corridors (Table 3.4; Figure 3.2). Wetlands were classified according to USFWS Circular 39 *Wetlands of the United States* (Shaw and Fredine 1956), *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979), and *Wetland Plants and Communities of Minnesota and Wisconsin* (Eggers and Reed 1997).

Table 3.5 describes the types of wetlands found in Minnesota. The most common wetland type in the West Range Site is wooded swamp (Type 7), which is vegetated with conifer trees such as tamarack (*Larix laricina*), black spruce (*Picea mariana*) and balsam fir, and deciduous trees such as red maple and black ash (*Fraxinus nigra*). Shrub swamp (Type 6) wetlands are also common in the Project area. The Project would directly impact approximately 57 acres of wetlands within the West Range Site (Table 3.6). Impacts would include wetland filling, temporary impacts, and type conversion (usually from shrub-covered or forested wetlands to emergent wetlands). Shrub swamp, wooded swamp, and bog wetlands (Type 8) would experience the greatest impacts.

3.2 Areas Surrounding the West Range Site

Land use surrounding the West Range Site includes residences, farms, mining, and other industrial operations (Figure 3.3). There are approximately 50 residences located within 1 mile of the proposed IGCC Power Station Footprint, including year-round residences, seasonal residences, and farmsteads. The residential neighborhoods of the City of Taconite are 1.5 miles south of the proposed Project site. Industries surrounding the West Range Site include a solid waste transfer station along the southern boundary of the site, mineral extraction operations approximately 2 miles to the south and 4.5 miles to the southeast, and the proposed Minnesota Steel Mine approximately 4 to 5 miles to the east. Abandoned mine pits are to the south and southeast of the site, including the Canisteo Mine Pit and Gross-Marble Mine Pit. Mine tailings piles and basins occur to the south, east, and west of the site.

With the exception of mine lands and residences, second-growth forest dominates the land around the site. Much of the forest land is actively managed for timber harvest but may serve as a refuge for lynx and gray wolf. State and national forests near the site include: Chippewa National Forest, approximately 6 miles northwest of the proposed Project site; Remer State Forest, approximately 22 miles southwest; George

Washington State Forest, approximately 11 miles north; Hill River State Forest, approximately 25 miles south-southwest; Savanna State Forest, approximately 25 miles south-southeast; and Golden Anniversary State Forest, approximately 12 miles south-southwest.

3.3 East Range Site and Corridors

The proposed East Range Site IGCC Power Station Footprint and Buffer Land comprises approximately 1,322 acres of property within the city limits of Hoyt Lakes in St. Louis County, on which Excelsior currently holds an option. Construction and operation activities would be confined within a smaller, 810-acre portion of this area (the boundaries of the 810-acre parcel are shown in Figure 2.2). The gasification facility would be located primarily on the bedrock of the Virginia formation, which is composed of argillite, siltstone, and greywacke. Glacial till of the Culver Moraine Association overlies bedrock within the site. Average elevation within the site is approximately 1,500 feet above mean sea level, with a north/south grade of 20 to 40 feet. As previously noted, with the exception of high voltage transmission line corridors traversing the site in east-west and north-south directions, the site currently is undisturbed by residential, commercial, or industrial development. Timber harvesting has occurred historically and in recent years on the site (Figure 3.4), but the site may serve as a refuge for lynx and gray wolf.

Northern mesic mixed forest habitat comprises most of the forest habitat within East Range Site. The canopy includes deciduous trees such as paper birch and quaking aspen (*Populus tremuloides*), and conifer trees such as balsam fir, white pine, red pine, and white spruce. Beaked hazel (*Corylus cornuta*), honeysuckle, mountain maple (*Acer spicatum*), and young balsam fir are common in the sub-canopy. The East Range Site encompasses approximately 416 acres of northern wet-mesic mixed forest habitat, of which 133 acres would be directly impacted by facility construction (Table 3.7).

Proposed utility/transportation corridors associated with the East Range Site pass through a variety of land cover types including several types of forests and grasslands. Approximately 360 acres of forest and grassland habitat currently exist within the preferred alternative utility/transportation corridors and would be impacted by the proposed Project (Table 3-8). Mixed wood forest is the most common land cover in these corridors, followed by shrubby grassland. The intensity and duration of these impacts would vary; some impacted areas would be within temporary ROW and regrowth of vegetation would begin immediately after construction activities cease, while other impacted areas would be in permanent ROW and vegetation clearing would be permanent.

Approximately 717 acres of wetlands have been delineated within the site and its associated utility and transportation corridors (Table 3.9; Figure 3.5). Shrub swamp, wooded swamp, and bog wetlands are the dominant wetland types in the Project area. The Project would directly impact approximately 61 acres of wetlands within the East Range Site and its utility/transportation corridors (Table 3.10). Impacts would include wetland filling, temporary impacts, and vegetation type conversion. Shrub swamp, wooded swamp, and bog wetlands would experience the greatest impacts.

3.4 Areas Surrounding the East Range Site

Land use surrounding the proposed East Range Site includes residences, mining, and other industrial operations (Figure 3.6). The nearest residences are located over 1 mile south of the proposed IGCC Power Station Footprint. Land to the north and west of the site is part of a mining complex that was owned by LTV Steel Mining Co. and shut down in February 2001 after many years of active mining. At the time, the complex was made up of three active and eight inactive mining areas. Cleveland Cliffs Inc. (CCI) acquired the mine and related mining assets in the fourth quarter of 2001 as part of a bankruptcy transaction. With the acquisition, Cliffs Erie LLC (a subsidiary of CCI) inherited the responsibility for reclaiming the complex. At present, some of the existing mine dumps - piles of ore, tailings (waste rock) or overburden – have been seeded with grasses and oats and have established good growth. Cliffs Erie has recently sold or optioned most of the property

originally acquired. Current owners of land associated with the mining complex that hold property nearby the East Range Site include Cliffs Erie, PolyMet Mining, Inc., and Steel Dynamics, Inc. (SDI). Industries near the site include: the Mesabi Nugget iron nugget manufacturing plant (located approximately 3 miles northwest of the Footprint); the Syl Laskin Energy Center, a coal-fired power plant owned by Minnesota Power and located approximately 1.3 miles to the southwest in the Laskin Energy Park; and a proposed PolyMet mining operation on Cliffs Erie property, approximately 3 miles to the north and northeast. Mine pits are found to the west, northwest, north, and northeast of the site, and waste rock piles are located along the western site boundary and 0.25 miles to the northeast of the site. SDI, one of the two parent companies of Mesabi Nugget, is known to be assembling a permit application to re-open mining areas immediately north of the large waste rock pile adjacent to the western boundary. Operations to conduct surface mining of iron deposits, and to construct and operate a facility for the concentrating of iron ore could begin in late 2009 or early 2010, assuming the timely issuance of permits.

With the exception of mine lands and residences, second-growth forest dominates the land in the proposed IGCC Power Plant Footprint and Buffer Land. Much of the forest land is actively managed for timber harvest but may serve as a refuge for lynx and gray wolf. State and national forests near the site include: Bear Island State Forest, approximately 9 miles north of the proposed Project; Finland State Forest, approximately 15 miles east; Cloquet Valley State Forest, approximately 16 miles south; Sturgeon River State Forest, approximately 20 miles northwest; and Superior National Forest, within which the proposed IGCC Power Plant Footprint and Buffer Land is located. The boundary of Superior National Forest lies immediately north of the site, less than 2 miles from the western site boundary, and includes much of the land to the east and south.

4.0 Listed Species or Critical Habitat that May Be Affected and their Status

Section 7 of the ESA requires the responsible federal agency (the DOE) to consult with the USFWS regarding federally-designated threatened or endangered species. The Canada lynx and gray wolf are the only federally listed species that may use the proposed Project sites. The bald eagle (*Haliaeetus leucocephalus*) has recently been delisted in Minnesota and no longer requires consultation with the USFWS. There are no federally listed plants or fish species in the Project areas.

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies. The proposed Project sites do not lie within or near any currently designated critical habitat for the lynx (the nearest critical habitat is in Voyageurs National Park approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site (Federal Register 2006a). On February 29, 2008, the USFWS published in the Federal Register (Federal Register 2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. As of January 31, 2009, the proposed rule was still under review by the USFWS.

In response to their vastly declining numbers range wide, the gray wolf was determined to be endangered in 1967 under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the Endangered Species Act (Federal Register 1974), and the Minnesota population was reclassified to threatened in 1977 (Federal Register 1977). In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS; Federal Register 2003a) to more effectively manage the species; the Minnesota population is a designated portion of the Eastern DPS. In March 2006, the USFWS proposed to designate gray wolves in the Western Great Lakes region as a distinct population segment (DPS) under the ESA and to remove wolves from Minnesota, Wisconsin, and Michigan from listing under the ESA. The Western Great Lakes DPS included Minnesota, Wisconsin, and Michigan as well as parts of North Dakota, South Dakota, Iowa, Illinois, Indiana, and Ohio (Federal Register 2006b). In March 2007, the USFWS removed the gray wolf from the endangered species list (Federal Register 2007). In

September 2008, the U.S. District Court for the District of Columbia overturned the Department of Interior's decision to remove the Great Lakes DPS of the gray wolf from federal ESA protection; the USFWS issued a rule in December 2008 to comply with court orders reinstating regulatory protections for the gray wolf in the western Great Lakes and northern Rocky Mountains (Federal Register 2008b).

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3. Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest.

5.0 Biological Assessment Methodology

5.1 Literature Review

This section is based on information (and references cited therein) in the *Recovery Plan for the Eastern Timber Wolf* (USFWS 1992); *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000); *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a), *Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule* (Federal Register 2000); *Biological Opinion on the Effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada Lynx (Lynx canadensis) in the Contiguous United States* (USFWS 2000); *Winter 2000 Wildlife Survey for the Proposed NorthMet Mine Site, St. Louis County, Minnesota* (ENSR 2000); *Minnesota Wolf Management Plan* (MnDNR 2001); *Endangered and Threatened Wildlife and Plants: Notice of Remanded Determination of Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule* (Federal Register 2003b); *Biological Opinion for the Revised Land and Resource Management Plans (Forest Plans) for the Chippewa and Superior National* Forests (USFWS 2004); *NorthMet Mine Summer Fish and Wildlife Study* (ENSR 2005); Endangered *and Threatened Wildlife and Plants: Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx* (Federal Register 2006a); *Canada Lynx Assessment* for the proposed NorthMet Mine Project (ENSR 2006); *Final Rule Designating the Western Great Lakes Populations of Gray Wolves as a Distinct Population Segment; Removing the Western Great Lakes Distinct Population Segment of the Gray Wolf From the List of Endangered and Threatened Wildlife* (Federal Register 2007); and *Canada Lynx Assessment* for the proposed Minnesota Steel Mine Project (ENSR 2007).

5.2 Database Inquiries

ENSR reviewed the Canada Lynx Sightings in Minnesota 2000-2007 Database (MnDNR 2007) for lynx sightings near the study areas. ENSR also reviewed the Wolf Telemetry Database (International Wolf Center 2007) for wolf sightings near the study areas.

5.3 Consultation with Biologists with Local Knowledge of the Species

ENSR conducted telephone and in-person interviews with agency staff, (MnDNR regional biologist and lynx biologist, U.S. Fish and Wildlife Service regional biologist, U.S. Forest Service Superior National Forest biologist (Aurora and Ely, Minnesota offices), and International Wolf Center wildlife biologist. The information received from these contacts was used to gain information on Canada lynx and gray wolves likely to be found in the study areas and species of interest to state and federal agencies.

5.4 Field Studies

Two recent Canada lynx winter tracking surveys have been conducted in the vicinity of the proposed Project sites: 1) a 2006 survey at PolyMet Mining Company's NorthMet Mine, approximately 9 miles northeast of the East Range Site (ENSR 2006); and 2) a 2007 survey at the Minnesota Steel Mine site, approximately 5 miles east of the West Range Site (ENSR 2007). Because of the proximity and similarity in habitat types between the PolyMet and Minnesota Steel sites and the proposed Project sites, information on lynx distribution and habitat use from these ENSR surveys is used in this BA.

The NorthMet Mine lynx survey was conducted during January through March of 2006. Six hundred sixteen miles of transect were surveyed in seven townships, including Township 59 North, Range 14 West, which encompasses the majority of the East Range Site. The East Range Site is located in the southwest corner of the NorthMet Mine lynx survey area. Tracks and scat of four female lynx were identified during the survey, concentrated in areas approximately 10 miles west and 18 miles northwest of the East Range Site. Lynx sign was most common in dense conifer forests of balsam fir and jack pine (*Pinus banksiana*). ENSR concluded that at least three lynx reside in the survey area. No evidence of lynx was found in Township 59 North, Range 14 West, and ENSR found this township to have the least amount of suitable lynx habitat of all townships surveyed, due to extensive mining operations and recent logging. However, in the relatively undisturbed southeast portion of the township, near the East Range Site, lynx use was considered likely.

The Minnesota Steel Mine site survey was conducted by ENSR during January through March of 2007 (ENSR 2007). Six hundred fourteen miles of transect were surveyed in seven townships, including Township 56 North, Range 24 West, which encompasses all of the West Range Site. The West Range Site is located in the southwest corner of the Minnesota Steel Mine survey area. No evidence of lynx was found during the survey, but evidence of bobcat (*Lynx rufus*) was common. Survey routes intercepted bobcat tracks at 56 locations, and 4 bobcat scat samples were collected. DNA analysis of the scat samples indicated that they were from four unique bobcats, none of which was an F1 lynx-bobcat hybrid. ENSR concluded that it is unlikely that any lynx reside in the survey area, but that lynx may travel through the area. Most of the habitat in Township 56 North, Range 24 West was found to be marginal or unsuitable lynx habitat because of mining operations in the area. The northeast corner of the township, which includes the West Range Site, was identified as having the greatest potential for lynx use.

Wildlife surveys were conducted in 2000, 2004, and 2008 for Canada lynx, gray wolf, and other wildlife for the NorthMet Mine Project located about 10 miles east of the East Range site (ENSR 2000, 2005, 2009). These surveys included howling surveys for wolves and track surveys for Canada lynx and gray wolves.

6.0 Analysis and Determination of Effects

Section 6 includes background information and an analysis of the effects of the proposed Project on the species covered by this BA. In the first part of each section, background information on species abundance and distribution, habitat requirements, reproductive biology and life history, and current status and presence/absence of designated critical habitat is provided. Potential beneficial, direct, indirect, interdependent, and interrelated threats to the species that are unrelated to the proposed action, and that may result in cumulative effect as a result of the proposed action, are presented in Section 6.3, Analysis of Cumulative Effects (for a more detailed discussion of types of effects, see USFWS and NMFS 1998). These effects are defined as follows:

- Beneficial – Effects of an action that are wholly positive, without any adverse effects, on a listed species or designated critical habitat. Determination that an action will have beneficial effects is a "may effect" situation.

- Direct – The direct or immediate effects of the project on the species or its habitat. Direct effects result from the proposed action including the effects of interrelated actions and interdependent actions.

- Indirect – Effects caused by or resulting from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action.

- Interdependent – Effects that result from an activity that has no independent utility apart from the action under consideration.

- Interrelated – Effects that result from an activity that is part of the proposed action and depends on the proposed action for its justification.

- Cumulative – Include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

The effects assessment is based on the following factors:

- the dependency of the species on specific habitat components;

- habitat abundance;

- population levels of the species;

- the degree of habitat impact; and

- the potential to mitigate for an adverse effect.

For the purposes of this assessment, the action area includes those areas within 6 miles of proposed Project disturbance, or approximately 250 square miles (mi^2). This area was identified by the USFWS as the minimum area that needed to be assessed to identify lynx that could be impacted by the proposed Project (Burke 2006). The USFWS felt that lynx having territories further than 6 miles from the mine project would likely not be directly affected by the Project. This same area was also used to assess potential impacts to wolves from the Project.

The area of analysis for the cumulative effects assessments is the Arrowhead Region of Minnesota. This area includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota.

6.1 Canada Lynx

6.1.1 Environmental Baseline

6.1.1.1 Species Description and Status and Critical Habitat Status

The lynx is a medium-sized cat with long legs. Adult males average 22 pounds in weight and 33.5 inches in length (head to tail), and females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

The bobcat is a North American relative of the lynx. Compared to the lynx, the bobcat has smaller paws, shorter ear tufts, and a more spotted pelage (coat), and only the top of the tip of the tail is black. The paws of the lynx have twice the surface area as those of the bobcat. The lynx also differs from the bobcat in its body proportions; lynx have longer legs, with hind legs that are longer than the front legs, giving the lynx a ''stooped'' appearance (Quinn and Parker 1987). Bobcats are largely restricted to habitats where deep snows do not accumulate (Koehler and Hornocker 1991). Hybridization (breeding) between lynx and bobcat was first documented in 2002 in Minnesota (Schwartz et al. 2004).

Classification of the lynx (also called the North American lynx) has been subject to revision. In accordance with Wilson and Reeder (1993), the USFWS currently recognizes the lynx in North America as *Lynx canadensis.* The USFWS previously used the scientific name *L. lynx canadensis* for the lynx (Jones et al. 1992). Other scientific names still in use include *Felis lynx* or *F. lynx canadensis* (Jones et al. 1986; Tumlison 1987).

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies (Federal Register 2000). On November 9, 2006, the USFWS designated 317 mi^2 as critical habitat in Voyageurs National Park (Federal Register 2006a). Voyageurs National Park is approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site (Federal Register 2006a). The lynx is afforded no special status under Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895), which requires the MNDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of December 31, 2008.

6.1.1.2 Distribution

The historical and present range of the lynx north of the contiguous United States includes Alaska and the portion of Canada extending from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982, Quinn and Parker 1987).

In the contiguous United States, the distribution of the lynx is associated with the southern boreal forest, comprised primarily of subalpine coniferous forest in the West and mixed coniferous/deciduous forest in the East (Aubry et al. 2000). In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; McKelvey et al. 2000a). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx species is highly adapted (Ruggiero et al. 2000a).

Lynx in the contiguous United States are part of a larger metapopulation whose core is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk et al. 2000; McKelvey et al. 2000a, b). The boreal forest extends south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the West, the western Great Lakes Region, and the Appalachian Mountain Range of the northeastern United States. At its southern margins, the boreal forest becomes naturally fragmented into patches of varying size as it transitions into other vegetation types. These southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of the lynx range. Lynx are considered “not at risk” in Canada (Committee on the Status of Endangered Wildlife in Canada 2006).

Many of these southern boreal forest habitat patches within the contiguous United States are able to support resident populations of lynx and their primary prey species. It is likely that some of the habitat patches act as sources of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 2000b). Other habitat patches act as ‘‘sinks’’ in which lynx mortality is greater than recruitment and lynx are lost from the overall population. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances (i.e., fire, clearcutting). In addition, fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. The term ‘‘resident population’’ refers to a group of lynx that has exhibited long-term persistence in an area based on a variety of factors, such as evidence of reproduction, successful recruitment into the breeding cohort, and maintenance of home ranges. The word ‘‘transient’’ refers to a lynx moving from one place to another within suitable habitat. The word “dispersing’’ refers to lynx that have left suitable habitat for various reasons, such as competition or lack of food. When dispersing lynx leave suitable habitat and enter habitats that are unlikely to sustain them, these individuals are considered lost from the metapopulations unless they return to boreal forest.

6.1.1.3 Population Dynamics

Density

Lynx numbers and snowshoe hare densities in the contiguous United States generally do not get as high as those in the center of their range in Canada, and there is no evidence they ever did so in the past (Hodges 2000a, b; McKelvey et al. 2000a). It appears that northern and southern hare populations have similar cyclic dynamics, but that in southern areas both peak and low densities are lower than in the north (Hodges 2000b). However, it is unclear whether hare populations cycle everywhere in the contiguous United States. Relatively low snowshoe hare densities at southern latitudes are likely a result of the naturally patchy, transitional boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those of the expansive northern boreal forest (Wolff 1980, Buehler and Keith 1982, Koehler 1990, Koehler and Aubry 1994). Additionally, the presence of more predators and competitors of hares at southern latitudes may inhibit the potential for high-density hare populations with extreme cyclic fluctuations (Wolff 1980). As a result of naturally lower snowshoe hare densities, lynx densities at the southern part of the range rarely achieve the high densities that occur in the northern boreal forest (Aubry et al. 2000).

Lynx and Snowshoe Hare Relationships

The association between lynx and snowshoe hare is considered a classic predator-prey relationship (Saunders 1963a, van Zyll de Jong 1966, Quinn and Parker 1987). In northern Canada and Alaska, lynx populations fluctuate on approximately 10-year cycles that follow the cycles of hare populations (Elton and Nicholson 1942; Hodges 2000a, b; McKelvey et al. 2000a). Generally, researchers believe that when hare populations are at their cyclic high, the interaction of predation and food supply causes the populations to decline drastically (Buehler and Keith 1982; Krebs et al. 1995; O’Donoghue et al. 1997). There is little evidence of regular snowshoe hare cycles in the Northeast and southern Quebec (Hoving 2001), but hare populations do fluctuate widely in this region. Hare fluctuations in this region may be more influenced by forest practices, weather, and other ecological factors. Snowshoe hare provide the quality prey necessary to support high-density lynx populations (Brand and Keith 1979). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis et al. 1972; Brand et al. 1976; McCord and Cardoza 1982; O’Donoghue et al. 1997, 1998a). Red squirrels *(Tamiasciurus hudsonicus)* are an important alternate prey (O’Donoghue et al. 1997, 1998a; Apps 2000; Aubry et al. 2000). However, a shift to alternate food sources may not sufficiently compensate for the decrease in hares consumed to be adequate for lynx reproduction and kitten survival (Brand and Keith 1979, Koehler 1990, Koehler and Aubry 1994). When snowshoe hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, if any are born during this time; as a result, recruitment of young into the population nearly ceases during cyclic lows of snowshoe hare populations (Nellis et al. 1972;

Brand et al. 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Mowat et al. 2000).

Home Range and Dispersal

Lynx require very large areas containing boreal forest habitat. In the Northeast, lynx are most likely to occur in areas containing suitable habitat that were greater than 40 mi^2 (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies by the animal's gender and age, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 2000; Mowat et al. 2000). Based on a limited number of studies in southern boreal forests, the average home range is 58 mi^2 for males, and 28 mi^2 for females (Aubry et al. 2000). Recent home range estimates from Maine are 27 mi^2 for males and 20 mi^2 for females. However, documented home ranges in both the southern and northern boreal forest vary widely from 3 to 300 mi^2 (Saunders 1963b; Brand et al. 1976; Mech 1980; Parker et al. 1983; Koehler and Aubry 1994; Apps 2000; Mowat et al. 2000; Squires and Laurion 2000). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the West, are a response to lower-density snowshoe hare populations (Koehler and Aubry 1994, Apps 2000, Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse. Long-distance movements (greater than 60 miles) are characteristic (Mowat et al. 2000). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; Koehler and Aubry 1994; O'Donoghue et al. 1997; Poole 1997). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges. Lynx are capable of moving extremely long distances (greater than 300 miles; Brainerd 1985; Washington Department of Wildlife 1993; Poole 1997; Mowat et al. 2000); for example, a male was documented traveling 380 miles (Brainerd 1985). While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing large, unforested openings. The ability of both male and female lynx to disperse long distances, crossing unsuitable habitats, indicates they are capable of colonizing suitable habitats and finding potential mates in areas that are isolated from source lynx populations.

Mortality

Common causes of mortality for lynx include starvation of kittens (Quinn and Parker 1987, Koehler 1990), and trapping (Ward and Krebs 1985; Bailey et al. 1986). Lynx mortality due to starvation has been shown in cyclic populations of the northern taiga, during the first 2 years of snowshoe hare scarcity (Pool 1994, Slough and Mowat 1996). During periods of low snowshoe hare numbers, starvation can account for up to two-thirds of all natural lynx deaths. Trapping mortality may be additive rather than compensatory during the low period of the snowshoe hare cycle (Brand and Keith 1979). Hunger-related stress, which induces dispersal, may increase exposure of lynx to other forms of mortality such as trapping and vehicle collisions (Brand and Keith 1979; Carbyn and Patriquin 1983; Ward and Krebs 1985; Bailey et al. 1986).

Predation on lynx by mountain lion (*Puma concolor*), coyote, wolverine (*Gulo gulo*), gray wolf, and other lynx has been observed (Berrie 1974; Koehler et al. 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Apps 2000; Squires and Laurion 2000). Squires and Laurion (2000) reported two of six mortalities of radio-collared lynx in Montana were due to mountain lion predation.

Interspecific Relationships with Other Carnivores

Buskirk et al. (2000b) described the two major competition impacts to lynx as exploitation (competition for food) and interference (avoidance). Of several predators examined (birds of prey, coyote, gray wolf, mountain lion, bobcat, and wolverine), it was deemed that coyotes were the most likely to pose local or regionally important

exploitation impacts to lynx, and coyotes and bobcats were deemed to possibly impart important interference competition effects on lynx. Mountain lions were described as interference competitors, possibly impacting lynx during summer and in areas lacking deep snow in winter, or when high elevation snow packs develop crust in the spring.

In southern portions of snowshoe hare range, predators may limit hare populations to lower densities than in the taiga (Dolbeer and Clark 1975, Wolff 1980, Koehler and Aubry 1994). Exploitation competition may contribute to lynx starvation and reduced recruitment. During periods of low snowshoe hare numbers, starvation accounted for up to two-thirds of all natural lynx deaths in the Northwest Territories of Canada (Poole 1994).

Parker et al. (1983) discussed anecdotal evidence of competition between bobcats and lynx. On Cape Breton Island, Nova Scotia, lynx were found to be common over much of the island prior to bobcat colonization. Concurrent with the colonization of the island by bobcats, lynx densities declined and their presence on the island became restricted to the highlands, the one area where bobcats did not become established.

Predation on adult lynx has rarely been observed and recorded in the literature. Predators of lynx include mountain lion, coyote, wolverine, gray wolf, and other lynx. The magnitude or importance of predation on lynx is unknown.

Behavioral Response to Humans

Staples (1995) described lynx as being generally tolerant of humans. Other anecdotal reports also suggest that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000) and ski area activities (Roe et al. 1999).

In a lightly roaded study area in north central Washington, logging roads did not appear to affect habitat use by lynx (McKelvey et al. 2000c). In contrast, six lynx in the southern Canadian Rocky Mountains crossed highways within their home ranges less than would be expected (Apps 2000). The latter study area contained industrial road networks, twin-tracked railway, and 2 to 4-lane highways with average daily traffic volumes of about 1,000 to 8,000 vehicles per day.

6.1.1.4 Habitat Requirements

To understand habitat relationships of lynx one must first understand the habitat relationships of snowshoe hares. Snowshoe hares use spruce and fir forests with dense understory vegetation that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe et al. 1982; Monthey 1986; Hodges 2000a, b). Generally, earlier succession (younger) forest stages have greater understory structure than do mature forests and, therefore, support higher hare densities (Fuller 1999; Hodges 2000a, b). Lynx generally concentrate their hunting activities in areas where hare populations are high (Koehler et al. 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray et al. 1994; O'Donoghue et al. 1997, 1998a). In Maine, snowshoe hare abundance and lynx occurrence are positively associated with late regeneration forests (forest stands that are growing back 12 to 30 years after being clear-cut and have greater than 50 percent canopy closure), evidence that lynx are selecting habitat primarily on the abundance of primary prey (Hoving 2001).

Diet

Snowshoe hares are the primary prey to lynx, comprising 35 to 97 percent of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species include red squirrel, several species of grouse (*Bonasa umbellus*, *Dendragopus obscurus, Canachites canadensis*, *Lagopus* spp.), flying squirrel (*Glaucomys sabrinus*), ground squirrel (*Spermophilus parryii*, *Spermophilus richardsonii*), porcupine (*Erethrizon dorsatum*), beaver (*Castor canadensis*), mice (*Peromyscus* spp.), voles (*Microtus* spp.), shrews (*Sorex* spp.), fish, and ungulates as carrion or occasionally as prey (Saunders 1963a; van Zyll de Jong 1966; Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Koehler 1990; Staples 1995; O'Donoghue et al. 1998b).

The importance of other prey species, especially red squirrel, increases in the diet during periods when snowshoe hares become scarce (Brand et al. 1976; O'Donoghue et al. 1998b; Apps 2000; Mowat et al. 2000). However, Koehler (1990) suggested that a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens.

Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. Mowat et al. (2000) reported that summer diets consist of less snowshoe hare and more alternate prey species than winter diets.

There has been limited research on the lynx diet in the southern portions of its range. Southern populations may prey on a wider diversity of species than northern populations because of lower snowshoe hare densities and differences in small mammal communities. In areas characterized by patchy distribution of lynx habitat, lynx may prey opportunistically on other species that occur in adjacent habitats, including white-tailed jackrabbit (*Lepus townsendii*), black-tailed jackrabbit (*Lepus californicus*), sage-grouse (*Centrocercus urophasianus*), and Columbian sharp-tailed grouse (*Tympanichus phasianellus*; Quinn and Parker 1987, Lewis and Wenger 1998).

Den Site Selection

Lynx den sites are found where coarse woody debris, such as downed logs and windfalls, provides denning sites with security and thermal cover for lynx kittens (McCord and Cardoza 1982, Koehler 1990, Koehler and Brittell 1990, Slough 1999, Squires and Laurion 2000). The integral component for all lynx den sites appears to be the amount of downed woody debris present rather than the age of the forest stand (Mowat et al. 2000). In Washington, lynx denned in lodgepole pine *(Pinus contorta),* spruce *(Picea* spp.), and subalpine fir *(Abies lasiocarpa)* forests older than 200 years with an abundance of downed woody debris (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/lodgepole pine forest with abundant downed logs and dense understory (Squires and Laurion 2000).

6.1.1.5 Range of Lynx within the Contiguous United States

Within the contiguous United States, the lynx's range coincides with that of the southern margins of the boreal forest along the Appalachian Mountains in the Northeast, the western Great Lakes, and the Rocky Mountains and Cascade Mountains in the West (Figure 6.1). In these areas, the boreal forest is at its southern limits, becoming naturally fragmented into patches of varying size as it transitions into subalpine forest in the West and deciduous temperate forest in the East (Agee 2000). Because the boreal forest transitions into other forest types to the south, scientists have difficulty mapping its exact boundaries (Elliot-Fisk 1988). Precisely identifying and describing the distribution of lynx habitat also is difficult because there are several vegetation and landform classifications and descriptions that have been published for various parts of North America (U.S. Forest Service and Bureau of Land Management 1999). However, the term "boreal forest" broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

In addition to appropriate vegetation type, delineation of the range of the lynx within the contiguous United States must consider snow conditions. Lynx are at a competitive advantage over other carnivores (e.g., bobcats or coyote) in areas that have cold winters with deep snow because of their morphological adaptations for hunting and surviving in such environments. Therefore, lynx populations may not be able to successfully compete and persist in areas with insufficient snow even if suitable forest conditions otherwise appear to be present (Ruediger et al. 2000; Ruggiero et al. 2000b; Hoving 2001). A consistent winter presence of bobcats indicates an area that is not of high quality for lynx.

Lynx in the contiguous United States are part of a larger metapopulation whose center is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk et al. 2000;

McKelvey 2000a, b). When there is a high in the lynx population in central Canada, it acts like a wave radiating out to the margins of the lynx range. The magnitude of the lynx population high emanating from the central Canadian boreal forest varies for each cycle (McKelvey et al. 2000a, b). This wave can be produced by local populations reacting to environmental conditions, dispersers, or a combination of these (McKelvey et al. 2000a). Schwartz et al. (2002) concluded this wave is driven by dispersers, based on findings of a high level of gene flow between lynx in Alaska, Canada, and the western United States.

An example of the cyclic population ‘‘wave’’ occurred in the 1960s and 1970s, when numerous lynx were reported in the contiguous United States far from source populations. These records of dispersing lynx correlate to unprecedented cyclic lynx highs in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey et al. 2000a; Mowat et al. 2000). These dispersers frequently were documented in areas, such as Wisconsin, that are close to source populations of lynx in Canada or possibly northeastern Minnesota and that contain some boreal forest. But there also have been a number of occurrences of dispersers in unsuitable habitats far from source populations, such as the North Dakota prairie (Adams 1963; Gunderson 1978; Thiel 1987; McKelvey et al. 2000a).

Lynx populations in the northeastern United States and southeastern Canada are separated from those in north central Canada by the St. Lawrence River. There is little evidence of regular hare or lynx population cycles in this area (Hoving 2001), but wide fluctuations in lynx and snowshoe hare populations do occur. On a smaller scale, fluctuating populations in the core of this area (Quebec’s Gaspé Peninsula, western New Brunswick, and northern Maine) can potentially influence lynx distribution up to several hundred miles distant.

Lynx dispersing during periods of population highs will occupy many patches of boreal habitat at the periphery of their range. Some patches will be suitable to maintain a long-term population and some will not. Where the boreal forest habitat patches within the contiguous United States are large, with suitable habitat, prey, and snow conditions, resident populations of lynx are able to survive throughout the low period of the approximately 10-year cycle. Most likely the influx of lynx from populations in Canada at the high point of the cycle augments these resident populations. It is likely that some of these habitat patches within the contiguous United States are able to act as sources of lynx (where recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 2000b).

In other areas, the lynx that remain in an area after a cyclic population high may be so few or in naturally marginal habitat that they are not able to persist or establish local populations, although some reproduction may occur. Such areas naturally act as population sinks (McKelvey et al. 2000b). Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat naturally becomes patchier and more distant from larger lynx populations. Lynx found in these sink habitats are considered dispersers, but are usually included within the species range. Changes in the habitat conditions or cyclic fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. Through this natural process, local lynx populations in the contiguous United States may ‘‘blink’’ in and out as the metapopulation goes through the 10-year cycle. Where habitat is of high enough quality and quantity, resident lynx populations are able to become established or existing populations are augmented, aiding in their long-term persistence.

Some maps (e.g., Hall and Kelson 1959) incorrectly portray the range of the lynx by encompassing peripheral records from areas that are not within boreal forest or do not have cold winters with deep snow, such as prairie or deciduous forest. Such maps have led to a misperception that the historic range of the lynx in the contiguous United States was once much more extensive than ecologically possible. Records of lynx outside of southern boreal forest in peripheral habitats that are unable to support lynx represent long-distance dispersers that are lost from the metapopulation unless they return to boreal forest and contribute to the persistence of a population. These unpredictable and temporary occurrences are not included within either the historic or current range of lynx because they are well outside of lynx habitat. This includes records from Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South

Dakota, and Virginia (Hall and Kelson 1959; Burt 1954 *as cited in* Brocke 1982; Gunderson 1978; McKelvey et al. 2000a). States that support some boreal forest and have frequent records of lynx are assumed to be the historic and current species range; these states include Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

6.1.1.6 Lynx Distribution within Great Lakes Region

The majority of lynx occurrence records in the Great Lakes Region are associated with the mixed deciduous-coniferous forest type (McKelvey et al. 2000a). Within this general forest type, the highest frequency of lynx occurrences have been in white spruce (*Picea glauca*), balsam fir, jack pine, white pine, red pine, black spruce, and mixed black spruce and tamarack forest types. These forest types are found primarily in northern Minnesota, northern Wisconsin, and Michigan's Upper Peninsula.

Although the mixed deciduous-coniferous forest covers an extensive area in the Great Lakes Region, much of this area may be marginal habitat for lynx because it is a transitional forest type at the edge of the snowshoe hare range. Habitat at the edge of hare range supports lower hare densities (Buehler and Keith 1982) that may not be sufficient to support lynx reproduction. Furthermore, appropriate habitat with snow depths that allow lynx a competitive advantage over other carnivores (e.g., coyotes) occur only in limited areas in northeastern Minnesota, extreme northern Wisconsin, and Michigan's Upper Peninsula.

The historic status of lynx in the Great Lakes Region is uncertain. Minnesota has a substantial number of lynx reports (McKelvey et al. 2000a), which is expected because of the connectivity of the boreal forest with that of Ontario, Canada, where lynx occur. Wisconsin and Michigan have substantially fewer records of lynx (McKelvey et al. 2000a). Researchers have debated whether lynx in this region are simply dispersing individuals emigrating from Canada, are members of a resident population, or are a combination of a resident population and dispersing individuals (McKelvey et al. 2000a). Recent research efforts in Minnesota have confirmed a resident population of lynx. Reproduction has been documented in all years since 2001. However, there are a few records of lynx occurrence in Michigan and Wisconsin during this same period.

6.1.1.7 Baseline Environment of the Great Lakes Geographic Area

Lynx are found within several geographic areas within the United States: the Cascade Mountains Geographic Area, Northern Rocky Mountains Geographic Area, Southern Rocky Mountains Geographic Area, Great Lakes Geographic Area, and Northeast Geographic Area. These geographic areas are separated from each other by expanses of unsuitable habitats that limit or preclude lynx movement, except the Northern Rockies and Cascades (Federal Register 2000).

Canada lynx in northern Minnesota are found within the Great Lakes Geographic Area. The Great Lakes Geographic Area encompasses northeastern and north-central Minnesota, northern Wisconsin, and the Upper Peninsula and northern portions of Michigan. The majority of lynx occurrence records in the Great Lakes Geographic Area are associated with the mixed deciduous-coniferous habitat type (McKelvey et al. 2000a). About 4.5 million of the 6 million acres of Forest Service-administered lands in the Great Lakes Geographic Area are mapped as primary lynx habitat. These lands comprise about 19 percent of all lynx habitat within the Great Lakes Geographic Area. About 2 million acres are included within non-developmental land allocations where natural processes are expected to predominate. Private lands account for about 81 percent of the lynx habitat within the Great Lakes Geographic Area.

6.1.1.8 Status of Canada Lynx within the Great Lakes Geographic Area

The proposed Project area is within the Great Lakes Geographic Area and is within the species range. Approximately 317 mi^2 in northern Minnesota (Voyageurs National Park) has been designated as critical habitat and is within this Geographic Area (Federal Register 2006). Voyageurs National Park is approximately

50 miles northwest of the proposed Project sites. Additionally, the USFWS has proposed to revise critical habitat to include all of Lake and Cook counties and the majority of St. Louis County in the Great Lakes Geographic Area (Federal Register 2008a).

6.1.1.9 Historical Records of Lynx in Northern Minnesota

The majority of lynx occurrence records are from the northeastern portion of Minnesota; however, dispersing lynx have been found throughout Minnesota outside of typical lynx habitat (Figure 6.2; Gunderson 1978; Mech 1980; McKelvey et al. 2000a). In northeastern Minnesota, where deep snow accumulates, suitable lynx and snowshoe hare habitat is present. Much of this area is protected as designated wilderness, including the Boundary Waters Canoe Area Wilderness. Furthermore, these habitats are contiguous with the boreal forest in southern Ontario. Until 1965, lynx had a bounty placed on them in Minnesota. In 1976, the lynx was classified as a game species, and harvest seasons were established (DonCarlos 1994). Harvest and bounty records for Minnesota are available since 1930. Approximate 10-year cycles are apparent in the data, with highs in the lynx cycle in 1940, 1952, 1962, and 1973 (Henderson 1978; McKelvey et al. 2000a). During a 47-year period (1930–1976), the Minnesota lynx harvest was substantial, up to 400 lynx in a year (Henderson 1978). These harvest returns for Minnesota are believed to be influenced by influxes of lynx from Canada, particularly in the 1960s and 1970s (Henderson 1978; Mech 1980; DonCarlos 1994; McKelvey et al. 2000a). When an anticipated lynx cyclic high for the early 1980s did not occur, the harvest season was closed in 1984 (DonCarlos 1994) and remains closed today.

Reproduction and maintenance of home ranges by lynx in Minnesota was documented in the early 1970s (Mech 1973, 1980), which may be evidence of a resident population. The early 1970s were a period when the second highest lynx harvest returns in the 20th century occurred throughout Canada. The high numbers of lynx trapped in Minnesota during this period likely included immigrants from Canada (McKelvey et al. 2000b). Lynx were consistently trapped over 40 years during cyclic lows, which may indicate that a small resident population occurred historically.

6.1.1.10 Observations of Lynx in the Vicinity of the West Range Site and East Range Site Since 2000

Approximately 115 lynx sightings have occurred in St. Louis County, and 16 lynx sightings have occurred in Itasca County, since 2000 (Figure 6.2; Minnesota Department of Natural Resources [MnDNR] 2008). The vast majorities of sightings are incidental encounters, and as such, tend to be clustered along roads and other places frequented by observant and interested people. Thus, while these reports tell us something (however incomplete) about where lynx are, they provide no information about where lynx do not occur. Similarly, we cannot know the relationship between the number of reports and the number of lynx in Minnesota at the time of the reports. The nearest sighting to the West Range Site occurred in September 2003 along Itasca County Road 7, within a half mile of the site's southern boundary. The nearest sighting to the East Range Site occurred in September 2003 along Highway 110 between Aurora and Hoyt Lakes, approximately 2.2 miles southwest of the site. Because the West Range Site is almost 60 miles further west, closer to the edge of the core area used by lynx in Minnesota, lynx are less likely to be found at the West Range Site than the East Range Site.

The NorthMet Mine lynx survey was conducted during January through March of 2006 (ENSR 2006). The East Range Site is located in the southwest corner of the NorthMet Mine survey area. Tracks and scat of four female lynx were identified during the survey, concentrated in areas approximately 10 miles west and 18 miles northwest of the East Range Site. Lynx sign was most common in dense conifer forests of balsam fir and jack pine. No evidence of lynx was found in Township 59 North, Range 14 West, and ENSR found this township to have the least amount of suitable lynx habitat of all townships surveyed, due to extensive mining operations and recent logging. However, in the relatively undisturbed southeast portion of the township, near the East Range Site, lynx use was considered likely.

The Minnesota Steel Mine site survey was conducted during January through March of 2007 (ENSR 2007). The West Range Site is located in the southwest corner of the Minnesota Steel Mine survey area. No evidence of lynx was found during the survey, but evidence of bobcat was common. ENSR concluded that it is unlikely that any lynx reside in the survey area, but that lynx may travel through the area. Most of the habitat in Township 56 North, Range 24 West was found to be marginal or unsuitable lynx habitat because of mining operations in the area. The northeast corner of the township, which includes the West Range Site, was identified as having the greatest potential for lynx use.

6.1.2 Factors Affecting Canada Lynx within the Action Area

6.1.2.1 Factors Identified in Final Rule

The USFWS concluded that the single biggest factor threatening the lynx in the contiguous United States is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of the lynx in National Forest and other resource management plans (Federal Register 2000). In addition, the USFWS noted that timber harvest and fire suppression impact lynx in the Great Lakes Geographic Area.

Lands under federal management are necessary to lynx conservation regionally and nationally, as federal lands often provide large amounts of forested habitat needed by lynx and snowshoe hare. Large tracts of National Forest lands are found approximately 6 miles west (Chippewa National Forest) of the West Range Site. State forests near the site include: Remer State Forest, approximately 22 miles southwest of the Project; George Washington State Forest, approximately 11 miles north; Hill River State Forest, approximately 25 miles south-southwest; Savanna State Forest, approximately 25 miles south-southeast; and Golden Anniversary State Forest, approximately 12 miles south-southwest. Most of the lands not associated with Mesabi Iron Range mining and related activities are forests. These forestlands could provide important habitat for lynx that use the proposed West Range Site, and for movement of lynx between the West Range Site and areas with higher densities of lynx to the northeast. In addition, Voyageur National Park has been identified as critical habitat for lynx; the park is approximately 75 miles north of the proposed West Range Site (Federal Register 2006). In 2008, the USFWS proposed to designate an additional approximately 8,226 mi^2 in portions of Cook, Koochiching, Lake, and St. Louis counties in Minnesota (Federal Register 2008). This proposed critical habitat is about 30 miles east of the West Range Site.

The East Range Site is within the Superior National Forest. Proposed lynx critical habitat surrounds, but does not include, the East Range Site. These forestlands, as well as private forestlands, could provide important habitat for lynx that use the proposed East Range Site, and for movement of lynx between the East Range Site and areas with higher densities of lynx to the northeast.

6.1.2.2 Other Lynx Risk Factors

The *Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) identified several other risk factors for lynx in the contiguous U.S., which could also apply to lynx in or near the Project sites. These factors are considered in the following section on the effects of the proposed action, and the cumulative effects of the Project and other projects within or near the study area, on lynx. These include (**bolded items** considered important in the West Range and East Range sites):

1. Factors Affecting Lynx Productivity
   a. Timber management
   b. Wildland fire management
   c. Recreation
   d. Forest/backcountry roads and trails
   e. Livestock grazing
   f. Other human developments (mining, power generation, etc.)

2. Factors Affecting Lynx Mortality
   a. Trapping
   b. Predator control
   c. Incidental or illegal shooting
   d. Competition and predation as influenced by human activities
   e. Highways (vehicular collisions)

3. Factors Affecting Lynx Movements
   a. Highways, roads, and ROW
   b. Land ownership patterns
   c. Ski areas and large resorts

4. Other Large-scale Risk Factors
   a. Fragmentation and degradation of lynx refugia
   b. Lynx movement and dispersal across shrub-steppe habitats
   c. Habitat degradation by non-native invasive plant species

6.1.3 Analysis of Direct and Indirect Effects

Environmental consequences to Canada lynx resulting from the Project are described in Section 3.8.3 of the Draft EIS. The primary direct impacts to lynx from the Project would result from habitat loss and disturbance. Approximately 618 acres of wetland, forest, and grassland habitat would be lost, at least temporarily, at the West Range Site, and 929 acres of these habitats would be lost at the East Range Site, including acreage in utility and transportation corridors (Tables 3.3 and 3.8).[1] Not all impacts would be expected to occur simultaneously, as construction of various corridors, facilities, and other Project components could take place at different times. Much of the habitat associated with these sites is suitable for lynx use, although the East Range Site is more likely to be used by lynx. Loss of this habitat would reduce the amount of prey items and cover available to lynx traveling through the Project area. Loss of habitat would also make it less likely that lynx would establish a territory within the Project area, especially areas directly impacted by the Project.

The Project would employ approximately 185 full-time workers during normal operations of Mesaba One and Mesaba Two, with a peak employment of approximately 1,500 people during the construction phase. Although some workers currently reside near the mine, other workers would move to the area. New housing and other infrastructure would be required to support these new workers and could indirectly affect lynx. Other industrial facilities proposed for development near the proposed and alternative sites (most notably the proposed Minnesota Steel Mine near the West Range Site, and the proposed SDI and PolyMet (NorthMet) mines near the East Range Site) would also increase the number of people living in or near the study area, and along with normal population growth, would result in conversion of wooded/forested habitats more suitable for lynx to developed uses that provide few habitat values for lynx. It is likely that ongoing and future development and disturbances within and near the study area would reduce the suitability of the area to provide habitat and travel corridors for lynx. State and federal forest lands near the study area would continue to provide a refuge for lynx, and it is likely the lynx would favor these areas over those within the study area.

Disturbance associated with the facility and associated transportation corridors would include lights, glare, and noise. The IGCC Power Station is expected to operate 24 hours a day, 365 days a year, for a minimum of 30

[1] As noted in the tables, the West Range Site impact analysis assumes both Excelsior's natural gas pipeline and the pipeline that has been permitted to serve the City of Nashwauk and Minnesota Steel Industries would be constructed. If Excelsior chooses to purchase natural gas from the City of Nashwauk, the Project's impacts would be decreased.

years. Lights and glare would primarily be associated with plant buildings and structures. Lynx traveling through the study area would likely avoid areas that are active and well lit.

Sources of noise during the construction phase include trucks, bulldozers, rock drills, jack hammers, graders, backhoes, air compressors, and cranes. Studies conducted at the West Range and East Range Sites for the Draft EIS predicted that noise from construction equipment could be as loud as 98 decibels at a distance of 50 feet from the source. Noise sources during the operational phase of the facility include heat recovery steam generator and air separation unit stack exits, gas burners, cooling towers, water pumps, generator buildings, rod mill buildings, and slurry feed buildings. Predicted noise levels at receptors located between 800 and 11,000 feet from facility noise sources are in the 45 to 55 decibel range during normal plant operations, for both the West Range and East Range sites. However, current noise levels in the vicinity of the sites are in this same range due to existing noise sources, and the plant is not expected to increase noise at offsite receptors by more that 2 decibels during operation. Nonetheless, noise from the generating station could impact lynx residing in or traveling through the Project area. The impacts of noise on lynx and other wildlife are largely unknown and the assessment of impacts remains subjective. Wildlife are receptive to different sound frequency spectrums, many of which may be inaudible to humans. Wildlife are also known to habituate to noise, especially noises that are steady or continuous, such as noises that would occur at the IGCC Power Station. Wildlife are less likely to habituate to sudden, infrequent impulse noises.

Impacts to lynx in and surrounding the facility site may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. As many as 185 vehicle trips for full-time workers would occur during normal operations of Mesaba One and Mesaba Two, and about 1,500 vehicle trips during the construction phase. Also, additional supply and support vehicles would travel to the facility each day.

Impacts to Canada lynx and gray wolf in and surrounding the Project may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. Consequently, the threat of lynx and wolf mortality from vehicle collisions would increase in the vicinity of the Project. There are few records of lynx being killed on highways, but direct mortality from vehicular collisions may be detrimental to small lynx populations in the lower 48 states. Minnesota DNR lynx sighting records indicate that six lynx were killed by vehicle collisions in Minnesota between 2000 and 2006, and one lynx was killed by a train (MnDNR 2008). Of those killed by vehicles, two occurred on Interstate 35, two on Highway 61, one on a county road, and one on the Gunflint Trail. No lynx- or wolf-vehicle collisions have been reported on roads associated with mining projects, even though lynx and wolves have been observed using mine roads at the Northshore Mine and former Cliffs Erie mine site near the East Range Site (ENSR 2006, 2009). Risks of mortality from lynx-vehicle collisions would likely be greater in the vicinity of the East Range Site than the West Range Site because lynx density is predicted to be higher near the East Range Site. Still, it is unlikely that lynx and wolf would be killed by traffic associated with the Project because the Project Sites provide minimal habitat for lynx and wolf, no lynx were observed using the Sites during field surveys, and vehicle traffic associated with the Project would be light and limited to mostly rural roads, rather than highways and county roads, where lynx- and wolf-vehicle collisions are rare.

New roads and trails associated with Project activities and the influx of workers may facilitate snowmobile, cross-country skiing, and other human uses in the winter. Snow compaction on roads or trails may allow competing carnivores, such as coyotes and mountain lions, access into lynx habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of these other predators during midwinter. It is likely that lynx near the Project site would compete with these competitors and predators for primary lynx prey (Buskirk et al. 2000).

The proposed Project sites do not lie within or near any currently designated critical habitat for the lynx (the nearest critical habitat is in Voyageurs National Park approximately 75 miles north-northeast of the West Range Site and 55 miles north-northwest of the East Range Site. The proposed revised critical habitat designation would surround, but would not include, the East Range Site and would exclude the West Range Site (Federal Register 2008a). Thus, the proposed Project would not impact lynx designated critical habitat.

6.1.4 Interrelated and Interdependent Effects

No known activities are interrelated or interdependent to the proposed Project that would have the potential to affect Canada lynx. It is possible that future specific programs or projects may have relevant interrelated and interdependent actions (e.g., construction and operation of additional power plants or substations on the site) and they will be considered in the context of consultations for those actions.

6.2 Gray Wolf

6.2.1 Environmental Baseline

6.2.1.1 Species Description and Status and Critical Habitat Status

Gray wolves are the largest wild members of the dog family (Canidae) with adults ranging from 40 to 175 pounds, depending on sex and subspecies (Mech 1974). Wolves have a gray fur coat that can vary from pure white to coal black (Federal Register 2003). Wolves may look similar to coyotes and some domestic dogs, such as the Siberian husky (*C. familiaris*; Federal Register 2003).

In response to their vastly declining numbers, the gray wolf was determined to be endangered in 1967 (Federal Register 1967) under the Endangered Species Preservation Act of 1966. In 1974, the species was formally listed as endangered through the authority of the ESA (Federal Register 1974), and the Minnesota population was reclassified to threatened in 1977 (Federal Register 1977). In April 2003, gray wolf populations in the United States were separated into three Distinct Population Segments (DPS; Federal Register 2003a) to more effectively manage the species; the Minnesota population is a designated portion of the Eastern DPS. In March 2006, the USFWS proposed to designate gray wolves in the Western Great Lakes region as a DPS under the ESA and to remove wolves from Minnesota, Wisconsin, and Michigan from listing under the ESA. The Western Great Lakes DPS included Minnesota, Wisconsin, and Michigan as well as parts of North Dakota, South Dakota, Iowa, Illinois, Indiana, and Ohio (Federal Register 2006b). In March 2007, the USFWS removed the gray wolf from the endangered species list (Federal Register 2007). In September 2008, the U.S. District Court for the District of Columbia overturned the Department of Interior's decision to remove the Great Lakes DPS of the gray wolf from federal ESA protection; the USFWS issued a rule in December 2008 to comply with court orders reinstating regulatory protections for the gray wolf in the western Great Lakes and northern Rocky Mountains (Federal Register 2008b).

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule (50 CFR 17.95(a)) identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3, as delineated in 50 CFR 17.40(d)(1). Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The East Range Site is within Zone 2, while the West Range site is outside the designated critical habitat area.

6.2.1.2 Distribution

The gray wolf historically occurred across most of North America, Europe, and Asia. The only areas of the conterminous United States that apparently lacked gray wolf populations since the last ice age are parts of California and portions of the eastern and southeastern United States (an area occupied by the red wolf; *Canis lupus rufus*). Widespread persecution of wolves began following European settlement of North America

(Boitani 1995). Poisons, trapping, and shooting spurred by federal, state, and local government bounties extirpated this once widespread species from more than 95 percent of its historic range. In the late 1960s, a diminished population (several hundred) of wolves was known to occur in northeastern Minnesota and on Isle Royale, Michigan; a few scattered wolves also may have occurred in Michigan's Upper Peninsula, Montana, and the southwest United States.

6.2.1.3 Life History

Wolves are carnivorous predators that prefer a diet of medium and large mammals. Wild prey species in Minnesota include white-tailed deer, moose, beaver, and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (Mech 1974, Wisconsin DNR 1999). Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species.

Wolves are social animals, normally living in packs of 2 to 12 wolves, although two packs in Yellowstone National Park had 22 and 27 members in 2000, and Yellowstone's Druid Peak pack increased to 37 members in 2001 (USFWS et al. 2001, 2002). Winter 2001–2002 pack size in Michigan's Upper Peninsula averaged 4.3 wolves. Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from the previous year, and occasionally an unrelated wolf. Packs typically occupy, and defend from other packs and individual wolves, a territory of 20 to 200 mi^2, with territories of 42 to 100 mi^2 in the Great Lakes region (Fuller 1989). In the northern Rocky Mountains of the United States, territories tend to be larger, usually from 200 to 400 mi^2. Normally, only the top-ranking (alpha) male and female in each pack breed and produce pups. Litters are born from early April to May and range from 1 to 11 pups, but generally include 4 to 6 pups (Michigan DNR 1997; USFWS 1992; USFWS et al. 2001). Normally a pack has a single litter annually, but the production of two or three litters in 1 year has been documented in Yellowstone National Park (USFWS et al. 2002). Yearling wolves frequently disperse from their natal packs, although some remain with their natal pack. Yearlings may range over large areas as lone animals after leaving their natal pack or they may locate suitable unoccupied habitat, pair with a member of the opposite sex, and begin their own pack. Dispersal distances of 500 miles have been documented (Fritts 1983); individual wolves have recently traveled from central Wisconsin to east-central Indiana (400 miles) and northern Illinois, from the Upper Peninsula of Michigan to northern Missouri (600 miles), and from the Minnesota-Wisconsin-Michigan population to east central Nebraska.

6.2.1.4 Population Numbers and Dynamics

Five comparable surveys of wolf numbers and range in Minnesota have been carried out since 1979. These surveys estimated that there were 1,235, 1,500 to 1,750, 2,440, 3,020, and 2,920 wolves in Minnesota in 1979, 1989, 1998, 2004, and 2008 respectively (Berg and Kuehn 1982; Fuller et al. 1992; Berg and Benson 1999; Erb 2008). Based on these surveys, wolf populations in Minnesota have increased at annual rates of about 3 percent between 1979 and 1989 and by about 4 percent between 1989 and 2008. The 1998 and later surveys revealed that the number of wolves in Minnesota was 2 times greater than the planning goal (1,400 wolves) as specified in the Recovery Plan for Minnesota.

In Minnesota, the Chippewa and Superior National Forests' wolf populations range from approximately 100 to 125 on the Chippewa National Forest (U.S. Forest Service 2004) to an estimated 300 to 400 on the Superior National Forest (Mech 2000, U.S. Forest Service 2004). Both Forests are operated and managed through current Forest Plans in conformance with standards and guidelines that follow the 1992 Recovery Plan's recommendations for the wolf.

Wolves were considered to have been extirpated from Wisconsin by 1960, and no formal attempts were made to monitor that state's wolf population from 1960 until 1979. During that time, individual wolves and an occasional wolf pair were reported. There is no documentation, however, of any wolf reproduction occurring in Wisconsin, and the wolves that were reported may have been animals dispersing from Minnesota. Wolf

population monitoring by the Wisconsin Department of Natural Resources (DNR) began in 1979 and a statewide population of 25 wolves was estimated at that time. This population remained relatively stable for several years, and then declined to approximately 15 to 19 wolves in the mid-1980s. In the late 1980s, the Wisconsin wolf population began an increase that has continued to date. In 2002, wolf numbers in Wisconsin alone surpassed the planning goal as specified in the Recovery Plan for a second population near Minnesota (100 wolves for a minimum of 5 consecutive years; geographically isolated populations should have 200 wolves for a minimum of 5 years). Approximately 540 wolves were in Wisconsin in 2008 (Wydeven and Wiedenhoeft 2008).

Michigan wolves were extirpated as a reproducing population long before they were listed as endangered in 1974. Before 1991, and excluding Isle Royale, the last known breeding population of wild Michigan wolves occurred in the mid-1950s. As wolves began to reoccupy northern Wisconsin, the Michigan DNR began noting single wolves at various locations in the Upper Peninsula of Michigan. In the late 1980s, a wolf pair was verified in the central Upper Peninsula and was known to have produced pups in 1991. Since that time, wolf packs have spread throughout the Upper Peninsula, with immigration occurring from both Wisconsin to the west and Ontario to the east. They now are found in every county of the Upper Peninsula. When the wolf population estimates of Wisconsin and Michigan are combined, the total population has exceeded the second population recovery goal, as specified in the Recovery Plan, of 200 wolves for 5 consecutive years for a geographically isolated wolf population. The two state wolf population, excluding Isle Royale wolves, has exceeded 200 wolves since late winter 1995-1996. An estimated 510 wolves were in Michigan in 2007 (Michigan Department of Natural Resources 2008).

6.2.1.5 Observations of Gray Wolf in the Vicinity of the West Range Site and East Range Site

The MnDNR conducts surveys for wolves about every 5 years, including 2007-2008. The wolf population estimate for 2007-2008 was 2,920. Based on analysis of 32 radio-marked wolves, average territory size was about 40 mi^2. Wolf observations were greatest in the vicinity of the Chippewa National Forest, in the Superior National Forest near Virginia, Minnesota, and in Voyageurs National Park. (Erb 2008). The Chippewa National Forest is about 6 miles from the East Range Site.

Since 1968, the Biological Resources Division of the U. S. Geological Survey, formerly the Division of Wildlife Research of the U. S. Fish and Wildlife Service has been studying the wolf population trend in the central Superior National Forest around Ely, Minnesota since 1968.

The main method involves live-trapping, drugging, radio-collaring, aerially radio-tracking and counting members of several packs (families). Each pack usually occupies about 30-100 mi^2. The budget for the project is very low, so the biologists cannot afford to follow the wolves as often as usual. Thus, there will be large gaps in the data. Wolves that are farthest away will be followed the least. Another reason why entries may stop being added to the data list is because some wolves disperse, or leave the area and travel hundreds of miles away. They are seeking new areas and mates to form their own packs. It is too expensive to follow them, so USGS biologists must give up gathering data about these animals.

The International Wolf Center posts on their website a database summary of wolf observations from these studies (http://www.wolf.org/wolves/experience/telemsearch/vtelem/telem_main.asp). Of the over 9,300 records in the monitoring database, 32 records involving 10 wolves have been recorded within about 10 miles of the East Range Site. Except for a single record in December 2006 and two records in 2001, all other records of wolves near the East Range Site were recorded between 1994 and 1997. No radio collared wolves were recorded within 10 miles of the West Range Site, although this may be due to the limited amount of wolf tracking that occurs in the central portion of Minnesota.

6.2.2 Factors Affecting Gray Wolf within the Action Area

Land management practices potentially may affect wolves and wolf habitat. These activities include management of timber and other vegetation, wildland or prescribed fire, recreation, construction and operation

of roads and trails, and other human developments (USFWS 1992, 2004; MnDNR 2001). Risks of direct wolf mortality may come from shooting, trapping, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors are disease and fragmentation and degradation of wolf habitat.

6.2.2.1 Habitat Management

Gray wolf density is heavily dependent on prey availability (Fuller 1989). Conservation of primary wolf prey, such as white-tailed deer, is clearly a high priority for the MnDNR, which typically manages ungulates to ensure a harvestable surplus for hunters and nonconsumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, the agency must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels when necessary.

Deer, moose, and beaver, the primary prey species for wolf, are closely associated with forage from young upland forest less than 10 years old. Deer and moose rely on upland conifer more than 9 years old for thermal and hiding cover. Currently, federal, state, and local forests and private lands provide ample habitat for prey species, and densities of these species (particularly white-tailed deer) have been high; therefore, prey availability is not likely to threaten wolves in the Great Lakes DPS.

6.2.2.2 Human Access and Disturbance

Human settlement and roads are considered to be major determinants in gray wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Mech 1995; Gogan et al. 1997).

Studies of wolf populations in Minnesota, Michigan, and Wisconsin indicate that wolf populations usually fail to sustain themselves in areas where rural roads open to the public have densities exceeding 0.93 linear miles or road per mi^2. The Wolf Recovery Plan recommends that density of higher standard roads remain below 1 mile/mi^2 in critical habitat to limit the extent of associated effects to gray wolves (USFWS 1992). Roads lead to wolf-vehicle collisions and an increase in access by hunters and trappers, and can be barriers to movement (USFWS 1992). However, wolves may tolerate road densities as high as 1.2 miles per mi^2 if roaded areas are adjacent to large road less areas, such as the Superior National Forest.

The Wolf Recovery Plan addresses the impact of low standard roads, but does not recommend a density threshold for such roads. Low standard roads may have a greater potential for human impact on wolves than high standard roads due to the potential for human access for trapping and shooting. These roads typically are accessed by recreational motor vehicles or on foot. Illegal killing of wolves may result from a variety of reasons. Some of these killings are accidental (e.g., wolves are hit by vehicles, mistaken for coyotes and shot, or caught in traps set for other animals) and may be reported to state, tribal, and federal authorities. Most illegal killings, however, likely are intentional and are never reported to authorities (Mech 1995). The MnDNR receives approximately two to six reports of wolves killed by vehicle collision annually.

While human habitation and the associated network of roads and vehicle traffic increase, wolf mortality from vehicle collisions is expected to continue both in actual numbers and as a percent of total diagnosed mortality in Minnesota. A study conducted in between 1980 to1986 within north central Minnesota found human-caused mortality occurred at a rate of 29 percent, a figure which includes 2 percent mortality from legal depredation control actions (Fuller 1989). The MnDNR conducted a radio-telemetry study of wolves and white-tailed deer, and of 32 wolves fitted with radio collars between 1993 and 2001, 7 of 11 documented mortalities were attributed to humans (DelGuidice et al. 2001). Minnesota DNR (2001) and the Forest Service (2004) use a variety of methods to encourage and support education of the public about the history and ecology of wolves in the state and the effects wolves on livestock, wild ungulate populations, and human activities. Public outreach efforts have been in effect for years in Minnesota, and while these efforts may not further reduce illegal take of

wolves from existing levels, these measures may be crucial in ensuring that illegal mortality does not increase. Illegal take of wolves is likely related to road and human population densities, but changing attitudes towards wolves may provide for their survival in areas where road and human densities were previously thought to be too high (Fuller et al. 2003). It is important to note that despite the difficulty in measuring the extent of illegal killing of wolves, all sources of wolf mortality, including legal (e.g., depredation control) and illegal human-caused mortality, have not been of sufficient magnitude to stop the continuing growth of the wolf population in Minnesota.

6.2.2.3 Other Factors

Den site disturbance may occur during timber harvest, site preparation, and prescribed burning. However, wolves at dens and rendezvous sites have been known to tolerate these activities. The proposed Project has the potential to disturb gray wolves, but impacts to wolves should be minimal due to the large home range size of wolves in Minnesota and large amount of disturbance that already occurs near the Project sites.

6.2.3 Analysis of Direct and Indirect Effects

The primary impacts to gray wolf from the Project would result from habitat loss and disturbance. Approximately 618 acres of wetland, forest, and grassland habitat would be lost, at least temporarily, at the West Range Site, and 929 acres of these habitats would be lost at the East Range Site, including acreage in utility and transportation corridors.[2] Not all impacts would be expected to occur simultaneously, as construction of various corridors, facilities, and other Project components could take place at different times. Much of the habitat associated with these sites is suitable for gray wolf and prey use. Loss of this habitat would reduce the amount of prey items and cover available to gray wolf traveling through the Project area. Loss of habitat would also make it less likely that a gray wolf pack would establish a territory within the Project area, especially areas directly impacted by the Project.

The Project would employ approximately 185 full-time workers during normal operations of Mesaba One and Mesaba Two, with a peak employment of approximately 1,500 people during the construction phase. Although some workers currently reside near the mine, other workers would move to the area. New housing and other infrastructure would be required to support these new workers. Other industrial facilities proposed for development near the proposed and alternative sites (most notably the proposed Minnesota Steel Mine near the West Range Site, and the NorthMet Mine near the East Range Site) would also increase the number of people living in or near the study area, and along with normal population growth, would result in conversion of wooded/forested habitats more suitable for gray wolf to developed uses that provide few habitat values for gray wolf. It is likely that ongoing and future development and disturbances within and near the proposed Project would reduce the suitability of the area to provide habitat and travel corridors for gray wolf. State and federal forest lands near the study area would continue to provide a refuge for gray wolf, and it is likely the gray wolf would favor these areas over those within the study area.

Disturbance associated with the facility and associated transportation corridors would include lights, glare, and noise. The IGCC Power Station is expected to operate 24 hours a day, 365 days a year, for a minimum of 30 years. Lights and glare would primarily be associated with plant buildings and structures. Gray wolf traveling through the study area would likely avoid areas that are active and well lit.

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[2] As noted in the tables, the West Range Site impact analysis assumes both Excelsior's natural gas pipeline and the pipeline that has been permitted to serve the City of Nashwauk and Minnesota Steel Industries will be constructed. If Excelsior chooses to purchase natural gas from the City of Nashwauk, the Project's impacts would be decreased. Also noted is that the East Range Site impact analysis does not include impacts that would occur along 11 miles of the existing NNG natural gas pipeline where NNG has only single line rights (therefore requiring new ROW to be obtained and construction to be undertaken thereon).

Sources of noise during the construction phase include trucks, bulldozers, rock drills, jack hammers, graders, backhoes, air compressors, and cranes. Studies conducted at the West Range and East Range Sites for the Draft EIS predicted that noise from construction equipment could be as loud as 98 decibels at a distance of 50 feet from the source. Predicted noise levels at receptors located between 800 and 11,000 feet from facility noise sources are in the 45 to 55 decibel range during normal plant operations, for both the West Range and East Range sites. However, current noise levels in the vicinity of the sites are in this same range due to existing noise sources, and the plant is not expected to increase noise at offsite receptors by more that 2 decibels during operation. Nonetheless, noise from the generating station could impact gray wolves residing in or traveling through the Project area. The impacts of noise on gray wolf and other wildlife are largely unknown and the assessment of impacts remains subjective.

The Wolf Recovery Plan recommends that density of higher standard roads remain below 1 mile/mi^2 in critical habitat to limit the extent of associated effects to gray wolves (USFWS 1992). However, wolves may tolerate road densities as high as 1.2 miles per mi^2 if roaded areas are adjacent to large road less areas, such as the Superior National Forest. Current road densities are 1.1 and 1.6 miles of road per mi^2 for the proposed West Range and East Range sites, respectively. Post construction, road densities would be 1.2 and 1.7 miles per mi^2 for the West Range and East Range sites, respectively. Thus, suitable habitat for wolves may currently be lacking, or would be lacking after construction of the proposed Project.

6.2.4 Effects of Interrelated and Interdependent Actions

No known activities are interrelated or interdependent to the proposed Project that would have the potential to affect gray wolf. It is possible that future specific programs or projects may have relevant interrelated and interdependent actions (e.g., construction and operation of additional power plants or substations on the site) and they will be considered in the context of consultations for those actions.

6.3 Analysis of Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The area of analysis for the cumulative effects assessments is the Arrowhead Region of Minnesota. This area includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota (Figure 7.1). The period for analysis of cumulative effects in this BA was from pre-settlement (prior to 1900) through completion and operation of reasonably foreseeable projects identified below (approximately 30 years).

Cumulative effects to wildlife habitat and wildlife travel corridors are discussed in Section 5.2.6 of the Draft EIS. The impacts discussed in that section were based on an analysis conducted by the DOE and a 2006 MnDNR report titled *Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota* (2006 Report; Emmons and Olivier Resources, Inc. 2006). Other cumulative effects considered in this BA include habitat loss and fragmentation, human access and disturbance, and mortality factors.

The Draft EIS identifies a number of proposed projects that should be considered reasonably foreseeable future actions and that may contribute to cumulative effects to Canada lynx, gray wolf, and other wildlife in the vicinity of the Project sites. Proposed projects near the West Range Site include: the Minnesota Steel Mine, approximately 7 miles northeast of the site; the Nashwauk gas pipeline, which would run north from the Blackberry Township, through the southeast corner of the Site, and continue northeast to the City of Nashwauk; the Itasca County Road 7 realignment, within a quarter mile of the southern boundary of the site; and the Itasca County rail alignment, which would run roughly from the City of Taconite to the Minnesota Steel Mine, passing within 1.25 miles of the southeast boundary of the site.

Proposed projects near the East Range Site include: the Mesabi Nugget plant, approximately 2 miles to the northeast; and the NorthMet Mine, comprising a tailings basin area approximately 3 miles to the north and a mine area approximately 10 miles to the northeast.

In addition to these projects, land management activities, such as timber harvest, prescribed fire, and road construction, that may be authorized or carried out on nearby national forests are likely to have both positive and negative effects to snowshoe hare, white-tailed deer, and moose habitat and therefore would have both positive and negative effects on the lynx and gray wolf. Projected acreage of forage and cover habitats for moose and deer over 100 years shows decreasing forage habitat (upland forest younger than 9 years) and greatly increasing cover habitat (upland conifer older than 10 years) on the Superior and Chippewa National Forests. Although the amount of available forage would decrease from current levels, the amount provided over the life of the Forest Plans should remain sufficient for healthy snowshoe hare and ungulate populations, based on the response of populations of these species on the Forests over the last 2 decades under current Forest management. Although the Forest Plans would provide significantly more young upland forage habitat and less upland conifer than would be found in the range of natural variability (U.S. Forest Service 2004), snowshoe hare, white-tailed deer, and moose populations should not be limiting factors for lynx or gray wolves under the Revised Forest Plans.

6.3.1 Habitat Loss and Fragmentation

The IGCC Power Station and other nearby proposed projects would increase the amount of habitat fragmentation in the area, changing wooded/forested and other vegetated habitats to disturbed/developed areas with limited habitat value. Development of iron mines along the Iron Range has made much of this area of limited value to lynx and wolf, especially areas with pits, tailings, and waste rock piles. Historic waste rock piles and tailings have begun to revegetate and provide some habitat for lynx, wolf, and their prey, but their value is greatly reduced compared to habitat that existed in the area prior to mining. At both sites, construction of the generating facility and much of the new corridors would occur on lands that are currently forested and potentially serve as lynx and wolf habitat. Although the amount of new habitat loss and fragmentation associated with the Project would be small in the context of available habitat within the region, the cumulative impacts would be greater. Impacts to lynx and wolf would be expected at the individual level, although not at the population or species level.

The 2006 Report estimates losses of wildlife habitat in seven ecological subsections of the Arrowhead region of Minnesota in the next 20 years due to mining, economic development, and forestry. The Arrowhead region is in the northeast corner of Minnesota and includes Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis counties (Figure 7.1). Because state timber harvest plans were only available through 2007 at the time of publication of the report, losses of wildlife habitat due to forestry are underestimated in the 2006 Report. The report considers all land cover types, including mine lands, croplands, and urban areas, to be potential wildlife habitat in its estimates of habitat loss. While lynx and wolf have been observed in these areas and use roads in mining areas as travel routes especially near the East Range site, the value to lynx and wolf as habitat may be minimal.

Chapter 5 of the Draft EIS estimates habitat losses at a smaller scale than in the 2006 Report. A study area for each of the proposed sites is defined according to local hydrology. For the West Range Site, the study area consists of the portion of the Swan River watershed above the point where Holman Lake discharges to the Swan River, plus the portion of the Prairie River watershed upstream of Prairie Lake. The East Range Site study area includes the portion of the Partridge River watershed upstream of its confluence with the St. Louis River. The Draft EIS estimates available habitat prior to European settlement, at the current time, and after the completion of reasonably foreseeable developments. Habitat loss is broken down by habitat type, and developed areas such as mine lands, croplands, and urban areas are not considered habitats.

The sections below summarize the data from the 2006 Report and Draft EIS on habitat loss in the Arrowhead region and in the ecological subsections and sub-watersheds in which the proposed Project sites lie.

6.3.1.1 Arrowhead Region

The Arrowhead Region includes seven ecological subsections totaling approximately 9.1 million acres in the northeast corner of Minnesota (Figure 7.1). The 2006 Report estimates that 8,727 acres (0.1 percent) of this area would be lost to economic development, mining, and forestry in the next 20 years (Table 7-1; Emmons and Olivier, Inc. 2006). Of the area lost, approximately 913 acres would be lost to mining, 498 acres would be lost to economic development, and 7,315 acres would be lost to forestry. While losses to forestry represent the bulk of habitat loss in the region, they are not as permanent or destructive as mining or economic development losses from the perspective of lynx and wolf. Forestry practices remove some or all trees from an area, reducing the value of that area as lynx and wolf habitat, but the natural process of succession ensures the regeneration of forest stands that can once again serve as high-quality habitat. Occasional timber harvest may actually promote the growth of dense conifer stands that are favored by snowshoe hare, the primary prey species of the lynx, and as bedding and thermal cover for white-tailed deer, an important prey species for gray wolf.

6.3.1.2 West Range Site

The West Range Site is situated in the Nashwauk Uplands ecological subsection, which is dominated by upland deciduous, upland shrub/woodland, and lowland conifer/shrubland habitats (Figure 7.2). The Nashwauk Uplands encompass an area of approximately 810,000 acres. The 2006 Report predicts losses of 158 acres (0.02 percent) to economic development and 718 acres (0.09 percent) to mining (Table 7.1; Emmons and Olivier, Inc. 2006). No habitat losses as a result of forestry are predicted in the 2006 Report. Mining is the largest threat to lynx and wolf habitat in this ecological subsection, although only a small fraction of the total available habitat is predicted to be lost.

The Draft EIS predicts a loss of 5,509 acres (1.4 percent of the currently existing wildlife habitat) in the West Range Site study area in the future due to reasonably foreseeable actions (Table 7.2). Within the study area, Mesaba One and Mesaba Two would account for 523 acres (9.5 percent) of this loss, while the largest contributor would be the Minnesota Steel Mine project at 3,324 acres (60 percent). Temporary impacts to habitat have been treated as though they were permanent habitat losses in the case of Mesaba One and Mesaba Two in order to ensure that a worst case estimate of the Project's impact was calculated. Using such estimates, aspen/birch deciduous forest habitat would experience the greatest loss at 1,884 acres, or about 1.4 percent of the existing aspen/birch deciduous forest in the study area (Table 7.3). Within the Project's site and corridors, aspen/birch deciduous forest and upland shrubland/woodland habitats would experience the greatest loss (Table 7.4).

6.3.1.3 East Range Site

The East Range Site is situated in the Laurentian Uplands ecological subsection, which is dominated by lowland conifer/shrubland, upland conifer, and upland deciduous habitats (Figure 7.3). The Laurentian Uplands encompass an area of approximately 567,000 acres. The 2006 Report predicts losses of 38 acres (0.01 percent) to economic development, 197 acres (0.03 percent) to mining, and 588 (0.10 percent) acres to forestry (Table 7.1; Emmons and Olivier, Inc. 2006). Forestry is the largest threat to lynx habitat in this ecological subsection, although only a small fraction of the total available habitat is predicted to be lost.

The Draft EIS predicts a loss of 4,846 acres (5.2 percent of the currently existing wildlife habitat) in the East Range Site study area in the future due to reasonably foreseeable actions (Table 7.5). Within the East Range study area, Mesaba One and Mesaba Two would account for 433 acres (9 percent) of this loss, but the NorthMet Mine and Mesabi Nugget projects would be much greater contributors to habitat loss at 2,957 acres

(61 percent) and 1,456 acres (30 percent), respectively. Aspen/birch deciduous forest habitat would experience the greatest loss at 1,558 acres, or 5.7 percent of the existing aspen/birch deciduous forest in the study area (Table 7.6). Within the Project site and corridors, upland aspen/birch deciduous forest and grassland habitats would experience the greatest loss (Table 7.7)

6.3.2 Impacts to Wildlife Travel Corridors

Much of the habitat for lynx, gray wolf, and other wildlife along the Iron Range has been eliminated by mining, other industrial activities, and residential development and remaining habitat is heavily fragmented. However, large patches of suitable lynx and wolf habitat exist on either side of the range, primarily within the Superior National Forest, Chippewa National Forest, and various state forests. To travel between habitat patches on either side of the Iron Range, lynx and wolf must find suitable corridors of habitat that traverse the range and allow safe movement. The 2006 Report identifies 13 wildlife travel corridors that facilitate movement of wildlife across the Iron Range (Figure 7.4). Corridors that could be affected by the Project and other existing and proposed projects in the area are discussed in the subsections below.

6.3.2.1 West Range Site

Two wildlife travel corridors exist in the vicinity of the West Range Site that could be impacted by the Project and other projects in the area. Corridor #2 from the 2006 Report is a roughly rectangular, 1.9-mile wide forested corridor connecting a large patch of wildlife habitat north of the Iron Range with several smaller patches south of the range (Figure 7.5). Existing mine features along the Iron Range on both sides of this corridor can hinder wildlife movement to the corridor for at least 1 mile in each direction. The proposed IGCC Power Station Footprint is located immediately northwest of the corridor, and lynx and wolf traveling to or from this corridor via the northwest could likely be forced to find an alternative route. The Itasca County Road 7 realignment, if it were to occur, could potentially run along the northeastern and eastern corridor boundaries, and while not an impenetrable barrier to lynx and wolf; it could discourage travel and increase wildlife-vehicle mortality. The Itasca County Railroad would cut across the southeast corner and along the southern boundary of the corridor, and could have a similar effect on lynx and wolf as the potential County Road 7 realignment. The Nashwauk gas pipeline and the existing transmission line corridor that traverses the entire proposed IGCC Power Station Footprint from north to south (which will remain in place) would run together along a north-south axis through the center of Corridor #2 and require vegetation clearing in the ROW. This would be a direct habitat loss and fragmentation in the corridor, but would not be an impenetrable barrier to movement. The 2006 Report predicts that this corridor would be isolated by future developments and would essentially be lost as a gateway between habitat blocks to the north and south. However, observations of lynx and wolves and their habitat use on the Northshore Mine Site during studies of the proposed NorthMet Mine (ENSR 2000, 2005, 2006, 2009) found that lynx and wolf used active mine areas as foraging habitat and for travel, and thus adverse impacts to lynx and wolf movements from mine development near corridors may be overstated in the 2006 Report.

Corridor #3 is an irregularly shaped corridor, varying in width between 1.4 and 2.3 miles, and located 2 miles east of Corridor #2 (Figure 7.6). Corridor #3 connects large habitat blocks the northwest and southeast, and is the only corridor for several miles in each direction, so it is considered a “high value” corridor. Current mining operations are immediately to the northeast and southwest of the corridor. The Project is not expected to directly impact this corridor, but other proposed projects could. The Itasca County rail alignment would run along the northern boundary of the corridor, and the Nashwauk gas pipeline would run along an east-west axis approximately 0.75 miles north of the corridor. These developments could discourage lynx and wolf movements and increase lynx and wolf mortality from vehicles. The Minnesota Steel Mine is expected to cause the loss of the majority of habitat in the eastern half of the corridor, and the 2006 Report suggested that other future developments may cause further habitat loss in the western half of the corridor.

6.3.2.2 East Range Site

Two wildlife travel corridors exist in the vicinity of the East Range Site that could be impacted by the IGCC Power Station and other projects in the area. Corridor #10 is approximately 1 mile wide and connects a large habitat patch to the north with several smaller patches to the south (Figure 7.7). Existing mine features on both sides of the corridor restrict access for several miles in each direction. The East Range Site lies approximately 1 mile to the southeast of the corridor, and would not be expected to significantly impact lynx or wolf access to or movement through the corridor. However, the Mesabi Nugget plant, which would be constructed along the entire northern boundary of the corridor, could eliminate the connection to the large habitat patch to the north of the corridor and cause the direct loss of the entire corridor. The plant would lessen the value of the corridor to lynx and wolf traveling across the Iron Range.

Corridor #11 is a small but important corridor, approximately 0.6 miles wide, that connects large habitat blocks to the east-southeast and north-northwest (Figure 7.8). The corridor could potentially be impacted by the NorthMet Mine tailings basin area, tentatively sited approximately 1 mile to the northwest, which could remove a large amount of habitat. The final site layout for the NorthMet Mine has not been finalized, however, and impacts to corridor #11 would be largely dependent on the final layout. The 2006 Report also noted that an area to the southwest has high potential for future growth, which could impact the corridor, but predicts that the corridor would continue to serve as an important connection for wildlife in the future.

6.3.3 Human Access and Disturbance

The IGCC Power Station and other nearby proposed projects would increase the amount of human access and disturbance in the area. Effects from loss of habitat and disturbance associated with human activities from the Project are discussed above. However, increased human populations in the Project area may also lead to increased risk to lynx and wolf from collisions with vehicles and trains, increased levels of recreation activities and use of backcountry roads and trails, increased mortality from illegal hunting and trapping, and increased risk from competition with other wildlife.

6.3.3.1 Collisions with Vehicles and Trains

Impacts to Canada lynx and gray wolf in and surrounding the Project may include mortality from vehicle collisions and trains. Construction of the facility and associated corridors, and the influx of workers to the area, would mean an increase in the number of roads and rail lines, as well as an increase in vehicular traffic volume along these transportation corridors. Consequently, the threat of lynx and wolf mortality from vehicle collisions would increase in the vicinity of the Project, as discussed in Sections 6.1.3, and 6.2.3 . There are few records of lynx being killed on highways, but direct mortality from vehicular collisions may be detrimental to small lynx populations in the lower 48 states. Risks of mortality from lynx-vehicle collisions would likely be greater in the vicinity of the East Range Site than the West Range Site because lynx density is predicted to be higher near the East Range Site. Still, it is unlikely that lynx and wolf would be killed by traffic associated with the Project because the Project Sites provide minimal habitat for lynx and wolf, no lynx were observed using the Sites during field surveys, and vehicle traffic associated with the Project would be light and limited to mostly rural roads, rather than highways and county roads, where lynx- and wolf-vehicle collisions are rare.

Studies of wolf populations in Minnesota, Michigan, and Wisconsin indicate that wolf populations usually fail to sustain themselves in areas where rural roads open to the public have densities exceeding 0.93 linear miles or road per mi^2. Post construction, road densities would be 1.2 and 1.7 miles per mi^2 in the vicinity of the West Range and East Range sites, respectively. Thus, suitable habitat for wolves may currently be lacking, or would be lacking after construction of the proposed Project.

6.3.3.2 Recreation

Recreational activities are becoming increasingly more widespread across the landscape, but their effects on lynx and wolf are little known. Very few studies have investigated the complex interactions between humans and wildlife. Some anecdotal information suggests that lynx are quite tolerant of humans, while wolves favor large tracts of land with low human densities, and that a wide variety of behavioral responses to human presence can be expected (USFWS 1992; Staples 1995; Roe et al. 1999; Mowat et al. 2000).

Nonconsumptive recreational activities are growing in popularity over the more traditional consumptive recreation uses of hunting and fishing (Duffus and Dearden 1990). Trends indicate that land-based activities occurring within developed recreation sites or near roads involve the greatest number of people. However, there have been vast improvements in bicycle and off-road vehicle technology, as well as a growing popularity in motorized off-road activities, including snowmobiling. Although the Project would not be used for recreational purposes, natural population growth, along with an influx of workers to support the Project, would further increase the growth of recreational activity in the study area and could possibly impact lynx and wolf movements within the area.

Recreational snowmobile use has expanded dramatically over the past 25 years, and is a common recreational activity in northern Minnesota. The growth of snowmobile use and an expanded trail system over the past 2 to 3 decades has increased human presence in lynx and wolf habitat in northern Minnesota and elsewhere in the United States. The impacts of this activity to lynx that may be found near the Project Sites would be minor given the limited number of lynx and wolf likely to use the Project area.

Lynx and carnivore biologists (Bider 1962; Ozoga and Harger 1966; Murray and Boutin 1991; Koehler and Aubry 1994; Murray et al. 1995; Lewis and Wenger 1998; Buskirk et al. 2000) have suggested that packed trails created by snowmobiles, cross-country skiers, snowshoe hares, and predators may serve as travel routes for potential competitors and predators of lynx, especially coyotes. Buskirk et al. (2000) hypothesized that the usual spatial segregation of lynx and coyotes may break down where human modifications to the environment increase access by coyotes to deep snow areas. Such modifications include expanded forest openings throughout the range of the lynx.

Fuller and Kittredge (1996) noted that the distribution and numbers of coyotes have dramatically expanded in recent decades. Geir (1975) and Nowak (1979) suggested that coyotes are thought to have originated in areas where snow cover was minimal, and it is only within the last century that they have colonized the boreal forests.

Buskirk et al. (2000) hypothesized that coyotes may be locally or regionally important competitors for lynx food resources, possibly exerting interference competition pressures on lynx as well. O'Donoghue et al. (1998b) also suggested coyotes exert potentially important exploitation competition pressures on lynx. Predation rates by coyotes on snowshoe hares exceeded those of lynx in the Yukon Territories during hare highs. Coyotes then shifted their prey preference from snowshoe hares to carrion because of intolerance to deep snow conditions (Todd et al. 1981). Coyotes have been shown to increase their use of open habitats between November and March due to the increase in packed snow conditions and the load-bearing strength of snow in openings. It is this strong prey- and habitat-switching ability of the coyote that may contribute to its success as a competitor with lynx (Buskirk et al. 2000).

Murray and Boutin (1991) reported that both lynx and coyotes used travel routes with shallow snow, but that coyotes traveled on harder snow more frequently. They also reported that the use of trails in the snow not only reduced the depth to which an animal sinks into the snow, but aided coyotes and lynx in obtaining additional food. Keith et al. (1977) suggested that during peak highs of hares, the density of trails in snow facilitates coyote movement. Murray and Boutin (1991) reported similar results with their study where hare densities were high.

Some studies suggest that wolves may exclude, and even kill coyotes in some areas of North America (Paquet 1992, Berger and Gese 2007), while others suggest that both species can coexist where food is abundant and varied (Arjo et al. 2002). Few coyotes have been seen near the West and East Range sites and likely would not influence wolf or lynx habitat use in these areas.

6.3.4 Forest/Backcountry Roads and Trails

A well-established road system is associated with mining activity along the Mesabi Iron Range, and to serve nearby towns, recreational areas, private residences, and pasturelands and forestlands. It is expected that the number of miles of roads within the study area would show little increase during the life of the Project, and some roads could be taken out of service or reclaimed during the life of the Project.

There is little information available on the effects of roads and trails on lynx or its prey (Apps 2000; McKelvey et al. 2000d), while road density appears to be an important factor in wolf habitat use (USFWS 1992). Construction of roads may reduce lynx and wolf habitat by removing forest cover and increasing the threat of illegal hunting and trapping. On the other hand, in some instances, along less-traveled roads where vegetation provides good snowshoe hare and white-tailed deer habitat, lynx and wolf may use the roadbed for travel and foraging (Koehler and Brittell 1990).

Roads and trails may facilitate snowmobile, cross-country skiing, and other human uses in the winter. As described previously in the recreation section, snow compaction on roads or trails may allow competing carnivores, such as coyotes and mountain lions, access into lynx and wolf habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of these other predators during mid-winter.

Recreational, administrative, and commercial uses of roads are known to disturb many species of wildlife (Ruediger 1996). However, preliminary information suggests that lynx do not avoid roads (Ruggiero et al. 2000a), except at high traffic volumes (Apps 2000). Lynx were often seen crossing roads near the NorthMet Mine and Northshore Mine sites, near Babbitt, Minnesota, during winter lynx surveys in 2006 and 2008. Wolf tracks were common on snow-packed trails near these sites. It is possible that summer use of roads and trails through denning habitat may have negative effects if lynx are forced to move kittens because of associated human disturbance (Ruggiero et al. 2000b).

At this time, there is no compelling evidence to suggest management of road density is necessary to conserve lynx, and the increase in road density associated with the Project and future growth in the study area should have little effect on lynx movements in the area. Management of road density, however, was identified as a critical factor in maintaining wolf populations in North America (USFWS 1992).

6.4 Factors Affecting Mortality

6.4.1 Trapping and Incidental or Illegal Shooting

There is evidence that lynx and wolf may be accidentally trapped during furbearer, including fisher (*Martes plennanti*), marten (*Martes americana*), and bobcat, trapping seasons. Of the 435 records in the MNDNR (2007) lynx database for 2000 to 2006, 10 records list that the animal was caught in a trap, and of these, 3 were killed, 6 were released unharmed, and the status of 1 is unknown. It is likely that other lynx have been trapped, but not reported. The magnitude of accidental lynx trapping in the Project area and in northern Minnesota is unknown.

Illegal trapping of wolves has occurred in Minnesota, but has not limited wolf range expansion and population increases (MnDNR 2001). Illegal killing of all types appears related to road density and level of human access, and wolf packs rarely live in territories where road densities are greater than 1 per mi^2.

Lynx and wolf could be shot mistakenly or intentionally by hunters or by poachers. Lynx and wolves may be shot by hunters during deer and other hunting seasons for fun, or lynx may be mistakenly identified as bobcat and shot during the bobcat season. The actual magnitude of lynx shooting in northern Minnesota is unknown. Of the 435 records in the MNDNR (2007) lynx database for 2000 through 2006, only 1 record lists that the animal was intentionally shot, while another lynx was accidentally shot. However, it is likely that lynx shootings are generally not reported. It is unlikely that many lynx would be shot within the study area due to limited numbers of lynx in the general vicinity of the Project.

Wolves have been shot in protection of livestock and pets, and to improve ungulate populations in Minnesota. The U.S. Department of Agriculture Wildlife Services also kills wolves in verified depredation situations. Still, legal and illegal remove of wolves has not prevent wolf range expansion and population increases (MnDNR 2001).

Education of the public as to the importance of protecting lynx and other wildlife has helped to reduce the accidental or intentional loss of lynx and wolves in recent years (MnDNR 2001).

6.4.2 Competition and Predation as Influenced by Human Activities

Lynx and wolves interact with other carnivores throughout their range. Competition with or predation by coyotes, gray wolves, mountain lions, bobcats, and birds of prey have been inferred or documented throughout the range of the lynx. Some human activities, particularly those related to timber harvest and over-the-snow access routes, have the potential to alter natural relationships between lynx and other predators.

Gray wolves were extirpated from the continental United States, except Minnesota, by 1960 (Thiel and Ream 1995). Much of this effort was carried out through government control programs to protect ungulates and halt the spread of rabies (Paradiso and Nowak 1982). Recently, wolf populations have rebounded in Minnesota, Wisconsin, the Upper Peninsula of Michigan and Montana, and have been reintroduced into central Idaho and the Yellowstone ecosystem.

Coyotes have expanded their range in recent decades (Fuller and Kittredge 1996), and coyotes may have expanded their range and increased in numbers as wolves were reduced in range and number. Crabtree and Sheldon (1999) also reported that in some areas of the contiguous U.S., wolves are increasing in numbers and distribution, while coyotes are decreasing in response.

Certain timber harvest practices increase edges and openings within forest stands, which may improve foraging conditions for generalist predators such as coyotes, bobcats, and great horned owls (*Bulbus virginianus*). This in turn increases the potential for both exploitation and interference competition with lynx to occur.

As described previously (in the Recreation section), snow compaction due to resource management or recreation activities may facilitate movement of coyotes and other potential competitors and predators into lynx habitat, making it likely that lynx in the study area would compete with these competitors and predators for primary lynx prey (Buskirk et al. 2000).

7.0 Conservation Measures

Six measures are recommended to Excelsior as conservation measures for potential impacts to lynx and wolves from the proposed Project. These measures are based, in part, on conservation measures identified in the *Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) that are applicable to lynx populations throughout the contiguous U.S. and could therefore apply to lynx in and around the proposed Project sites. The *Minnesota Wolf Management Plan* (MnDNR 2001) identifies measures that can benefit wolves in Minnesota.

Because limited research has been conducted on lynx in the contiguous United States, the first conservation measure would be to continue to follow studies of lynx conducted by the Forest Service, National Resources Research Institute, MnDNR, and other conservation agencies and groups to better understand lynx use of the study area during the Project's construction and operation, and to identify specific reclamation measures that could be implemented to restore lynx habitat to the area after facility closure. Numerous wolf studies have been conducted in northern Minnesota, but studies of wolves near the Project area could benefit wolf populations and habitat restoration near the Project. Additional conservation measures that are recommended if the Project is approved include: i) reclaiming the Project site to habitats favored by lynx, wolves, and other wildlife; ii) maintaining vegetated buffers around the Project site to reduce impacts to lynx and wolves from light and noise, where feasible; iii) restricting site access for recreation during development, operation, and reclamation; iv) minimizing the number of roads constructed and reclaiming roads upon facility closure; and v) educating workers on the need to observe speed limits and other facility regulations, and educating the public to take measures to protect lynx, wolves, and other wildlife. These measures are discussed in more detail below.

These conservation measures are written to support management of lynx, wolves, and their habitat. However, given the limited knowledge about lynx in the study area, many of the recommendations were drawn from knowledge about their primary prey (snowshoe hares) and important alternate prey (red squirrel, ruffed grouse [*Bonasa umbellus*]), other forest carnivores, and basic principles for maintaining or restoring native ecological processes and patterns. A benefit of this approach is that it should enhance compatibility with the needs of other species that inhabit the same ecosystem.

7.1 Reclaim Project Site

The IGCC Power Station and its associated infrastructure would modify wildlife habitat on a portion of the Project site. An important goal of reclamation would be to restore these portions of the site to productive uses for lynx, wolves, and other wildlife.

Upon site closure, much of the site could be reclaimed to wooded/forested habitat. Although it could take decades for reclaimed areas to provide suitable habitat for lynx, wolves, and their prey, timber management practices conducted on the site after closure that maintain or enhance habitat for snowshoe hare, white-tailed deer, moose, ruffed grouse, red squirrel, and other lynx and wolf prey would be beneficial. Reclaiming sites using deciduous and conifer tree species can also create good cover for snowshoe hare and white-tailed deer. Reclamation of the site would be enhanced if Excelsior evaluates historical and current conditions and landscape patterns to develop vegetation mosaics within the reclaimed area that are beneficial to lynx, wolf, and other wildlife and are conducive to promoting movement of wildlife throughout the study area and region. Given that past (and proposed) projects have led to fragmentation of habitat in the vicinity of the proposed Project sites, management activities that produce forest composition, structure, and patterns similar to those that would have occurred under historical disturbance regimes would benefit lynx, wolf, and their prey. Excelsior could also encourage nearby landowners to manage their forest stands to benefit lynx, wolf, and other wildlife, and to help maintain habitat connectivity between the study area and nearby national and state forests to provide future habitat for lynx and wolf and to allow for the movement of lynx between private and public lands.

Lynx and wolf exemplify the need for landscape-level ecosystem management. Contiguous tracts of land in public ownership (e.g., national and state forests) provide an opportunity for management that can maintain lynx habitat connectivity. Throughout most of the lynx range in the lower 48 states, connectivity with habitats and populations in Canada is critical for maintaining populations in the United States.

Efforts undertaken by Excelsior to minimize habitat disturbance during facility construction and operation, and to reclaim disturbed lands to wooded/forested habitat, would help ensure that habitat fragmentation is minimized and large blocks of lynx and wolf habitat remain in the region of the Project site. Although it is

unlikely that the Project site would ever serve as a refuge for lynx and wolves, given the high level of human activity within the area, it can continue to serve as an important travel corridor for lynx and wolves moving between state and national forests.

7.2 Maintain Vegetated Buffers

The facility should be designed to minimize impacts to lynx and wolves by minimizing the disturbance area and new road construction, and reclaiming any areas where Project activities cease. Where feasible, a vegetative buffer should be retained around the perimeter of the facility to reduce light and noise effects on nearby lynx and wolves. In addition, existing and newly constructed roads (built to access the Project site) should be reclaimed or obliterated after facility closure, where feasible.

7.3 Limit Public Access to Project Site

Recreational activities on the Project site should be limited to the extent possible during development, operation, and reclamation. Users of any snowmobile or hiking trails within the site should be encouraged to stay on the trail and avoid travel into other areas. After closure and reclamation, activities that compact snow could be minimized. Excelsior could work with county officials and private and public landowners in the region of the Project site to encourage them to minimize or preclude snow compacting activities on little-used roads and other ROW, where feasible and appropriate.

Lynx have evolved a competitive advantage in environments with deep soft snow that tends to exclude other predators during the middle of winter, a time when prey is most limiting (Murray and Boutin 1991; Livaitis 1992; Buskirk et al. 2000). Widespread human activity (snowshoeing, cross-country skiing, snowmobiling, all-terrain vehicles) may lead to patterns of snow compaction that provide additional advantage to competing predators such as coyotes and bobcats to occupy lynx habitat through the winter, reducing its value to and even possibly excluding lynx (Bider 1962; Ozoga and Harger 1966; Murray et al. 1995; O'Donoghue et al. 1998b).

7.4 Minimize Road Construction and Reclaim Unused Roads

As discussed above, road density is an important factor in determining if an area is suitable for wolves. Thus, new road construction should be avoided or limited, where feasible. Where feasible and appropriate, dirt and gravel roads traversing lynx and wolf habitat within the Project site should not be paved or otherwise upgraded (e.g., straightening of curves, widening of roadway, etc.) in a manner that is likely to lead to significant increases in traffic speeds or increased width of the cleared ROW, or would foreseeably contribute to development or increases in human activity in lynx habitat within the Project area.

Plowed roads and groomed over-the-snow routes may allow competing carnivores such as coyotes to access lynx habitat in the winter, increasing competition for prey (Buskirk et al. 2000). However, plowed or created snow roads would be necessary to access the facility during construction and operation, and are necessary to access other lands within the vicinity of the Project sites.

Preliminary information suggests that lynx may not avoid roads, except at high traffic volumes. Therefore, at this time, there is no compelling evidence to recommend management of road density to conserve lynx. There is evidence, however, that road density can impact wolf use of an area. Thus, the number of new roads constructed in support of the Project should be minimized and roads reclaimed/obliterated where feasible and appropriate.

7.5 Educate Workers and Public

Direct mortality from vehicular collisions has been detrimental to lynx and wolves in northern Minnesota. It is unlikely that lynx or wolves would travel close to the IGCC Power Station due to disturbance and lack of habitat. Still, to benefit lynx and other wildlife, speed limits should be enforced along access roads to reduce the risk of wildlife-vehicle collisions. Workers should be given training to make them aware of the importance of the area to wildlife, to request that employees report sick or dying wildlife along roads or at facilities, to ensure that employees do not dump wastes or other harmful materials off the site, and to make employees aware of other actions that could be harmful to wildlife or their habitats.

Lynx and wolves may be mistakenly trapped or shot by legal predator hunters seeking bobcats or other furbearers, or illegally trapped or shot by poachers. Prey species, such as snowshoe hares, white-tailed deer, and ruffed grouse, may also be affected by legal and illegal trapping and shooting. To reduce or eliminate the incidence of illegal trapping and shooting of lynx and wolf, Excelsior could work with the MnDNR and local conservation groups to initiate information and education efforts to protect the lynx and wolf and to ensure that trappers check their traps at frequent intervals and release lynx and wolves that are still alive. Trailhead posters, magazine articles, and news releases could be used to inform the public of the possible presence of lynx and wolves within or near the Project area.

8.0 Determination of Effects

A recent survey for lynx conducted near the preferred West Range Site found no evidence of lynx residing in or traveling through the action area. A survey near the alternative East Range Site found evidence of lynx within 10 miles of the Project site. Lynx may be present in the vicinity of the proposed Project sites, but habitat in both areas is heavily fragmented by mining operations and is generally of marginal quality for lynx. Lynx density at the sites is expected to be low, particularly at the West Range Site, which lies at the western edge of the lynx's range in Minnesota. Surveys for wolves were not conducted within the action areas. Surveys conducted by the MnDNR have shown that wolves are most common in Minnesota in the Chippewa and Superior National Forests, and in Voyageur National Park. The Chippewa National Forest is about 6 miles from the West Range Site. In a study of radio-collared wolves by the Biological Resources Division of the U.S. Geological Survey, no radio-collared wolves were found near the West Range Site, but 10 wolves have been observed within 10 miles of the East Range site since 2004. However, except for a single record in December 2006 and two records in 2001, all other records of wolves near the East Range Site were recorded between 1994 and 1997. Habitat in the Project areas is of marginal quality for wolves and their primary prey, white-tailed deer, due to area disturbances, and road densities exceed levels (1 mile/mi^2) that are conducive for good wolf habitat (USFWS 1992).

Habitat loss and fragmentation would be unavoidable effects to lynx and wolves from the Project, and additional impacts from other proposed projects in the area are expected. However, the types of habitat that would be lost are common in northeastern Minnesota, and lands along the Iron Range are already highly fragmented. It is unlikely that habitat loss and fragmentation resulting from the Project would represent a significant impact to lynx and wolf from a regional perspective.

Although lynx and wolves are unlikely to be resident species in the action area or nearby, individuals may move into the action area while making the types of long-range movements described above. The IGCC Power Station and other regional projects have the potential to disrupt travel corridors that connect habitats on either side of the Iron Range. Two travel corridors could be negatively impacted by the Project at either of the proposed sites. There are 13 travel corridors across the Iron Range, however, and it is unlikely that the IGCC Power Station and other nearby projects would prevent lynx and wolves from traversing the Range, although lynx and wolves may be forced to travel further or through poorer habitat to do so. Both lynx and wolves have been observed using active mining areas to the northeast of the East Range Site, including lynx with kittens.

With implementation of conservation measures, other potential adverse effects to lynx and wolves could be mitigated. Noise and light disturbance could be minimized by designing and/or maintaining vegetated buffers around the generating station. Minimizing road construction and educating workers about wildlife could reduce or prevent lynx or wolf mortality resulting from harmful material releases and incidental shooting. Lynx and wolf habitat lost as a result of the Project could eventually be restored with proper site closure and reclamation measures.

Collision with vehicles is also recognized as a documented cause of lynx and wolf mortality in Minnesota. Vehicle traffic to and from the project site would include road access to the Project site, rail access to the Project site, and road traffic within the Project site. Increased traffic is expected in the vicinity of the Project. However, the increased traffic would occur in areas where lynx and wolves are not likely resident and away from areas identified as suitable or potentially suitable for lynx (ENSR 2006, 2007) and wolves. Therefore, the likelihood of the proposed action resulting in the death or injury of any Canada lynx or wolves due to a vehicle collision is discountable.

Critical habitat for the lynx has been designated in Minnesota, but is more than 60 miles away from the proposed Project sites, thus the IGCC Power Station would not adversely modify of otherwise affect lynx critical habitat. On February 29, 2008, the U.S. Fish and Wildlife Service (USFWS) published in the Federal Register (Federal Register 2008a) a proposed rule that included a proposed revised critical habitat designation that surrounded, but did not include, the East Range Site and excluded the West Range Site. The proposed rule is still under review by the USFWS as of January 31, 2009.

In 1978, critical habitat was designated for the Eastern DPS of gray wolf (Federal Register 1978). That rule (50 CFR 17.95(a)) identified critical habitat at Isle Royale National Park, Michigan, and Minnesota wolf management zones 1, 2, and 3, as delineated in 50 CFR 17.40(d)(1). Wolf management zones 1, 2, and 3 comprise approximately 9,800 miles^2 in northeastern and north central Minnesota and include all of the Superior National Forest and portions of the Chippewa National Forest. The West Range Site is outside of these zones, while the East Range Site is in Zone 2.

Not all areas within the mapped boundaries of designated habitat are considered critical habitat. Only areas that contain the primary constituent elements required by the species are considered critical habitat. Primary constituent elements are the physical and biological features of a landscape that a species needs to survive and reproduce (USFWS and NMFS 1998). Habitat quality for wolves is marginal in the action areas, and road densities suggest that wolves would not establish territories near the Project; thus, the action areas likely also lack the primary constituent elements the wolf needs to survive and reproduce.

In conclusion, the action areas do not contain extensive areas of suitable lynx and wolf habitat in the vicinity of the Project. A comprehensive survey using established methods (e.g., see Squires et al. 2004) and qualified observers failed to record a single lynx in and around the Project sites in 2006 and 2007 (ENSR 2006, 2007). Increased vehicular traffic would not occur near any area where lynx have been recently verified, and road densities in the action areas, and noise and disturbance associated with the Project, suggest that wolves would avoid the Project sites. The West Range Site is located near the edge of lynx range, while wolves are widely distributed throughout northern Minnesota. Although project activities may affect lynx and wolves potentially moving through the action area due to the destruction of forested habitat, it is unlikely that these effects to movement would result in reduced survival or reproduction of any lynx or wolves. Habitat assessments indicate that the habitat is marginal and lacks the primary constituent elements the lynx and wolf need to survive and reproduce. In summary, although the Project could result in some effects to lynx and wolves, those effects are likely to be insignificant or discountable and, thus, **may affect, but are not likely to adversely affect** any Canada lynx or gray wolves or their critical habitat.

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Tables

Appendix E

Table 3.1 Existing and Impacted Wildlife Habitat in the West Range IGCC Power Station Footprint

Terrestrial Community	Areas within Mesaba IGCC Site (acres)	Areas Impacted by West Range IGCC Power Plant Footprint (acres)		
		Phase I	Phase II	Total Acres
Northern Mesic Hardwood Forest (Red oak, sugar maple, basswood, bluebead lily) forest (MNDNR Code MHn35b)	682.36	84.19	66.60	150.79
Northern Wet-Mesic Boreal Hardwood-Conifer Forest (Aspen, birch, red maple forest) (Mhn44a)	468.93	12.30	0.00	12.30
Aspen Forest[1]	185.35	0.51	7.12	7.62
Old Field[1]	31.16	0.00	0.00	0.00
Northern Mixed Cattail Marsh (MRn83)	12.55	0.01	0.45	0.45
Northern Wet Ash Swamp (WFn55)	209.68	6.08	17.24	23.32
Northern Wet Meadow/Carr (WMn82)	79.19	7.53	0.04	7.57
Northern Spruce Bog (Apn80)	3.95	0.00	0.00	0.00
Northern Open Bog (Apn90)	0.41	0.00	0.00	0.00
Northern Rich Alder Swamp (FPn82)	34.00	0.00	0.00	0.00
Northern Rich Tamarack Swamp (FPn82)	0.16	0.00	0.00	0.00
Inland Lake Clay/Mud Shore (Lki54)	0.56	0.00	0.00	0.00
Other Water Body (OW)	0.12	0.00	0.00	0.00
Total	**1,708.42**	**110.62**	**91.45**	**202.05**

[1] Codes were created for cover not included in ECS classification system.
Note: Numbers may not total due to rounding.
Source: Table 3 Technical Memo Supplement (Short Elliott Hendrickson, Inc. [SEH] 2008a).

Table 3.2 Land Cover Types in Minnesota

Ecological Classification System (ECS)	
Habitat Code and Name	**Definition**
APn80 - Northern Spruce Bog	Includes bogs dominated with black spruce trees (*Picea mariana*). Trees are usually stunted (< 30 feet tall) with 25-75% coverage. The understory is dominated by sphagnum mosses (*Sphagnum* spp.) and fine-leaved graminoids such as cottongrass (*Eriophorum vaginatum*) and sedge species (*Carex* spp.) Low-shrubs, such as cranberry species (*Vaccinium* sp.) and Labrador tea (*Ledum groenlandicum*) comprise approximately 25% of the canopy
APn81 - Northern Poor Conifer Swamp	Includes bogs dominated by black spruce and tamarack (*Larix laricina*). Trees are usually stunted (< 33 feet tall) with 25-50% coverage. The understory is dominated by sphagnum mosses, fine-leaved graminoids, and low-shrubs. The tall shrub layer is dominated by speckled alder (*Alnus incana*) and willow species (*Salix* spp.). The tall and low shrub layers comprise approximately 25% coverage of the canopy.
APn90 - Northern Open Bog	Includes bogs dominated by low-shrubs, sphagnum mosses, and fine-leaved graminoids. Graminoids species present include bog wiregrass sedge (*Carex oligosperma*), cottongrass, and miscellaneous other sedge species. Tree cover is sparse or absent (< 25%) and generally comprised of stunted black spruce and tamarack mix.
FPn73 - Northern Alder Swamp	Includes tall-shrub wetlands dominated by speckled alder, red-osier dogwood (*Cornus sericea*), and currant species (*Ribes* spp.). The herbaceous layer is comprised of Canada bluejoint (*Calamagrostis canadensis*), fowl mannagrass (*Glyceria striata*), sedge species, common marsh marigold (*Caltha palustris*), touch-me-nots (*Impatiens* spp.), and fern species (*Dryoptteris* spp.)
FPn82 - Northern Rich Tamarack Swamp (Western Basin)	Includes wetlands dominated by tamarack trees with black spruce, red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), and balsam fir (*Abies balsamea*) in the understory. Tree canopy is patchy to interrupted with 25-75% coverage. Speckle alder and willows dominate the tall-shrub layer. Sphagnum mosses, Canada bluejoint grass, and sedge species comprise the herbaceous layer.
LKi54 - Inland Lake Clay/Mud Shore	Includes inland lakes and ponds with plant communities growing in a clay, mud, or silt substrates. Vegetation cover and composition vary seasonally and from year to year dependent on water levels.
MHn35 - Northern Mesic Hardwood Forest	Includes hardwood forest on well-drained to moderately well-drained soils. Tree canopy is usually continuous (> 75% cover) and comprised of sugar maple (*Acer saccharum*), basswood (*Tilia americana*), northern red oak (*Quercus rubra*) with occasional area of paper birch and quacking aspen (*Populus tremuloides*) The shrub layer includes sapling of the tree canopy species with beaked hazelnut (*Corylus cornuta*), chokecherry (*Prunus virginiana*), and balsam fir. The herbaceous layer ranges from 5-75% coverage and dominated by Pennsylvania sedge (*Carex pennsylvanica*), large-leaved aster (*Aster macrophyllus*), and bedstraw species (*Galium* spp.)

Table 3.2 Terrestrial Land Cover Types in Minnesota (Cont.)

Ecological Classification System (ECS)	
Habitat Code and Name	**Definition**
MHn44 - Northern Wet-Mesic Boreal Hardwood-Conifer Forest	Includes forests on generally wet-mesic to mesic soils. Tree canopy is dominated by quacking aspen, paper birch, balsam fir with occasional red maple, white spruce (*Picea glauca*), and black ash (*Fraxinus nigra*). The shrub layer is comprised of beaked hazelnut, chokecherry, and juneberries (*Amelanchier* spp.). The ground layer is dominated by large-leaved aster, bedstraw species, and Canada mayflower (*Maianthemum canadense*).
MRn83 - Northern Mixed Cattail Marsh	Includes wetland complexes that are dominated by cattail species (*Typha* spp.). The cattails are often found is dense stands interspersed with pools of open water. Associated species are highly variable.
MRn93 - Northern Bulrush-Spikerush Marsh	Include emergent marsh communities typically dominated by bulrush species (*Scirpus* spp.) and spikerush species (*Eleocharis* spp.). Associated species include pondweeds (*Potamogeton* spp.), broad-leaved arrowhead (*Sagittaria latifolia*), and bur-reed (*Sparganium* spp.). Cattail species present but not dominant.
OW- Other Water Body	Includes open water body not associated with a natural body of water. An example is abandoned open pit mine filled with water.
WFn55 - Northern Wet Ash Swamp	Includes forested wetlands dominated (50-100% cover) with black ash primarily. Fine-bladed sedges and fern species dominate the herbaceous layer.
WMn82 - Northern Wet Meadow/Carr	Includes open wetlands dominated by dense cover of broad-leaved graminoids and/or tall shrubs. Tall shrubs include speckled alder, willow species (*Salix* spp.), and red-osier dogwood. Herbaceous layer dominated by Canada bluejoint, tussock sedge (*Carex stricta*), and lake sedge (*Carex lacustris*).
AFXXXX - Aspen Forest[1]	Includes forested areas dominated primarily by sapling quaking aspen. Generally these are areas that were logged using clear cutting methods.
XDXXOF - Old Field[1]	Includes native habitats that were disturbed by agricultural, development, or construction activities. The current vegetation likely dominated by non-native vegetation.
XDXXXX - Disturbed Land[1]	Includes primarily mine spoil areas that have not been vegetated.

[1] Codes were created for cover not included in ECS classification system.
Source: Table 19 Technical Memo Supplement (SEH 2008a).

Table 3.3 Existing and Impacted Wildlife Habitat in West Range IGCC Power Station Footprint and Utility/Transportation Corridors[1]

Land Use/Land Cover	Areas within Mesaba IGCC Site and Transportation/ Utility Corridors (acres)	Area Impacted (acres)				
		Phase I	Phase II	Transportation Corridors[2,3]	Utility Corridors[3]	Total[3]
Coniferous forest	67.21	0.34	3.94	3.47	13.72	21.47
Deciduous forest	788.17	46.48	45.77	60.28	69.35	221.88
Grassland	18.19	0.00	0.00	0.85	15.78	16.63
Gravel pits and open mines	50.52	0.00	0.00	0.01	50.50	50.51
Mixed wood forest	361.39	46.87	12.38	20.13	30.47	109.85
Open water	4.9	0.00	0.00	0.87	1.23	2.10
Other rural developments	42.54	0.00	0.00	1.13	20.86	21.99
Regeneration/young forests	253.99	0.48	9.11	10.14	36.68	57.31
Shrubby grassland	9.31	0.00	0.00	0.00	9.32	9.32
Urban/Industrial (cities & towns)	0.19	0.00	0.00	0.00	0.19	0.19
Wetlands	447.73	16.34	20.16	8.27	61.57	106.34
Totals	**2,044.14**	**110.51**	**91.36**	**106.05**	**309.67**	**617.59**

[1] Area calculations are based on the provided native file Universal Transverse Mercator (UTM) projection system. Minute differences will be noticed when comparing UTM calculation results to calculations based on the Minnesota County Lambert projection systems (ECS Terrestrial Communities).
[2] This summary excludes the area within the preferred Alternative 3B rail loop as impacted habitat.
[3] The totals include impacts over the entire area and along the full length of all project elements
Source: SEH email correspondence, January 19, 2009.

Table 3.4 Existing Wetlands in West Range Site and Utility/Transportation Corridors

Wetland Classification System			Area (acres)
Circular 39[1]	Eggers and Reed[2]	Cowardin[3]	
1	Seasonally Flooded Basin or Flat	PFO1A	0.49
2	Wet Meadow	PEMB	2.08
3	Shallow Marsh	PEMC	7.03
4	Deep Marsh	PUBF	0.42
5	Shallow Open Water	PEM1H/L1UBH	3.23
6	Shrub Carr	PSS1	80.14
6	Alder Thicket	PSS1A/C	46.83
7	Hardwood Swamp	PFO1A/B/C	208.88
7	Coniferous Swamp	PFO1C	12.73
8	Coniferous Bog	PFO7B	23.70
Total Wetland Area			**385.53**

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
[3] From: Cowardin et al. (1979).
Source: Table 2 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.5 Wetland Types and Definitions in Minnesota

Circular 39[1]	Eggers & Reed[2]	Definition
Type 1 - Seasonally Flooded Basin or Flat	Floodplain forest Seasonally flooded basin Wet to Wet-mesic prairie Fresh (wet) meadow	Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding from bottomland hardwoods (floodplain forests) to herbaceous plants.
Type 2 - Inland Fresh Meadow	Wet to Wet-mesic prairie Fresh (wet) meadow Sedge meadow Calcareous fen	Soil is usually without standing water during most of the growing season, but is waterlogged within at least a few inches of surface. Meadows may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side. Vegetation includes grasses, sedges, rushes, and various broad-leaved plants. Other wetland plant community types include low prairies, sedge meadows, and calcareous fens.
Type 3 - Inland Shallow Fresh Marsh	Shallow marsh	Soil is usually waterlogged early during the growing season and may often be covered with as much as 6 inches or more of water. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side. These are common as seep areas on irrigated lands. Vegetation includes grass, bulrush, spikerush, and various other marsh plants such as cattail, arrowhead, pickerelweed, and smartweed.
Type 4 - Inland Deep Fresh Marsh	Deep marsh	Soil is usually covered with 6 inches to 3 feet or more of water during growing season. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks, and sloughs, or the may border open water in such depressions. Vegetation includes cattail, reeds, bulrush, spikerush, and wild rice. In open areas, pondweed, naiad, coontail, Eurasian watermilfoil, waterweed, duckweed, waterlily, or spatterdock may occur.
Type 5 - Inland Open Fresh Water	Shallow open water	Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and fringed by a border of emergent vegetation similar to areas of Type 4.
Type 6 - Shrub Swamp	Shrub-Carr Alder thicket	Soil is usually waterlogged during the growing season and is often covered with as much as 6 inches of water. These occur mostly along sluggish streams and occasionally of floodplains. Vegetation includes alder, willow, buttonbush, dogwood, and swamp-privet.
Type 7 - Wooded Swamp	Hardwood swamp Coniferous swamp	Soil is waterlogged at least within a few inches of the surface during the growing season and is often covered with as much as 1 foot of water. These occur mostly along sluggish streams, on old riverine oxbows, on flat uplands, and in ancient lake basins. Forest vegetation includes tamarack, arborvitae, black spruce, balsam fir, red maple, and black ash. Deciduous swamps frequently support beds of duckweed and smartweed. Other wetland plant community types include lowland hardwood swamps and coniferous swamps.
Type 8 - Bogs	Open bog Coniferous bog	Soil is usually waterlogged. These occur mostly in ancient basins, on flat uplands, and along sluggish streams. Vegetation is woody or herbaceous or both, usually on a spongy covering of mosses. Typical plants are heath shrub, sphagnum moss, and sedge. In the North, leatherleaf, Labrador tea, cranberry, and cottongrass are often present. Scattered, often stunted, black spruce and tamarack may occur.

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
Source: Table 3.7-1 in Draft EIS and Table 3 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.6 Wetland Impacts in West Range IGCC Power Station Footprint and Utility/Transportation Corridors[1,2]

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I			0.04			7.31	6.27		13.62
IGCC Power Station, Phase II							17.74		17.74
Railroad						4.75	0.98		5.73
Plant Access Road (acres in Right of Way [ROW])			0.004			0.19			0.19
High Voltage Transmission Line (HVTL)						0.0032	0.0026	0.0039	0.01
Subtotal Wetland Filling									**37.29**
Temporary Disturbance									
Access Road			0.08			0.13			0.21
HVTL						2.33			2.33
Gas Pipeline (acres in ROW)	0.70	1.98	1.22			0.84			4.74
Process Water 1 – Lind Pit to Canisteo (acres in ROW)									0.00
Process Water 2 – Canisteo to IGCC site (acres in ROW)						0.18			0.18
Process Water 3 – Gross Marble to Canisteo (acres in ROW)				0.62	0.64	1.15			2.41
Potable Water and Sanitary Sewer									
Subtotal Temporary Disturbance									**7.54**
Permanent Type Conversion									
Access Road									0.00
HVTL						9.40	6.84	19.92	36.16
Gas Pipeline						4.5	9.16	2.72	16.38
Process Water 1- Lind Pit to Canisteo									0.00
Process Water 2 – Canisteo to IGCC Site						0.12	1.98		2.10
Process Water 3 – Gross Marble to Canisteo						1.23	0.51	0.63	2.37
Potable Water and Sanitary Sewer									0.00
Subtotal Permanent Type Conversion									**57.01**

[1] In instances where National Wetlands Inventory (NWI) and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.
[2] Accurate Eggers and Reed classifications are only available for wetlands that have been field delineated. Eggers and Reed classifications for NWI wetlands are assumed to be the most common wetland types for this area of Minnesota. In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type present.
Source: Table 15 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.7 Existing and Impacted Wildlife Habitat in the East Range IGCC Power Station Footprint

Terrestrial Community	Areas within Mesaba IGCC Site (acres)	Areas Impacted by East Range IGCC Power Plant Footprint (acres)		
		Phase I	Phase II	Total Acres
Northern Mesic Hardwood Forest (Red oak, sugar maple, basswood, bluebead lily) forest (MNDNR Code MHn35b)	304.34	2.76	11.10	13.86
Northern Wet-Mesic Boreal Hardwood-Conifer Forest (Aspen, birch, red maple forest) (Mhn44a)	416.38	63.74	69.43	133.17
Aspen Forest[1]	21.36	0.00	0.00	0.00
Old Field[1]	23.18	0.34	0.66	1.00
Northern Mixed Cattail Marsh (MRn83)	62.71	1.89	1.38	3.27
Northern Wet Ash Swamp (WFn55)	249.42	21.78	0.31	22.09
Northern Wet Meadow/Carr (WMn82)	12.14	1.79	0.01	1.80
Northern Spruce Bog (Apn80)	12.90	4.75	0.00	4.75
Northern Poor Conifer Swamp (Apn81)	37.12	0.66	1.42	2.08
Northern Rich Alder Swamp (FPn82)	181.22	0.19	0.90	1.09
Disturbed Land[1]	0.89	0.00	0.00	0.00
Total	**1,321.66**	**97.90**	**85.21**	**183.11**

[1] Habitats not included in ECS.
Source: Table 26 Technical Memo Supplement (SEH 2008a).

Table 3.8 Existing and Impacted Wildlife Habitat in East Range IGCC Power Station Site and Utility/Transportation Corridors[1]

Land Use/Land Cover	Areas within Mesaba IGCC Site and Transportation/ Utility Corridors (acres)	Area Impacted (acres)				
		Phase I	Phase II	Transportation Corridors[2]	Utility Corridors[3]	Total[4]
Coniferous forest	102.53	0.00	0.00	1.13	4.38	5.51
Deciduous forest	64.53	2.07	22.33	0.00	4.76	29.16
Grassland	305.35	0.00	0.00	0.00	9.74	9.74
Gravel pits and open mines	71.88	0.00	0.00	0.00	71.88	71.88
Mixed wood forest	489.29	67.45	57.27	38.76	37.72	201.2
Open water	7.93	0.00	0.00	0.17	7.44	7.61
Other rural developments	87.18	0.82	1.24	1.24	76.04	79.34
Regeneration/young forests	204.13	0.00	0.00	0.00	116.59	116.59
Shrubby grassland	201.73	13.91	0.00	12.73	133.34	159.98
Urban/Industrial (cities & towns)	0.17	0.00	0.00	0.00	0.00	0.00
Wetlands	748.46	13.44	3.70	15.12	216.00	248.26
Totals	**2,283.18**	**97.69**	**84.54**	**69.15**	**677.89**	**929.27**

[1] Area calculations are based on the provided native file Universal Transverse Mercator (UTM) projection system. Minute differences will be noticed when comparing UTM calculation results to calculations based on the Minnesota County Lambert projection systems (ECS Terrestrial Communities).
[2] This summary does not consider the area within the rail loop to be impacted habitat.
[3] Land Use/Land Cover calculations are based on a data set with 30 meters spatial resolution. The resolution of the data causes inaccuracies in land cover calculations such that the existing utility corridors (i.e., the natural gas pipeline and HVTL routes) that have been cleared of trees and shrubs artificially show as other land cover types found adjacent. In actuality, there will be minimal habitat impacts to such existing, cleared corridors. To address such known inaccuracies when dealing with the existing ROW that will be used on the East Range Site (where all gas pipeline ROW is existing ROW), the data in this table has been revised by assuming that all coniferous, deciduous, and mixed wood forest cover identified in Geographical Information System (GIS) studies focused on the gas pipeline are actually grassland. In like manner, all coniferous, deciduous, and mixed wood forest types identified in sections of the East Range HVTLs that are known to use existing ROW are assumed to be grassland.
Land cover types within new HVTL ROW that are identified in GIS studies are assumed to be accurate.
[4] The totals include impacts of the entire area within the East Range Site and along the full length of all the IGCC Power Station's linear facilities.
Source: SEH email correspondence, January 21, 2009.

Table 3.9 Existing Wetlands in East Range IGCC Power Station Footprint and Utility/Transportation Corridors

Circular 39[1]	Eggers and Reed[2]	Cowardin[3]	Area (acres)
2	Wet Meadow	PEMB	10.17
2	Sedge Meadow	PEMC	0.08
3	Shallow Marsh	PEMC	6.38
4	Deep Marsh	PUBF	62.94
5	Shallow Open Water	PEM1H/L1UBH	5.05
6	Alder Thicket	PSS1A/C	276.04
6	Shrub Swamp	PSS1B	154.87
7	Hardwood Swamp	PFO1A/B/C	71.76
7	Coniferous Swamp	PFO2B/C	33.37
8	Coniferous Bog	PFO7B	96
R	Riverine		0.28
Total Wetland Area			**716.94**

[1] From: Shaw and Fredine (1971).
[2] From: Eggers and Reed (1997).
[3] From: Cowardin et al. (1979).
Source: Table D-1 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.10 Wetland Impacts in East Range IGCC Power Station Footprint and Utility/Transportation Corridors[1, 2, 3]

Project Element	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total
Wetland Filling									
IGCC Power Station, Phase I		1.79		1.89		0.19	9.57		13.44
IGCC Power Station, Phase II		0.007		1.38		0.90	1.42		3.71
Railroad		0.05		2.67		8.86	0.89	0.91	13.38
Plant Access Road (acres in ROW)						0.05	0.39		0.44
HVTL	0.0006	0.0025			0.0025	0.0334	0.0114	0.0383	0.09
Subtotal Wetland Filling									**31.06**
Temporary Disturbance									
HVTL						0.20			0.20
Gas Pipeline Alt. 1	0.09	14.12	0.003	0.68	0.00	0.33		9.10	24.32
Process Water 1 – Intake			0.38	0.41		0.19			0.98
Potable Water and Sanitary Sewer									0
Subtotal Wetland Filling									**25.50**
Permanent Type Conversion									
HVTL						19.21	10.99	29.42	59.62
Gas Pipeline							0.41	0.06	0.47
Process Water - Intake						0.26	0.75	0.32	1.33
Potable Water and Sanitary Sewer									
Subtotal Permanent Type Conversion									**61.42**

[1] In instances where National Wetland Inventory and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type.
[2] Wetland impacts are first counted for the plant site, rail, road, HVTL, gas pipeline, process water lines, sanitary sewer, and process water, in that order.
[3] Accurate Eggers and Reed classifications are only available for wetlands that have been field delineated. Eggers and Reed classifications for NWI wetlands are assumed to be the most common wetland types for this area of Minnesota. In instances where NWI and other data identify wetland complexes of multiple types, the information above uses the most predominant wetland type present.
Source: Table D-17 in Mesaba Energy Project Draft Wetland Permit Application (SEH 2008b).

Table 3.11 Minnesota Species of Greatest Need Wildlife Species Assemblages in the East and West Range

Species	Habitat Associations[1]
Mammals	
Canis lupus – Gray wolf	All habitats
Lynx canadensis – Canada lynx	AF, MHn44
Phenacomys intermedius– Heather vole	APn90, APn80, APn81
Snaptomys borealis – Northern bog lemming	APn90, APn80, APn81
Birds	
**Accipiter gentiles* – Northern goshawk	MHn35, MHn44
**Asio flammeus* – Short-eared owl	OF, XD
**Botaurus lentiginosus* – American bittern	FPn73, LKi54, MRn83, MRn93, OW
**Buteo lineatus* – Red-shouldered hawk	MHn35, MHn44
**Catharus fuscescens* – Veery	MHn35, MHn44
**Chodeiles minor* – Common nighthawk	All habitats
**Circus cyaneus* – Northern harrier	OF, XD
**Coccocyzus erythropthalmus* – Black-billed cuckoo	MHn35, MHn44
**Contopus cooperi* – Olive-sided flycatcher	APn80, APn81
**C. virens* – Eastern wood-pewee	MHn35, MHn44, WFn55, WFn64, APn80, APn81, AF, FPn82
**Coturnicops novaboracensis* – Yellow rail	WMn82
**Dendroica cearulescens* – Black-throated blue warbler	MHn44
**D. castanea* – Bay-breasted warbler	MHn35, MHn44
**D. tigrina* – Cape May warbler	MHn35, MHn44
**Empidonax* – Flycatchers	MHn35, MHn44, WFn55, WFn64, APn80, APn81, AF, FPn82
**Gavia immer* – Common loon	OW, LKi54
**Haliaeetus leucocephalus* – Bald eagle	OW, LKi54, MHn35, MHn44
**Hylocichlia mustelina* – Wood thrush	MHn35, MHn44
**Melospiza georgina* – Swamp sparrow	LKi54, APn80, APn81, APn90, FPN73, FPn82, MRn83, MRn93, WFn55, WFn64
**Opornis agilis* – Connecticut warbler	MHn35, MHn44, WFn55, WFn64, APn81
**Pheuticus ludovicianus* – Rose-breasted grosbeak	MHn35, MHn44
**Scolopax minor* – American woodcock	LKi54, APn80, APn81, APn90, FPN73, FPn82, MRn83, MRn93, WFn55, WFn64
**Seiurus aurocapillus* – Ovenbird	MHn35, MHn44
**Sphyrapicus varius* – Yellow-bellied flycatcher	MHn35, MHn44, WFn55, WFn64, APn81
**Wilsonia canadensis* – Canada warbler	MHn35, MHn44, WFn55, WFn64, APn81
**Zonotrichia albicollis* – White throated sparrow	APn90, OF, XD, WMn82
Reptiles	
Chelydra serpentina – Snapping turtle	LKi54, OW
Amphibians	
Hemidactylum scutatum – Four-toed salamander	MHn35, MHn44, WFn55, WFn64, APn81, APn80, APn83
Plethodon cinereus – Eastern red backed salamander	MHn44, APn80
Rana palustris – Pickerel frog	LKi54, OW

[1] See Table 3-2 for habitat association types.
Note: OF = Old Field (XDXXOF); XD = Disturbed Land (XDXXX); AF = Aspen Forest (AFXXXX).
* Migratory bird species.
Sources: Table 20 and Table 31 in Technical Memo Supplement (SEH 2008a).

Table 7.1 Cumulative Habitat Impacts in the Arrowhead Region and Ecological Subsections in the Next 20 Years

	Losses to Forestry (acres)	Losses to Economic Development (acres)	Losses to Mining (acres)	Total Losses (acres)
Arrowhead Region	7,315	498	913	8,727
Nashwauk Uplands	0	158	718	876
Laurentian Uplands	588	38	197	823

Source: Emmons and Olivier, Inc. (2006).

Table 7.2 Cumulative Habitat Impacts in the West Range Study Area by Project

	Total Habitat in Study Area (acres)	Total Habitat Impacts (acres)	Percent Loss of Total Habitat		Proportion of Cumulative Impact (percent)
			From Past	From Existing	
Past Natural Habitat	400,052				
Existing Natural Habitat	387,754		3.07		
Future Actions					
Mesaba Energy Project		523[1,2]		0.13	9.49
Minnesota Steel		3,324		0.86	60.34
Nashwauk Gas Pipeline		157		0.04	2.85
County Road 7 Realignment		59		0.02	1.07
Itasca County Railroad		122		0.03	2.21
Keetac Mine Expansion		1,324		0.34	24.03
Total of Future Actions		5,509[3]		1.42	100.00
Future	**382,245**				

[1] This table includes habitat impacts that would occur in the 13.2 mile corridor along which the natural gas pipeline serving the Project would traverse. The table also includes pipeline impacts that would occur from constructing the natural gas pipeline adjacent to the natural gas pipeline that the City of Nashwauk will use to serve Minnesota Steel Industries, LLC. If Excelsior purchases its natural gas from the City of Nashwauk via the City's pipeline, Excelsior would not construct its own pipeline and thus could avoid associated impacts (i.e., the total habitat impacts noted would decrease by approximately 103 acres).
[2] The 523 acres differs from the 618 acres shown in Table 3.3 because the West Range study area does not include the entire length of the gas pipeline.
[3] This number differs from the sum of the numbers above it due to rounding.
Sources: Tables 2, 3, 4, 5, 6, 7, and 8 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.3 Cumulative Habitat Impacts in the West Range Study Area by Habitat Type

Habitat Type	Existing Conditions (acres)	Impacts of Reasonably Foreseeable Future Actions (acres)	Percent Loss Resulting from Implementation of Reasonably Foreseeable Future Actions
Open Wetland	7,763	113	1.46
Lowland Deciduous	8,172	26	0.32
Lowland Deciduous Shrubland	46,527	946	2.03
Lowland Conifer	31,731	31	0.10
Lowland Conifer Shrubland	212	0	0.00
Upland Conifer	22,878	28	0.12
Upland Conifer/Deciduous Mix	100	0	0.00
Upland Deciduous (Aspen/Birch)	139,407	1,884	1.35
Upland Deciduous (Hardwoods)	12,234	351	2.87
Upland Shrub/Woodland	64,509	1,465	2.27
Water	34,281	527	1.54
Urban/Developed	11,555	453	3.92
Cropland	3,381	35	1.04
Grassland	16,559	104	0.63
Barren	743	11	1.48
Total Area	**400,052**	**5,973**	**1.49**
Total Natural Habitat (Not Included; Urban or Barren)	**387,754**	**5,509**	**1.42**

Source: Table 9 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.4 IGCC Power Station Cumulative Habitat Impacts in the West Range Study Area[1,2]

Habitat Type	Habitat Impact (acres)	Percent Loss as Compared to Total Habitat within Study Area for Existing Conditions	Proportion of Cumulative Impact (percent)
Open Wetland	1	0.01	0.88
Lowland Deciduous	9	0.11	34.62
Lowland Deciduous Shrubland	16	0.03	1.69
Lowland Conifer	11	0.03	35.48
Lowland Conifer Shrubland	0	0.00	0.00
Upland Conifer	5	0.02	17.86
Upland Conifer/Deciduous Mix	0	0.00	0.00
Upland Deciduous (Aspen/Birch)	291	0.21	15.45
Upland Deciduous (Hardwoods)	69	0.56	19.66
Upland Shrub/Woodland	114	0.18	7.78
Water	1	0.00	0.19
Urban/Developed	7	0.06	1.55
Cropland	0	0.00	0.00
Grassland	6	0.04	5.77
Barren	0	0.00	0.00
Total Area	**530**	**0.13**	**8.87**
Total Natural Habitat (Not Included; Urban or Barren)	**523**	**0.13**	**9.49**

[1] Includes only impacts within the defined West Range Site Cumulative Wildlife Assessment Study Area.
[2] Data excludes cover within the rail loop.
Sources: Table 3 and Table 9 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.5 Cumulative Habitat Impacts in the East Range Study Area by Project

	Total Habitat in Study Area (acres)	Total Habitat Impacts (acres)	Percent Loss of Total Habitat		Proportion of Cumulative Impact (percent)
			From Past	From Existing	
Past Natural Habitat	103,563				
Existing Natural Habitat	92,758		10.4		
Future Actions					
Mesaba Energy Project		433		0.47	8.94
PolyMet Mining NorthMet Project		2,957		3.19	61.02
Mesabi Nugget		1,456		1.57	30.05
Total of Future Actions		4,846		5.22	100.00
Future	**87,912**				

[1] This number differs from the sum of the numbers above it due to rounding.
Note: See the note in Table 7.7 for the explanation of why the total habitat impacts for the Mesaba Energy Project identified within the East Range study area differ from the 618 acres of impacts quantified in Table 3.8.
Sources: Tables 10, 11, 12, 13, and 14 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.6 Cumulative Habitat Impacts in the East Range Study Area by Habitat Type

Habitat Type	Existing Conditions (acres)	Impacts of Reasonably Foreseeable Future Actions (acres)	Percent Loss of Existing Habitat Resulting from Implementation of Reasonably Foreseeable Future Actions
Open Wetland	1,585	15	0.95
Lowland Deciduous	1,555	20	1.29
Lowland Deciduous Shrubland	14,868	244	1.64
Lowland Conifer	18,712	804	4.30
Lowland Conifer Shrubland	702	327	46.58
Upland Conifer	12,418	1,268	10.21
Upland Conifer/Deciduous Mix	269	3	1.12
Upland Deciduous (Aspen/Birch)	27,579	1,558	5.65
Upland Deciduous (Hardwoods)	1,278	214	16.74
Upland Shrub/Woodland	6,513	113	1.73
Water	5,431	199	3.66
Urban/Developed	8,721	1,138	13.05
Cropland	61	0	0.00
Grassland	1,787	81	4.53
Barren	2,084	0	0.00
Total Area	**103,563**	**5,984**	**5.78**
Total Natural Habitat (Not Included; Urban or Barren)	**92,758**	**4,846**	**5.22**

Source: Table 14 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Table 7.7 IGCC Power Station Cumulative Habitat Impacts in the East Range Study Area

Habitat Type	Habitat Impact (acres)	Percent Loss as Compared to Total Habitat within Study Area for Existing Conditions	Proportion of Cumulative Impact (percent)
Open Wetland	3	0.19	20.00
Lowland Deciduous	18	1.16	90.00
Lowland Deciduous Shrubland	34	0.23	13.93
Lowland Conifer	9	0.05	1.12
Lowland Conifer Shrubland	2	0.28	0.61
Upland Conifer	21	0.17	1.66
Upland Conifer/Deciduous Mix	1	0.37	33.33
Upland Deciduous (Aspen/Birch)	218	0.79	13.99
Upland Deciduous (Hardwoods)	1	0.08	0.47
Upland Shrub/Woodland	42	0.64	37.17
Water	7	0.13	3.52
Urban/Developed	46	0.53	4.04
Cropland	0	0.00	0.00
Grassland	77	4.31	95.06
Barren	0	0.00	0.00
Total Area	**479**	**0.46**	**8.00**
Total Natural Habitat (N.I. Urban or Barren)	**433**	**0.47**	**8.94**

Note: The East Range study area excludes i) most of a 35 mile transmission line corridor along which an additional 30 feet of ROW will be required and ii) a 2 mile segment of new ROW must be acquired.
Source: Table 11 in Cumulative Wildlife Effect Assessment (SEH 2008c).

Figures

Appendix E

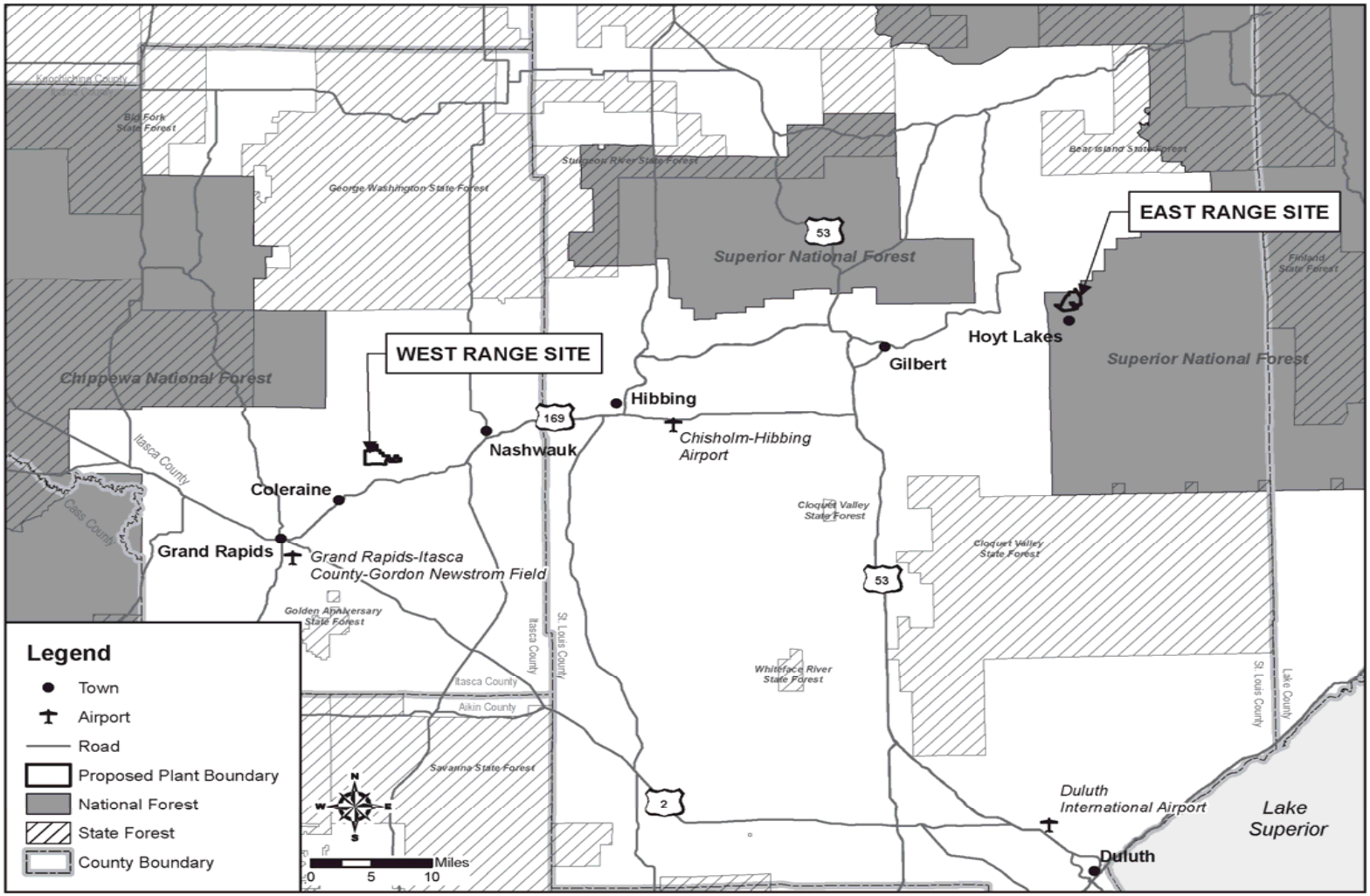


Figure 1.1 General Location Map

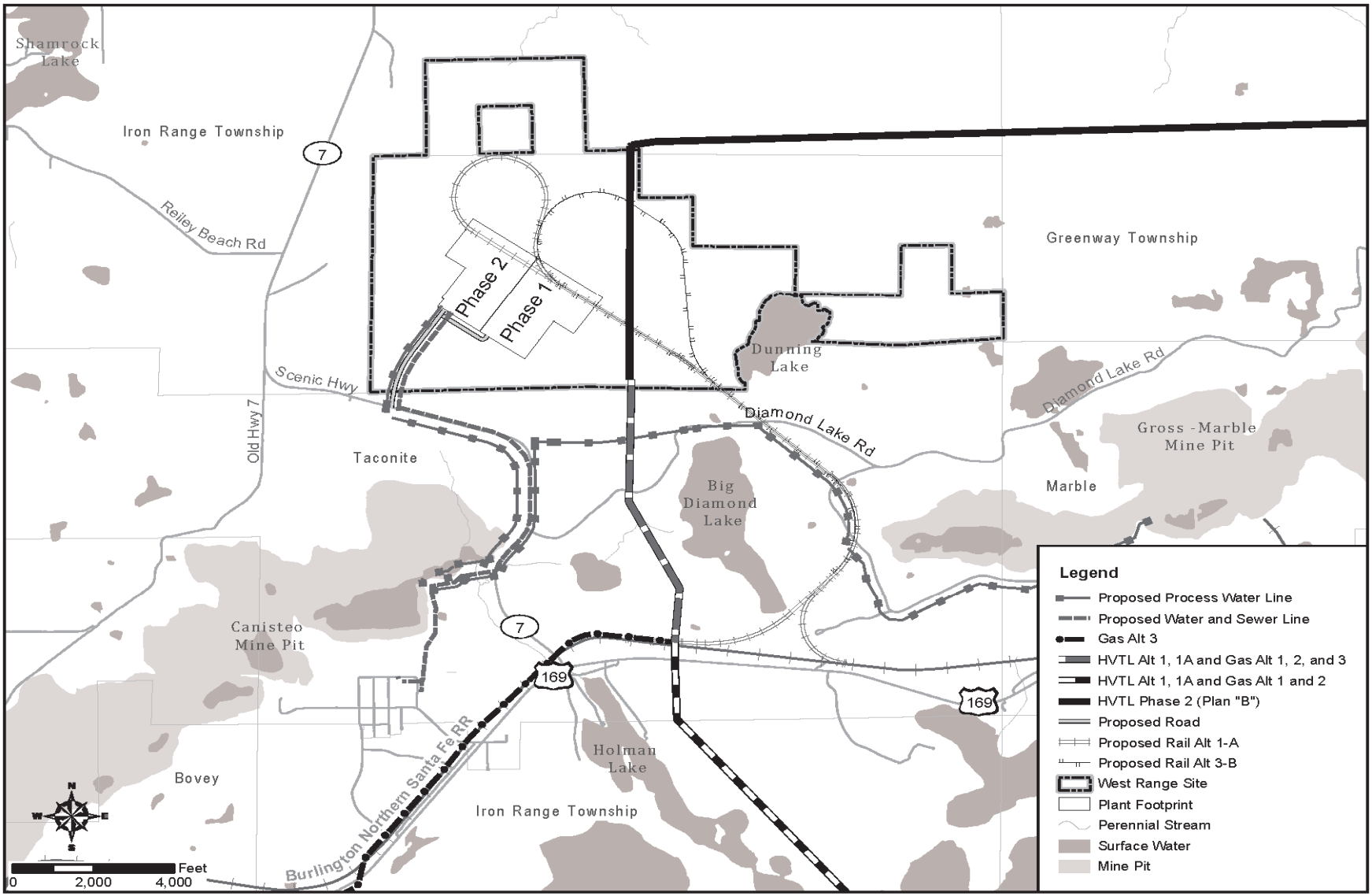


Figure 2.1 West Range Plant Site

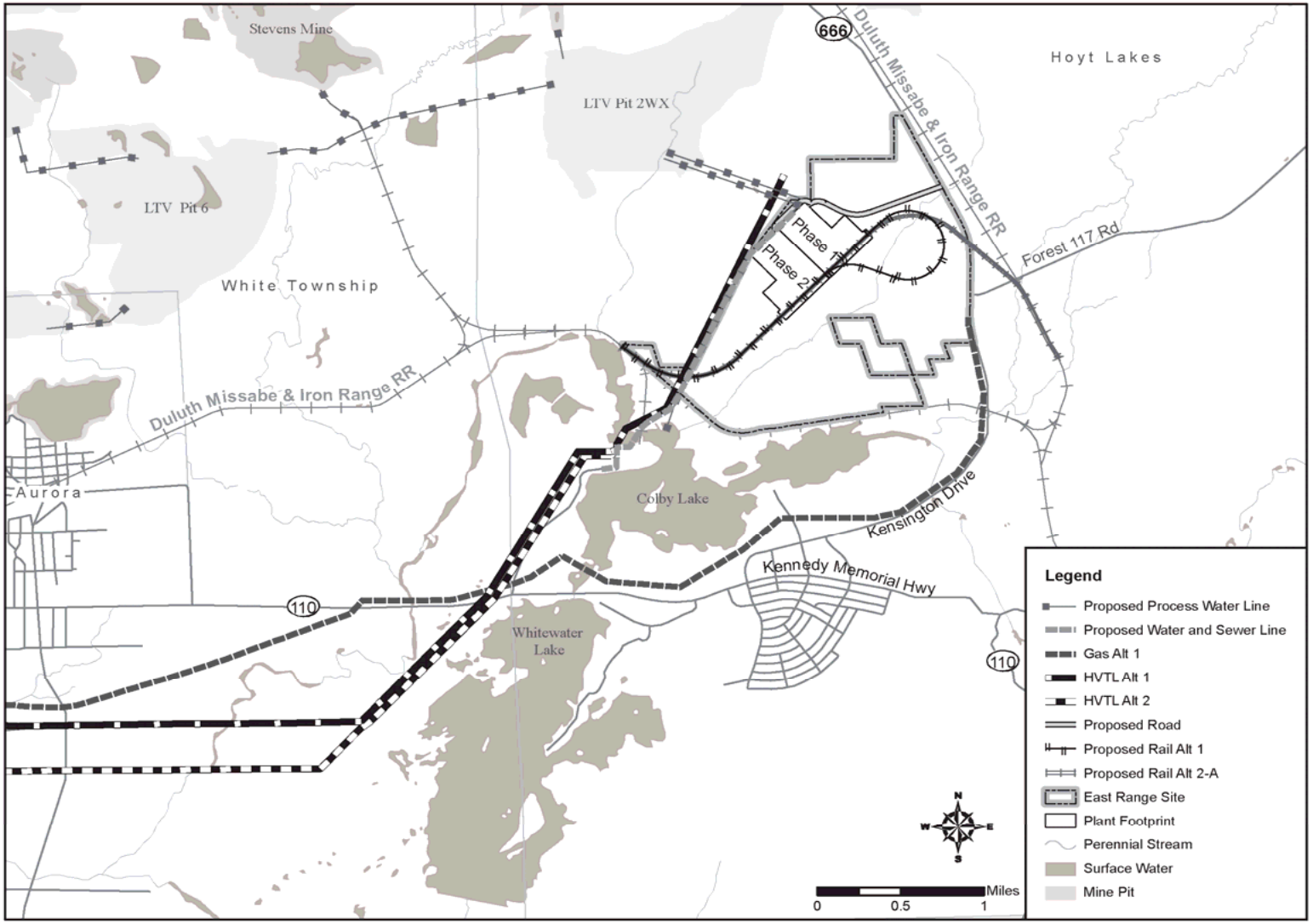


Figure 2.2 East Range Plant Site

Figure 2.3 Artist's Visualization of Integrated Gasification Combined Cycle (IGCC) Power Station

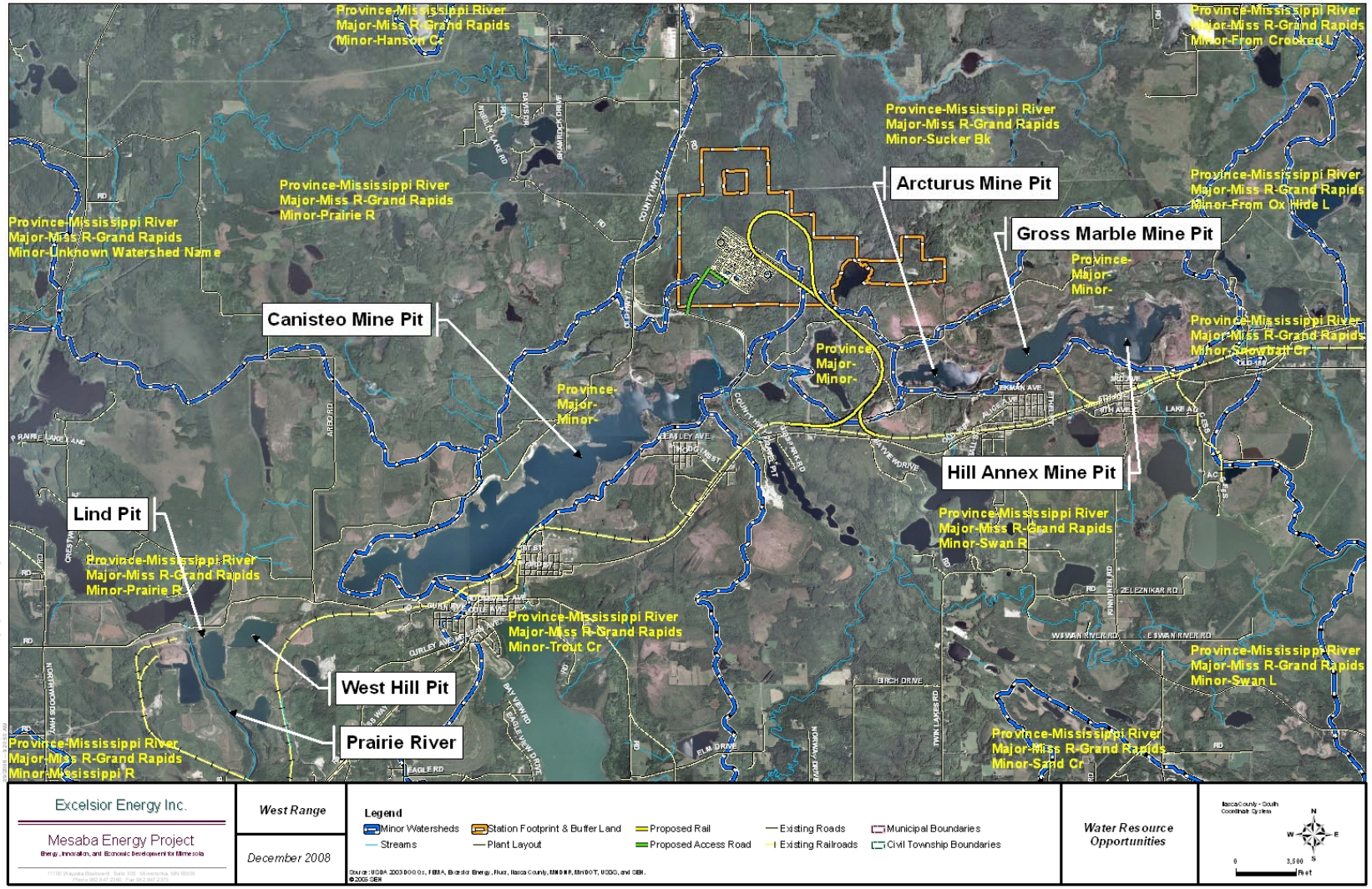


Figure 2.4 West Range Site Supply and Receiving Waters

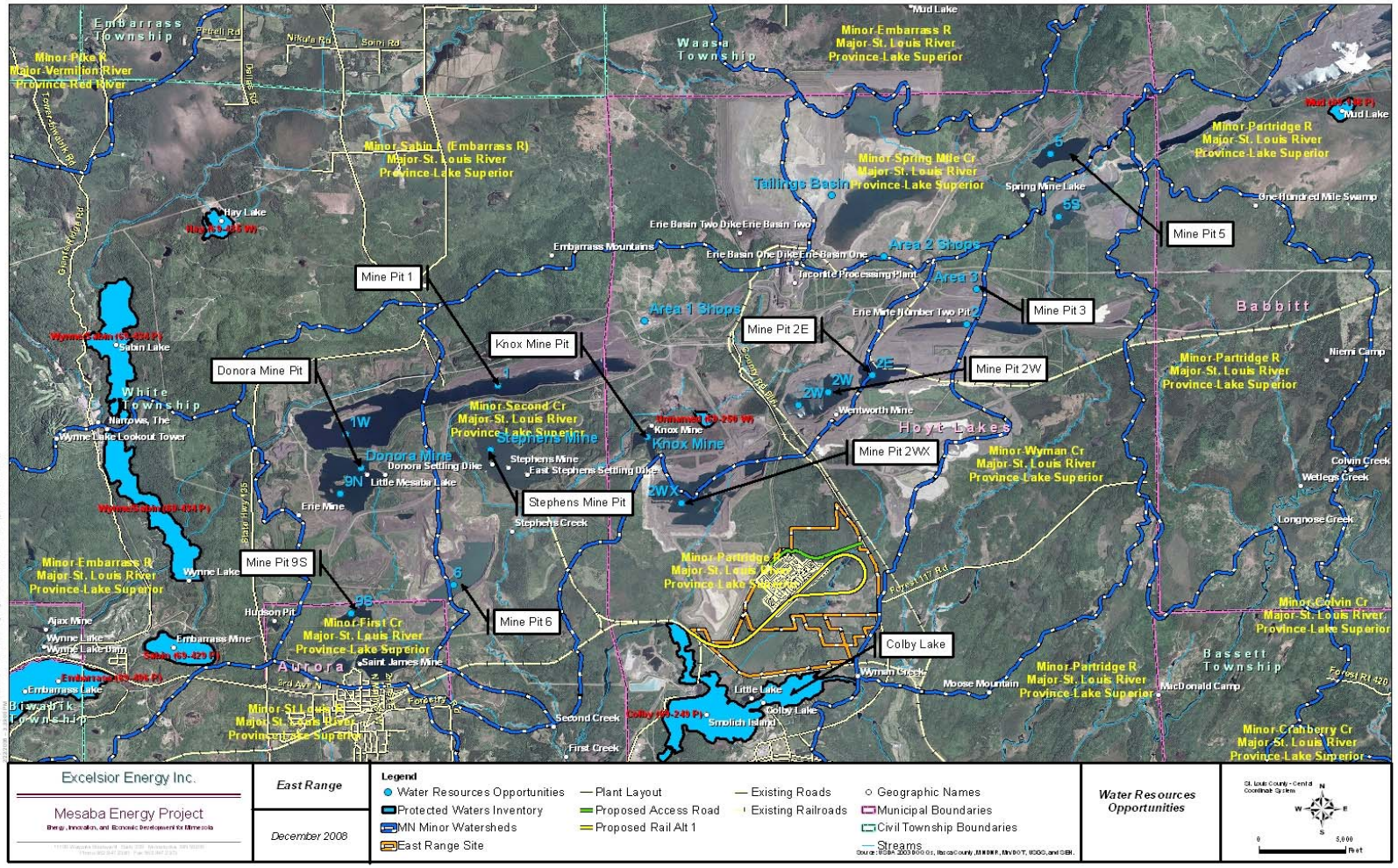


Figure 2.5 East Range Site Supply and Receiving Waters

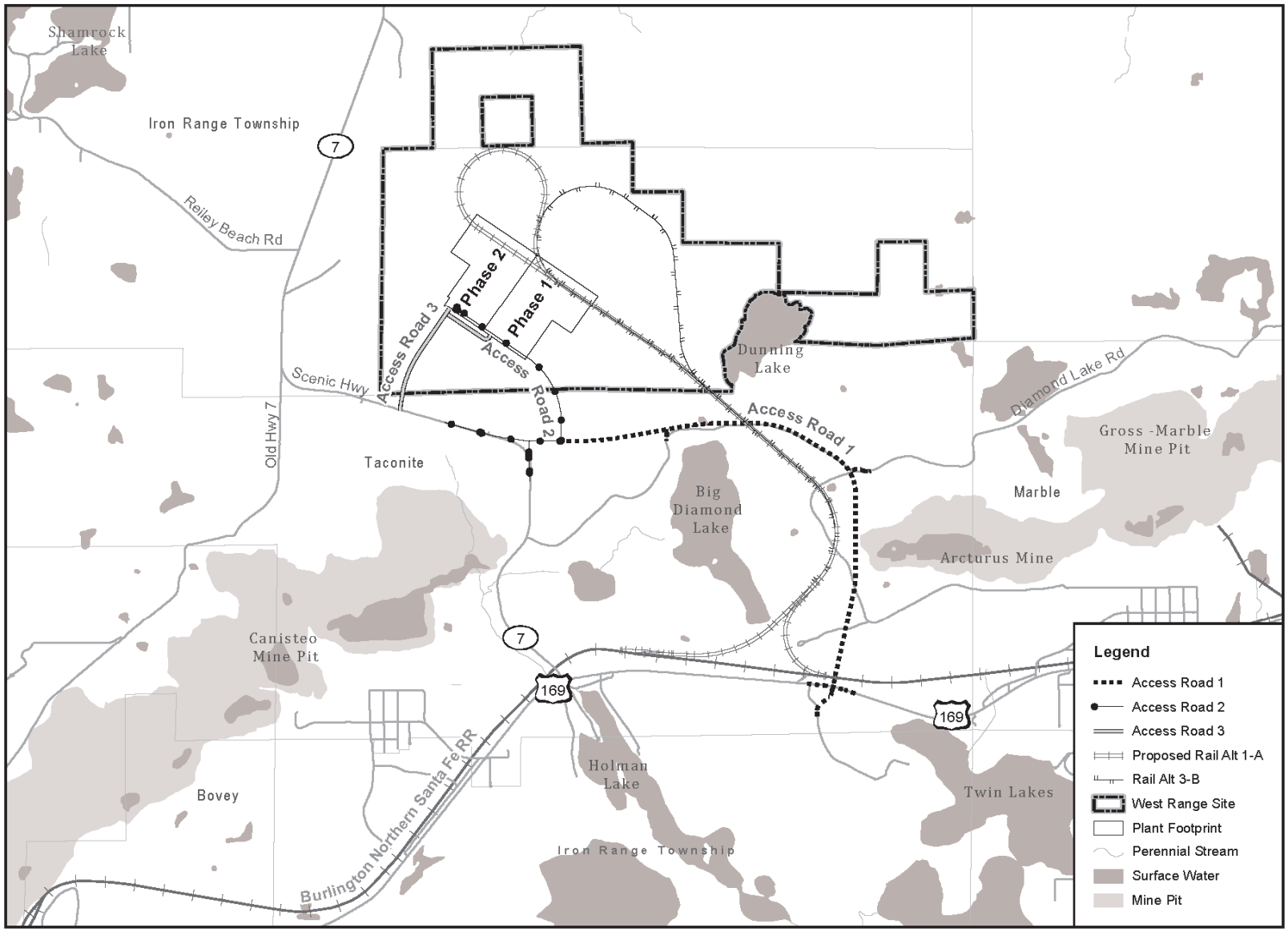


Figure 2.6 West Range Rail and Road Alternatives

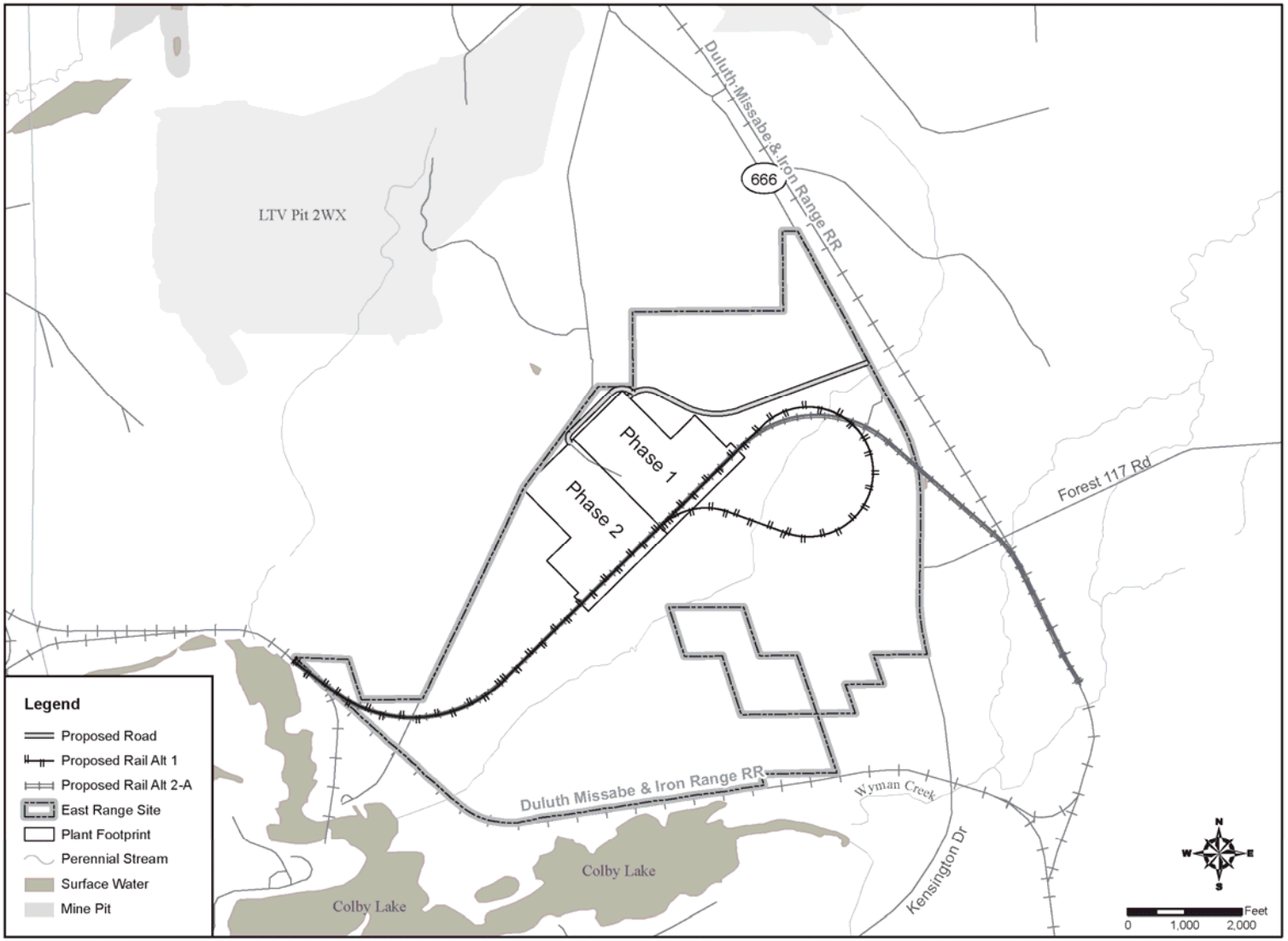


Figure 2.7 East Range Rail and Road Alternatives

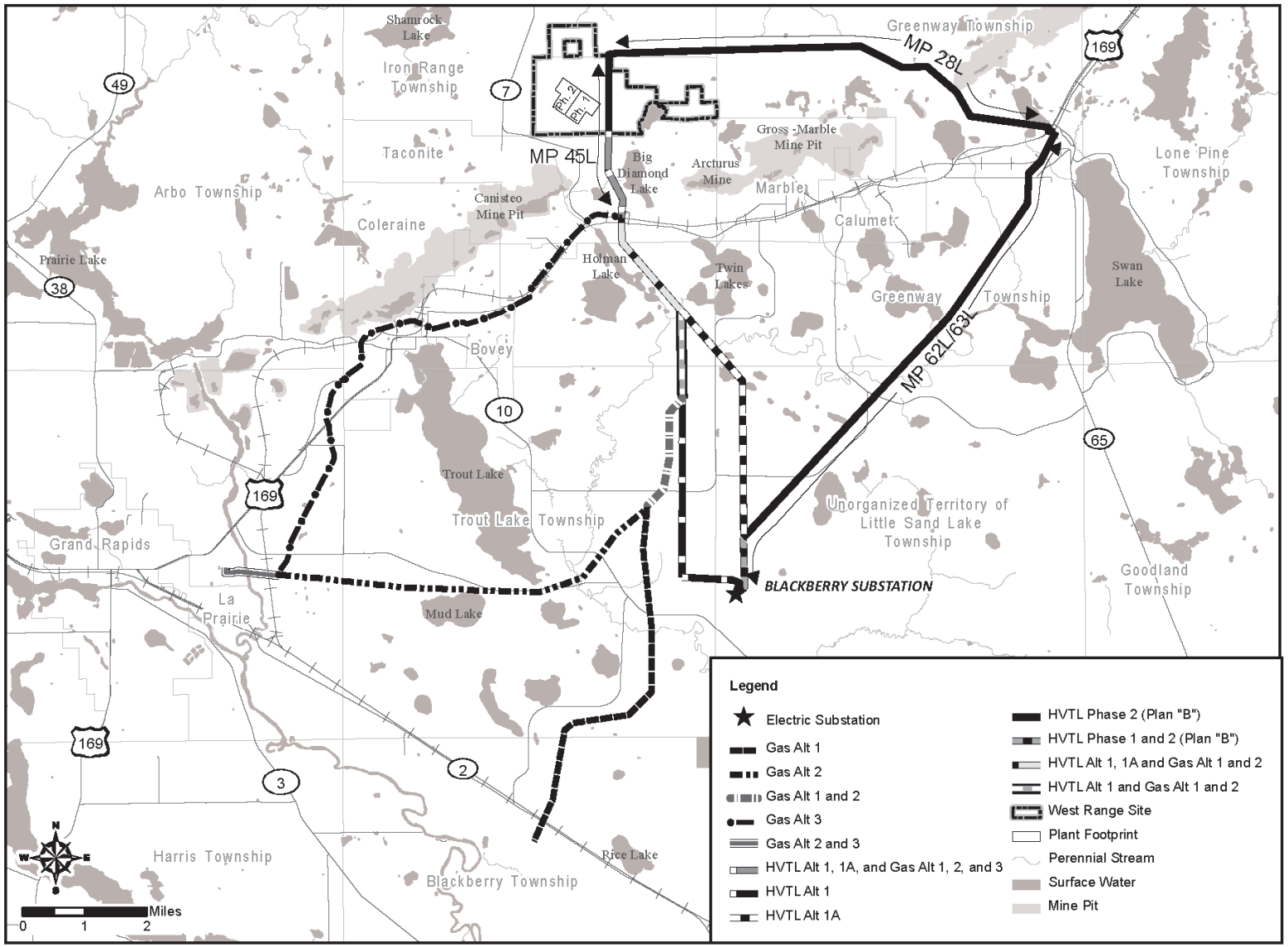


Figure 2.8 West Range Natural Gas Pipeline and HVTL Alternatives

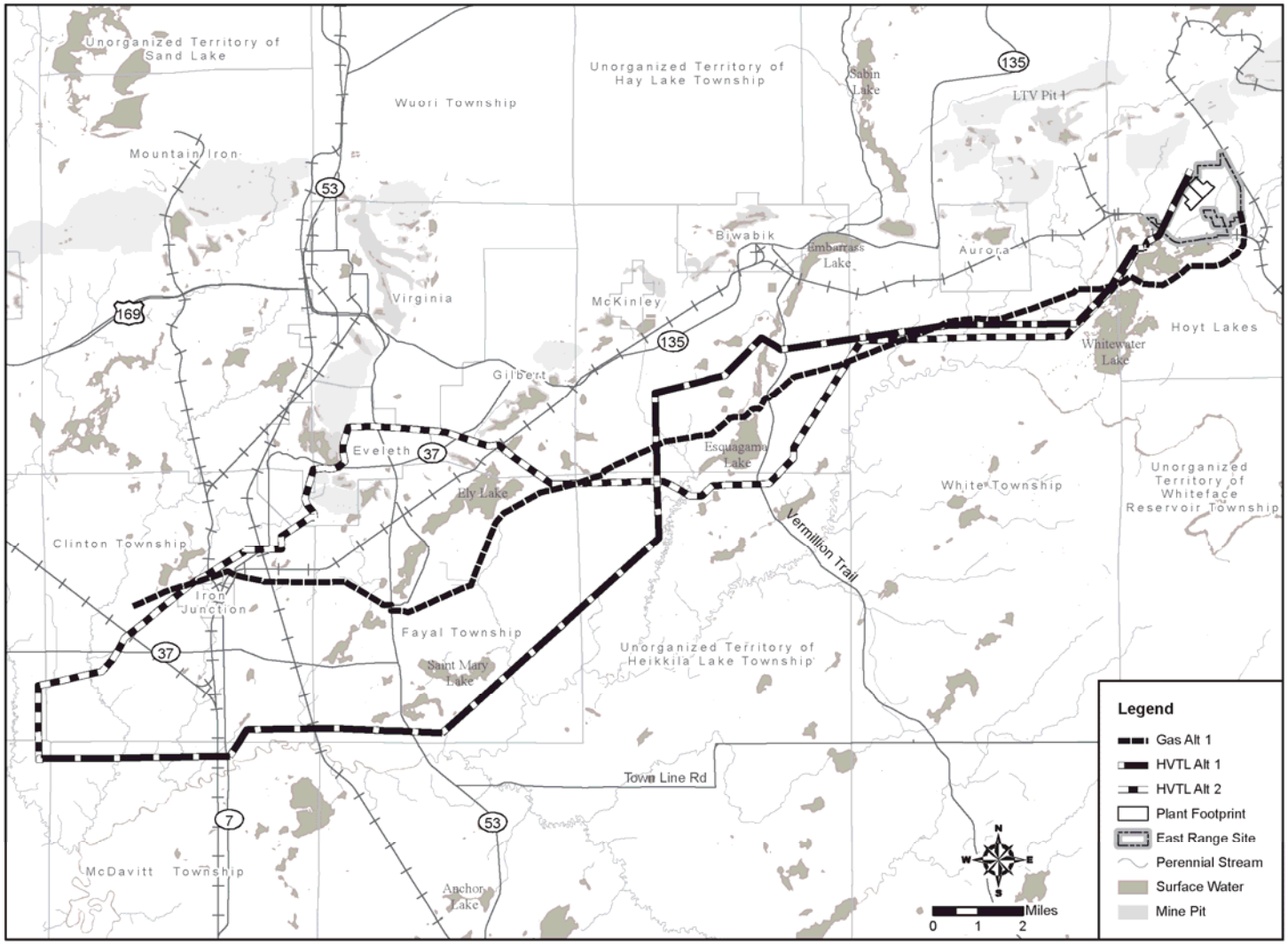


Figure 2.9 East Range Natural Gas Pipeline and HVTL Alternatives

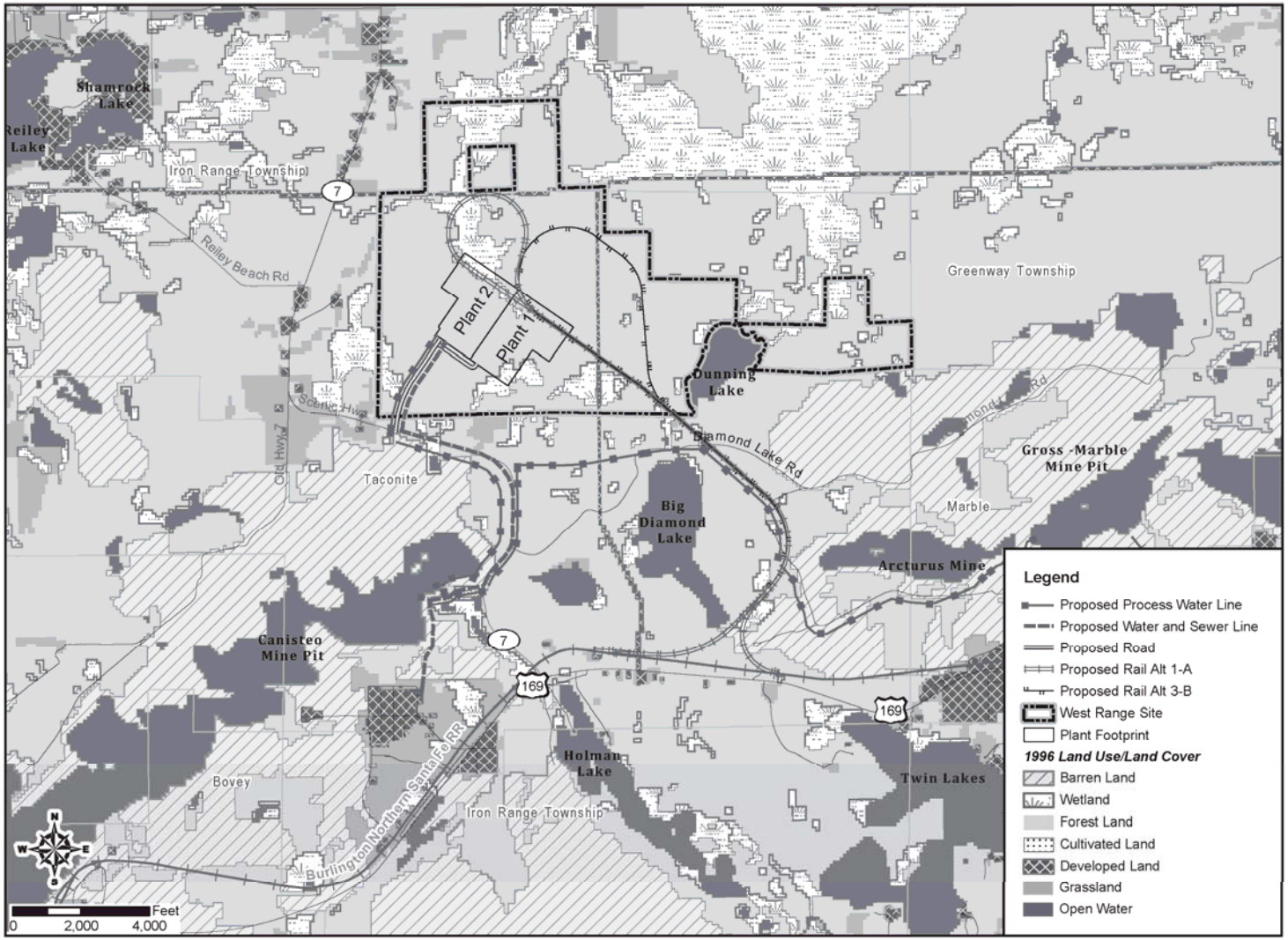


Figure 3.1 West Range Site Land Use and Land Cover

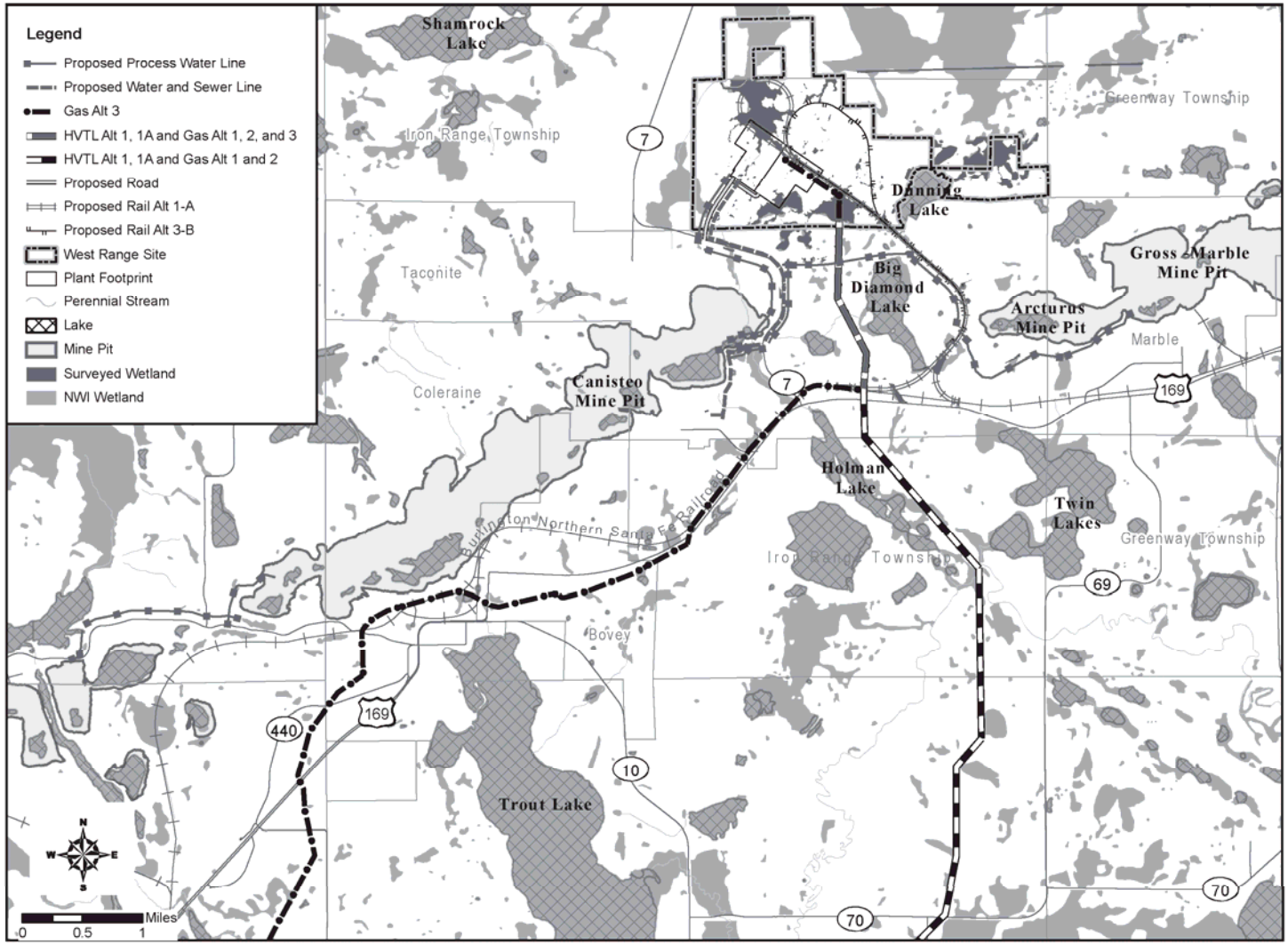


Figure 3.2 West Range Site Wetlands

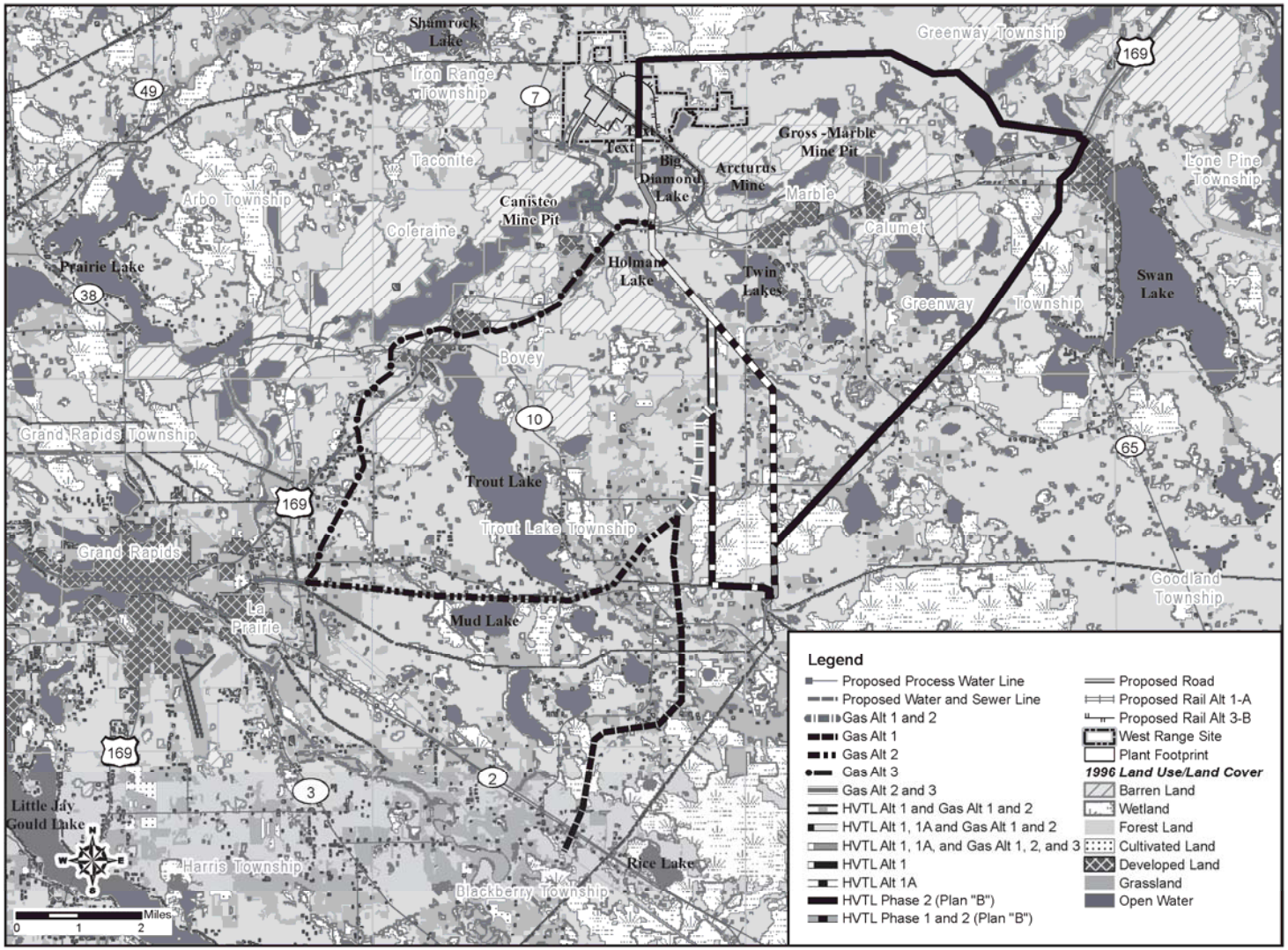


Figure 3.3 West Range Site Corridors and Surrounding Land Use and Land Cover

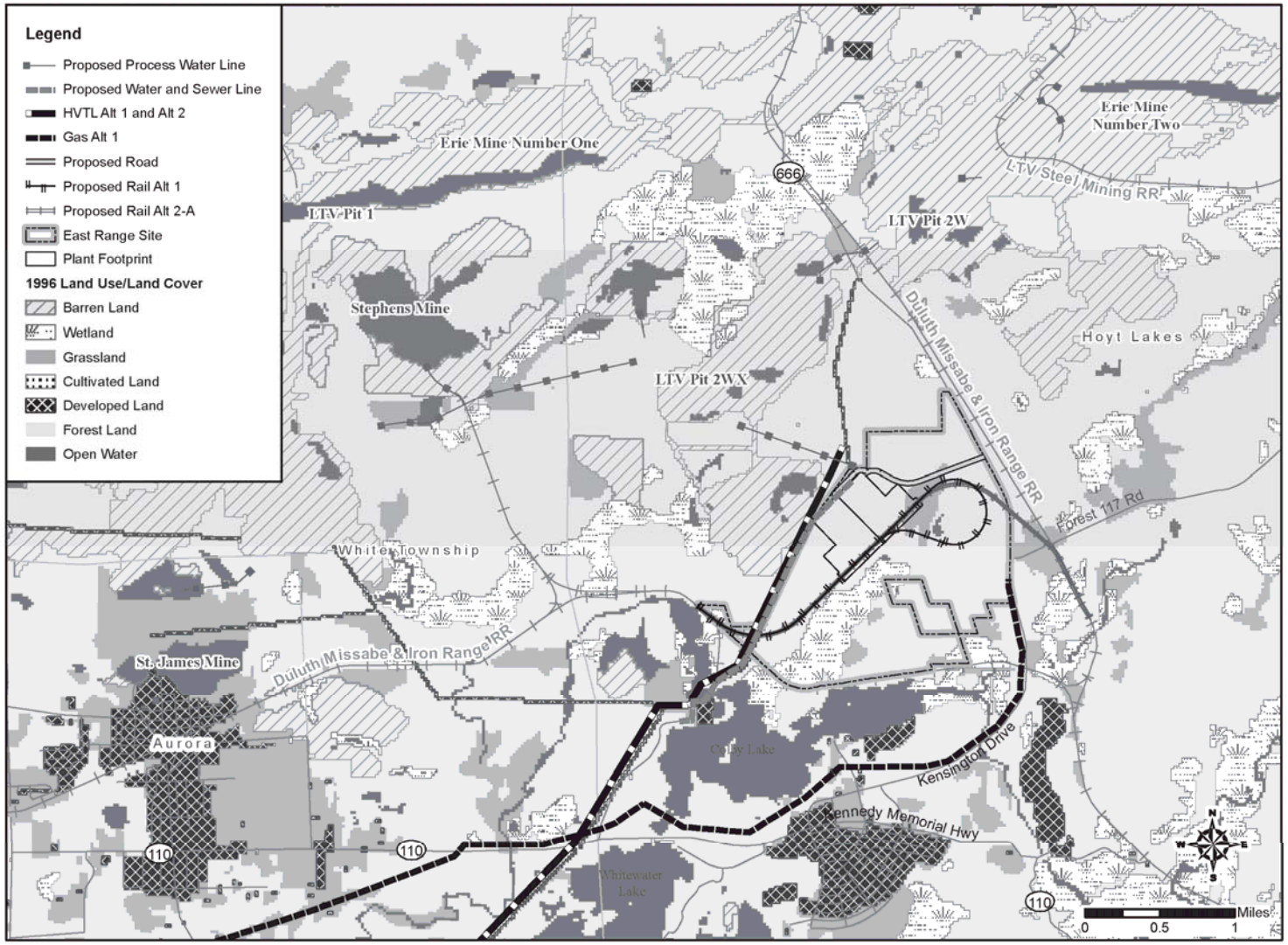


Figure 3.4 East Range Site Land Use and Land Cover

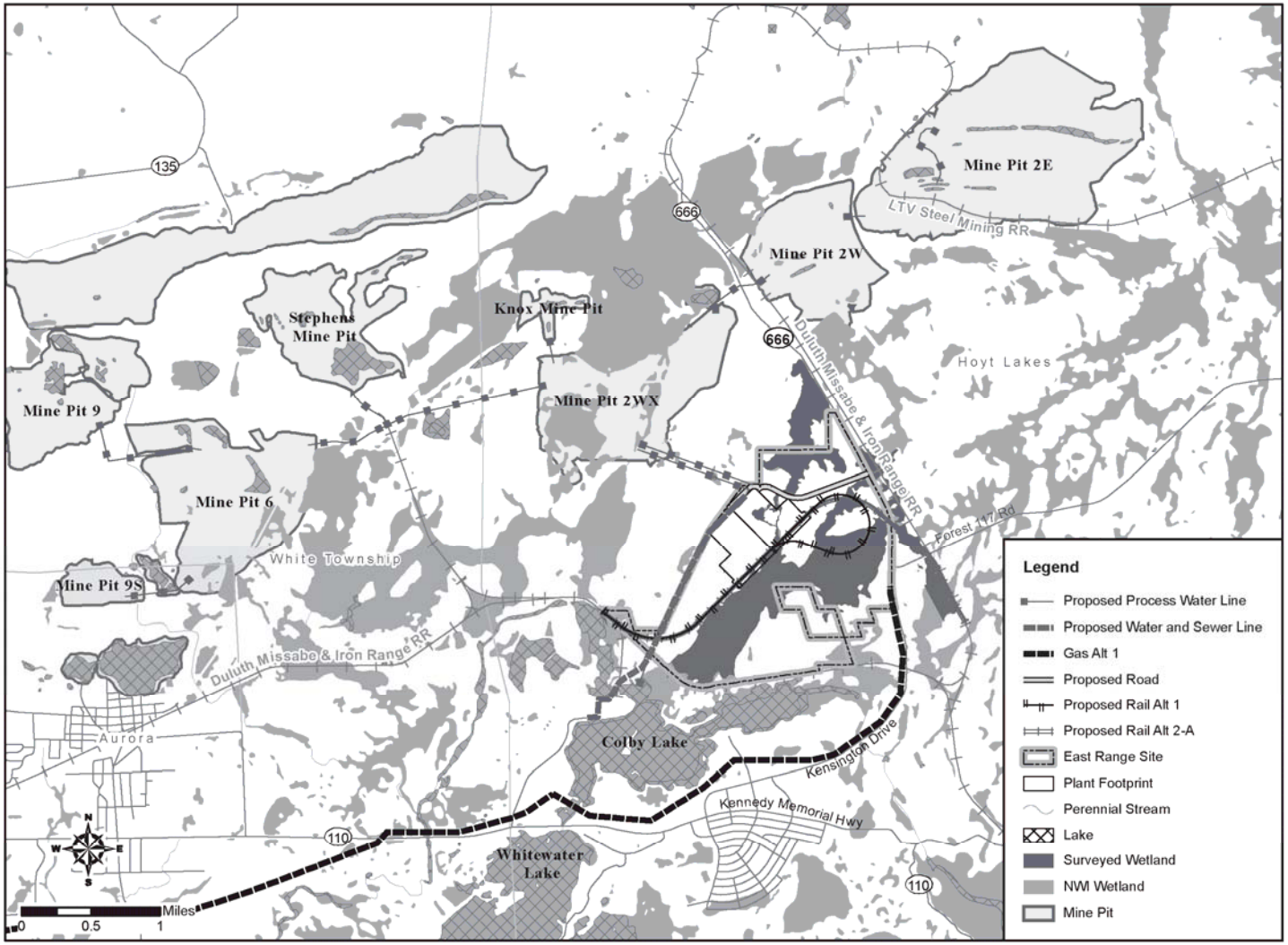


Figure 3.5 East Range Site Wetlands

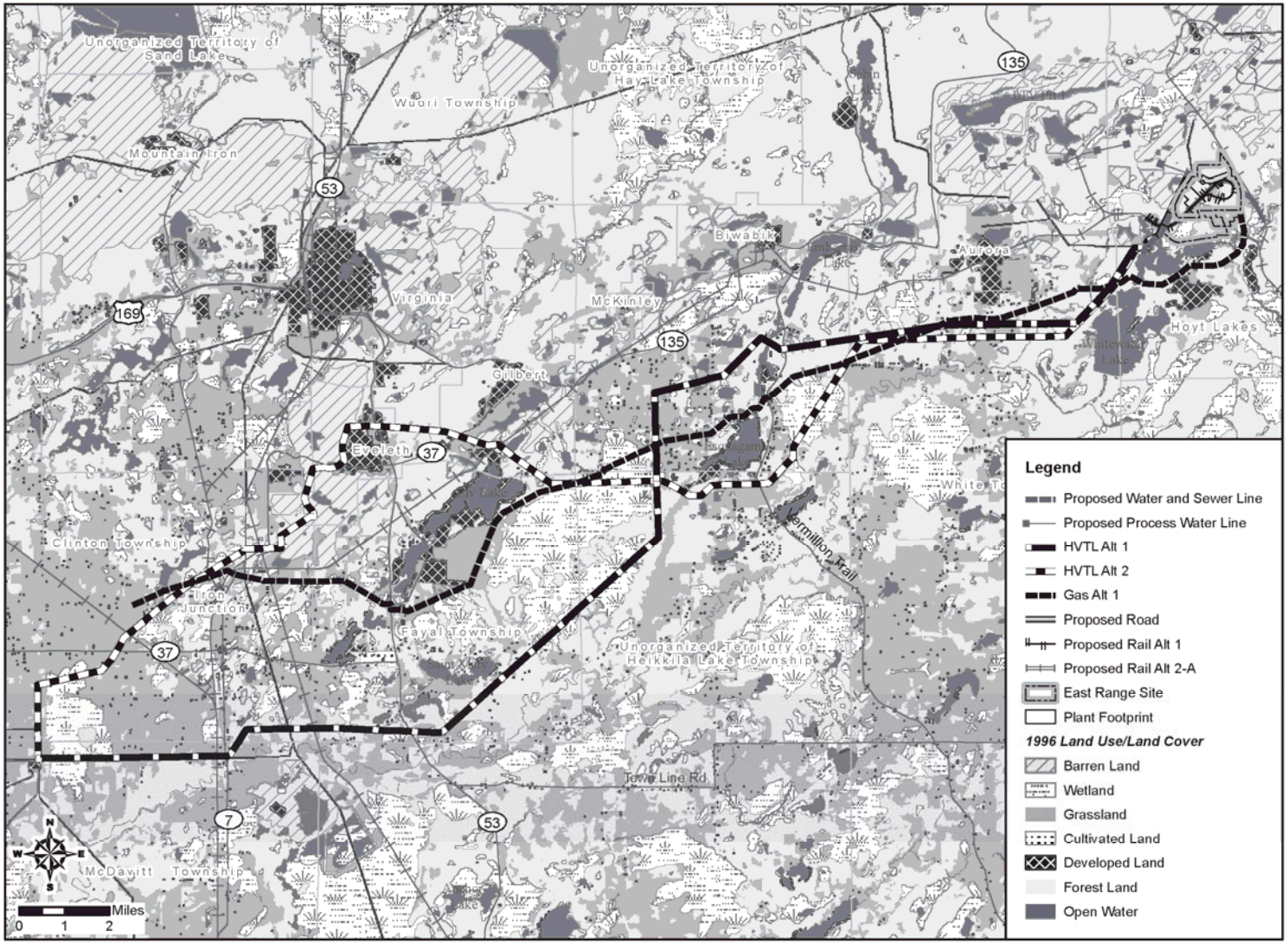


Figure 3.6 East Range Corridors and Surrounding Land Use and Land Cover

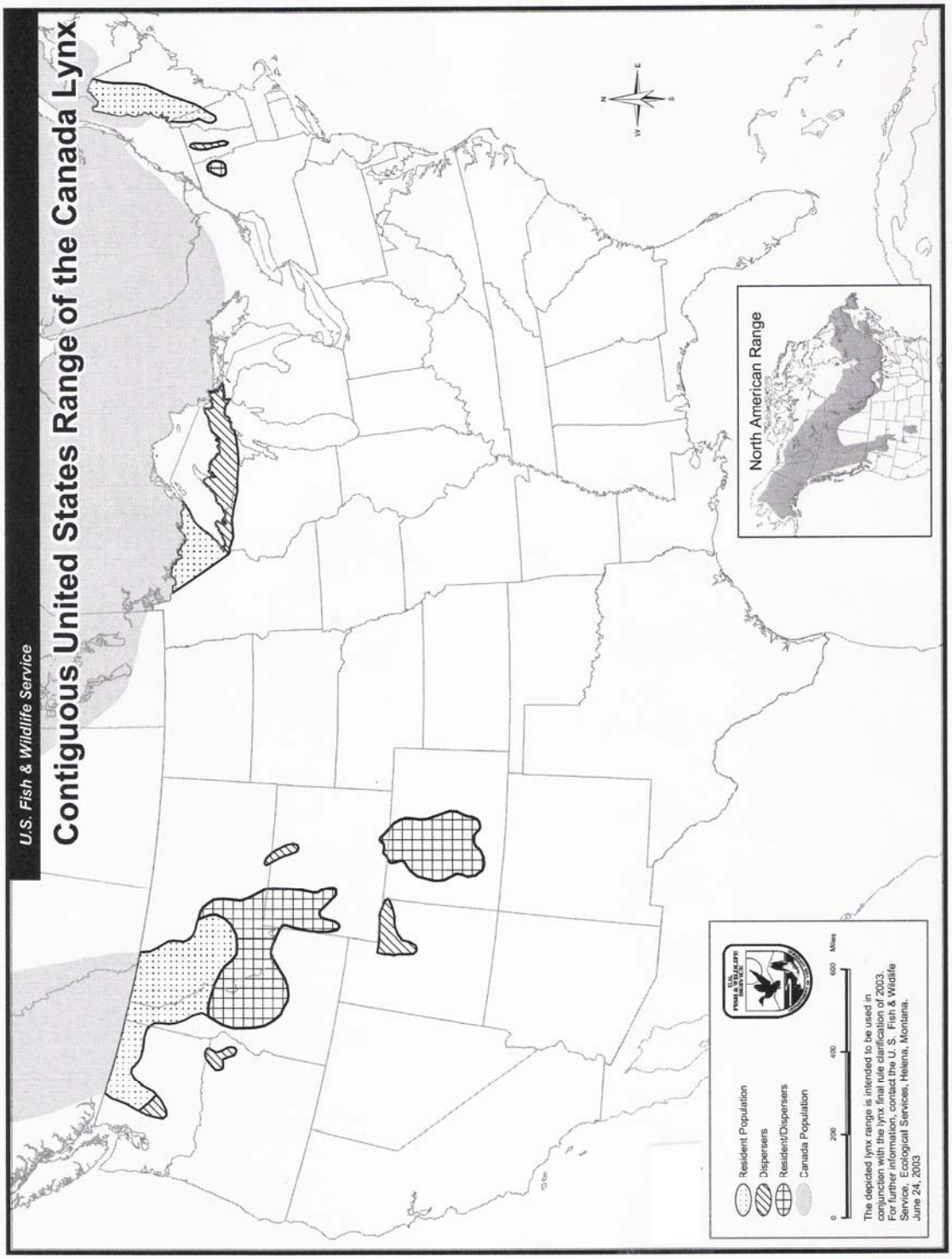
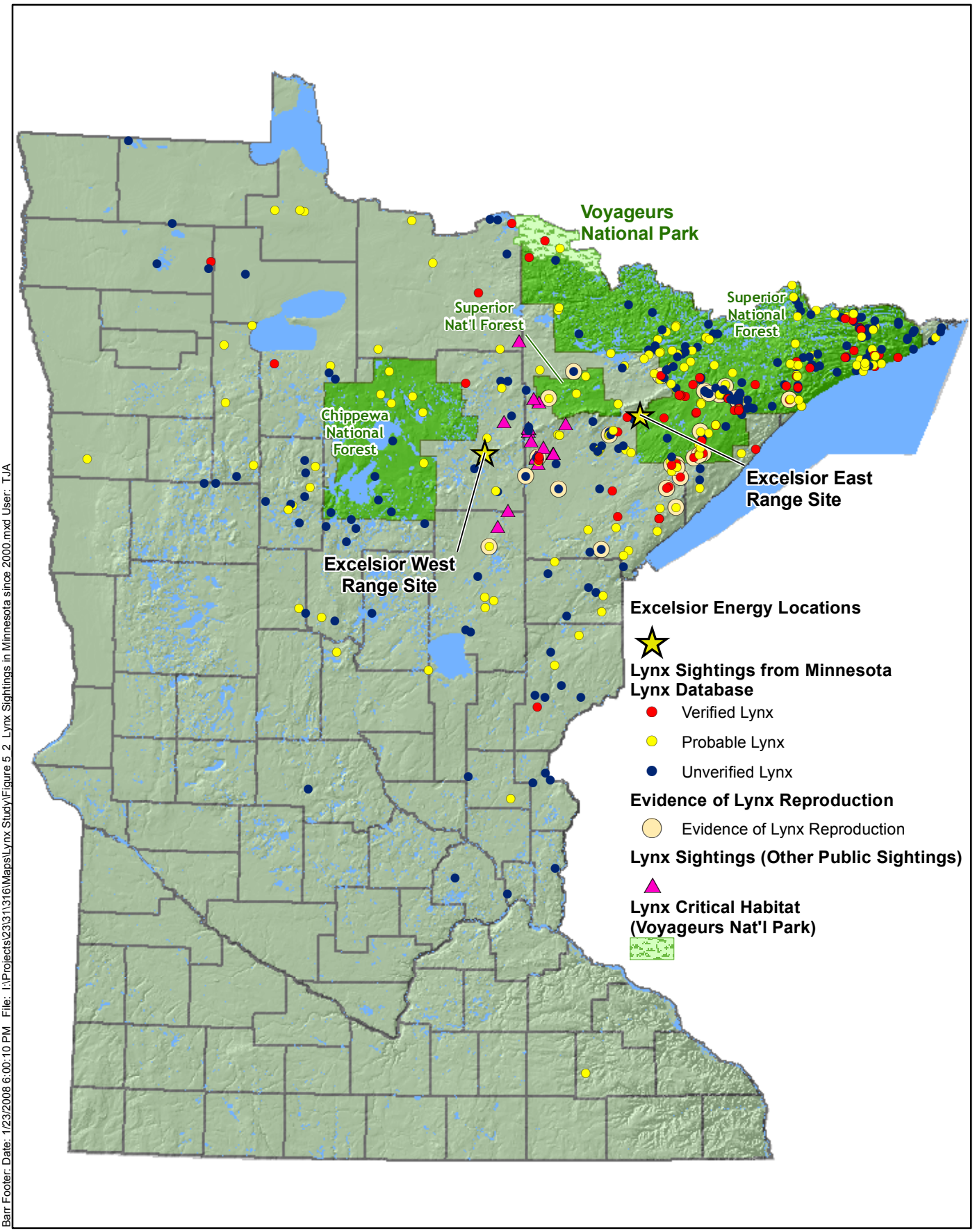


Figure 6.1 Contiguous United States Range of the Canada Lynx



Barr Footer: Date: 1/23/2008 6:00:10 PM File: I:\Projects\23\31\316\Maps\Lynx Study\Figure 5_2_Lynx Sightings in Minnesota since 2000.mxd User: TJA

0 25 50 100
Miles

Figure 6.2

LYNX SIGHTINGS IN MINNESOTA SINCE 2000
Excelsior Energy, Inc

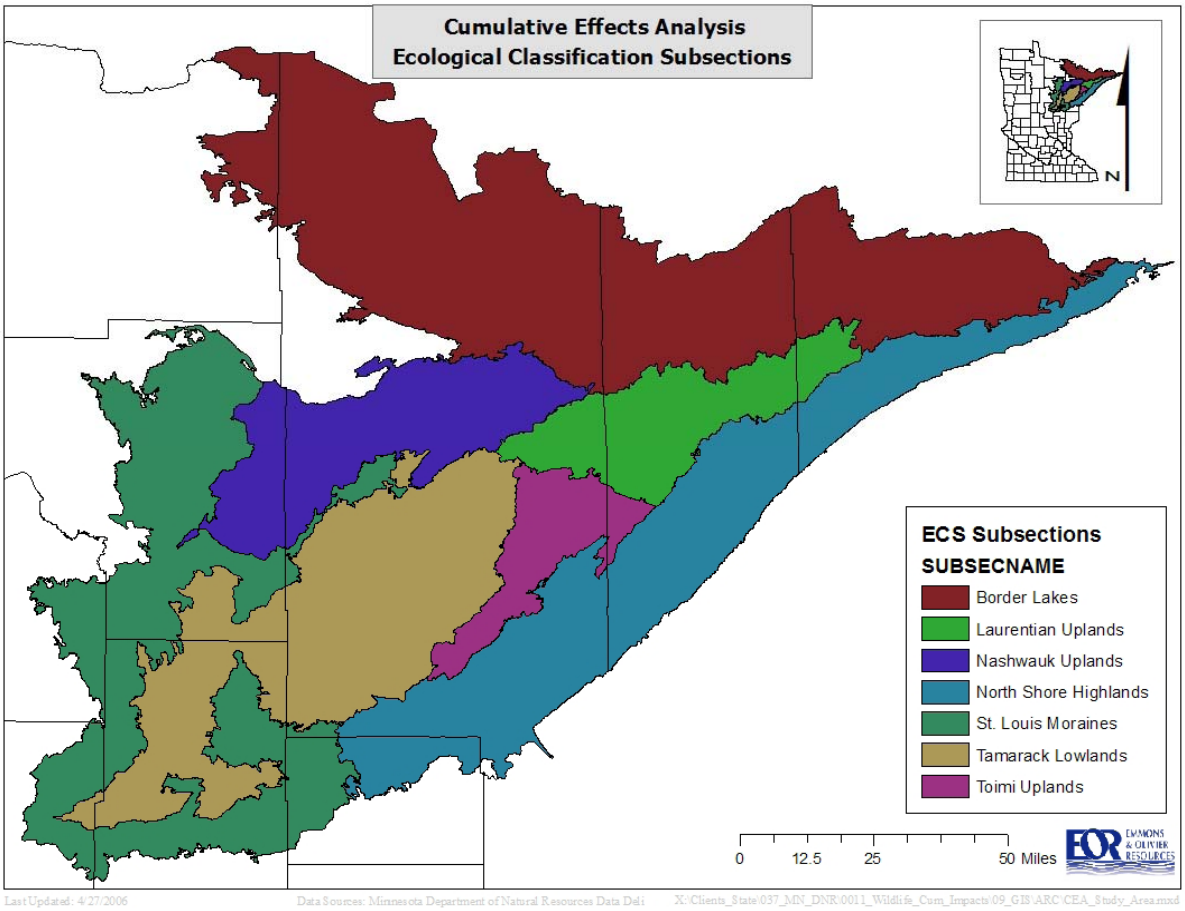


Figure 6.3 Arrowhead Region of Minnesota and its Ecological Subsections

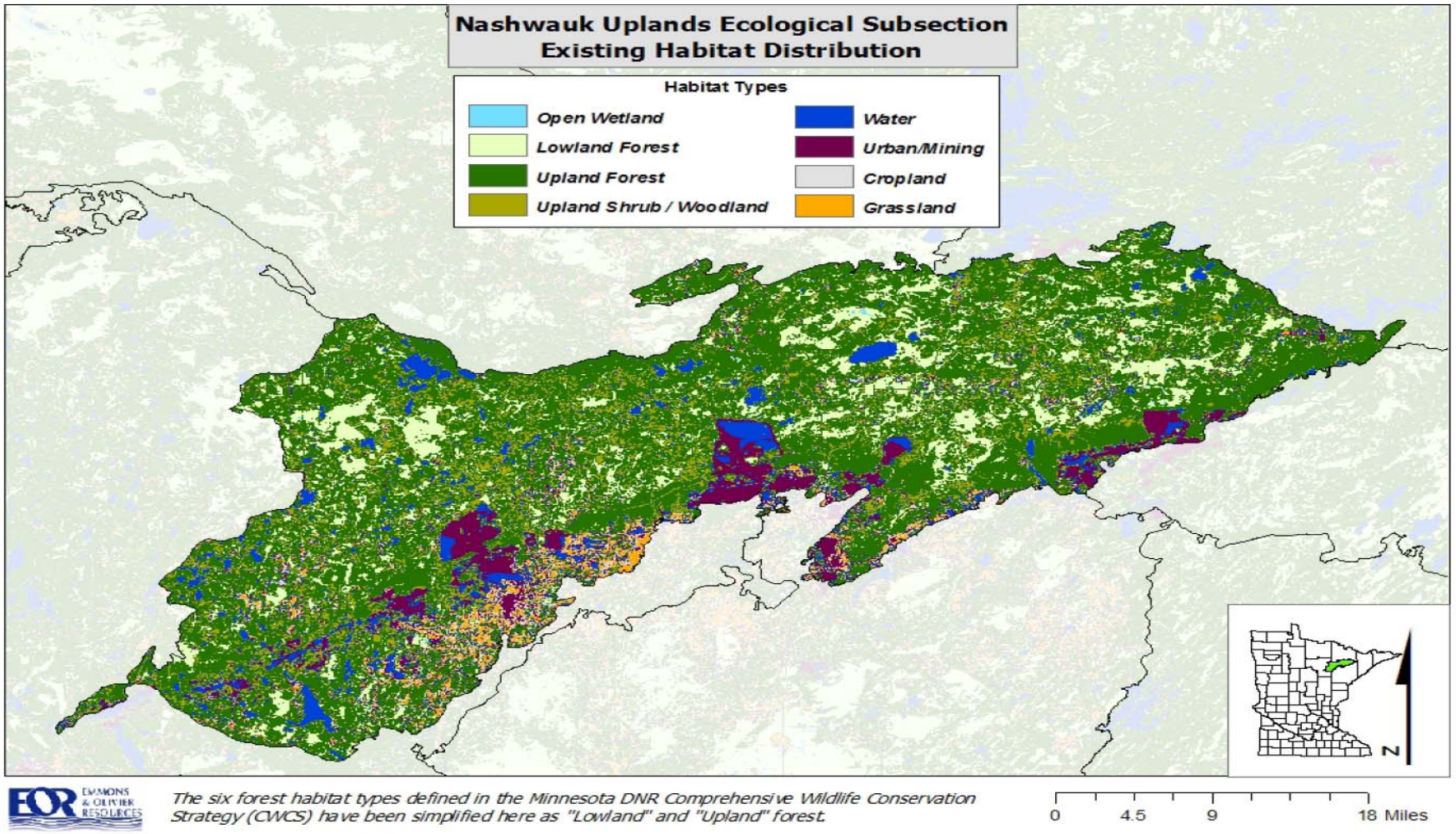


Figure 6.4. Nashwauk Uplands Ecological Subsection

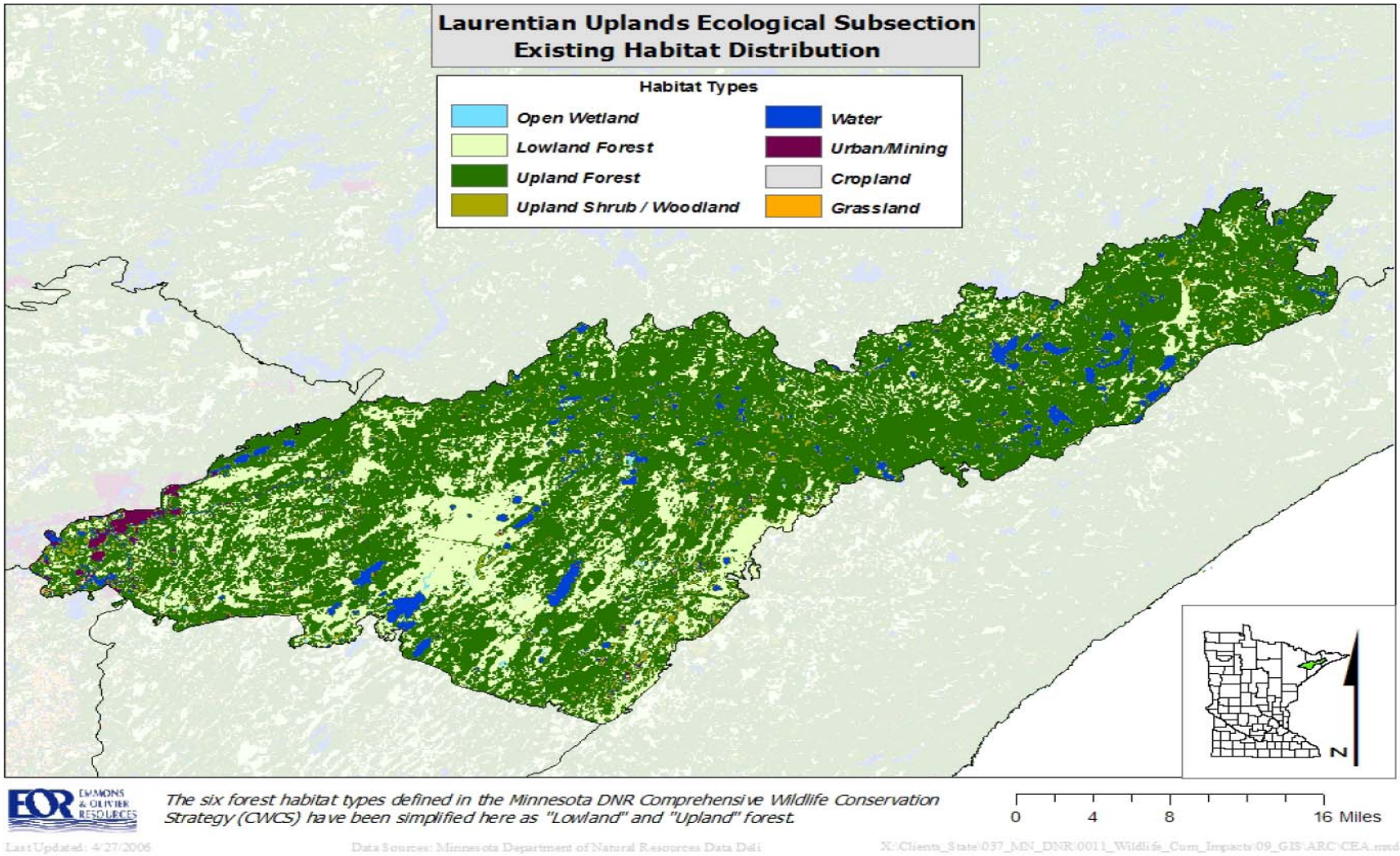


Figure 6.5 Laurentian Uplands Ecological Subsection

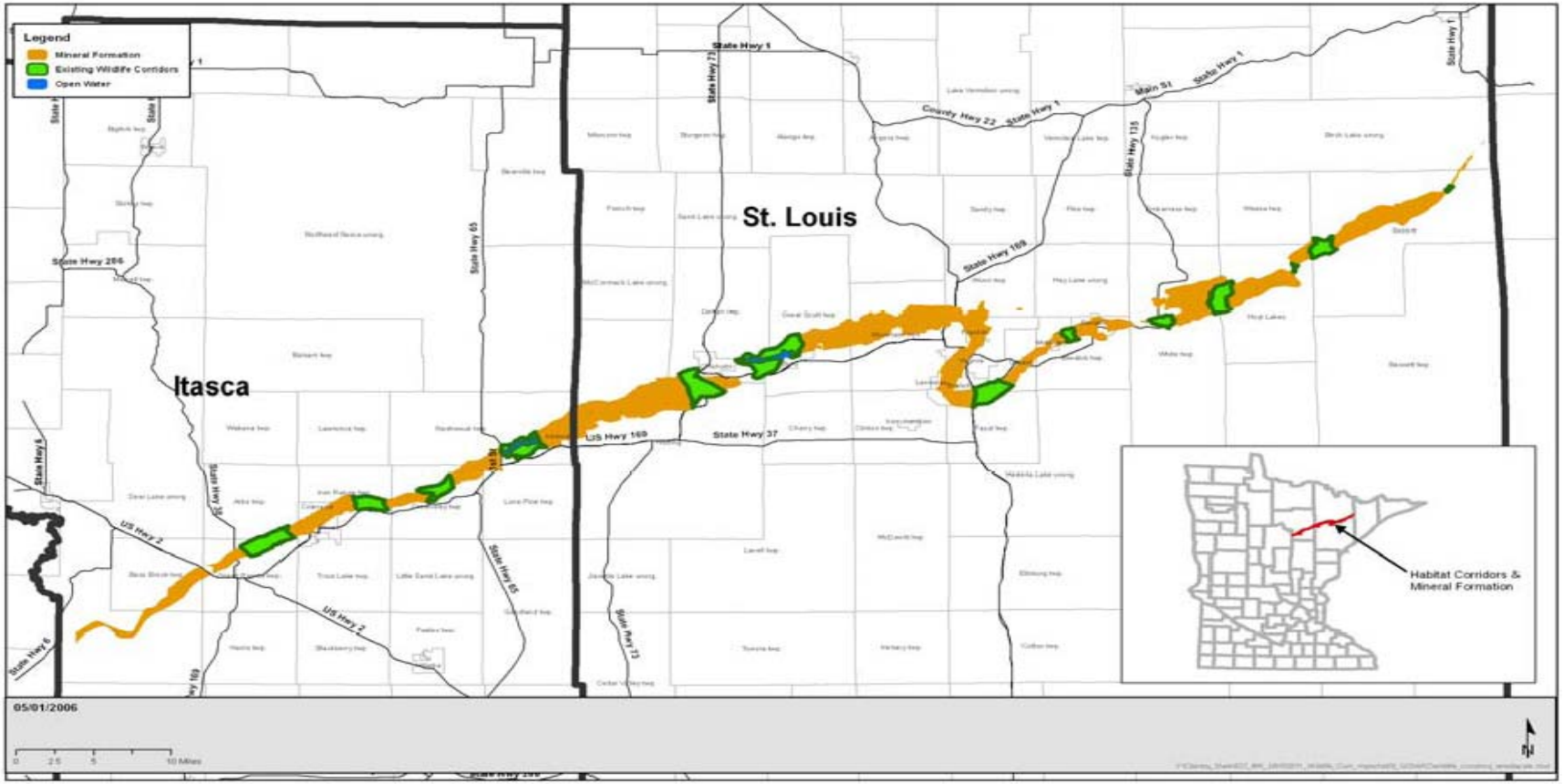


Figure 6.6 Wildlife Travel Corridors in the Iron Range

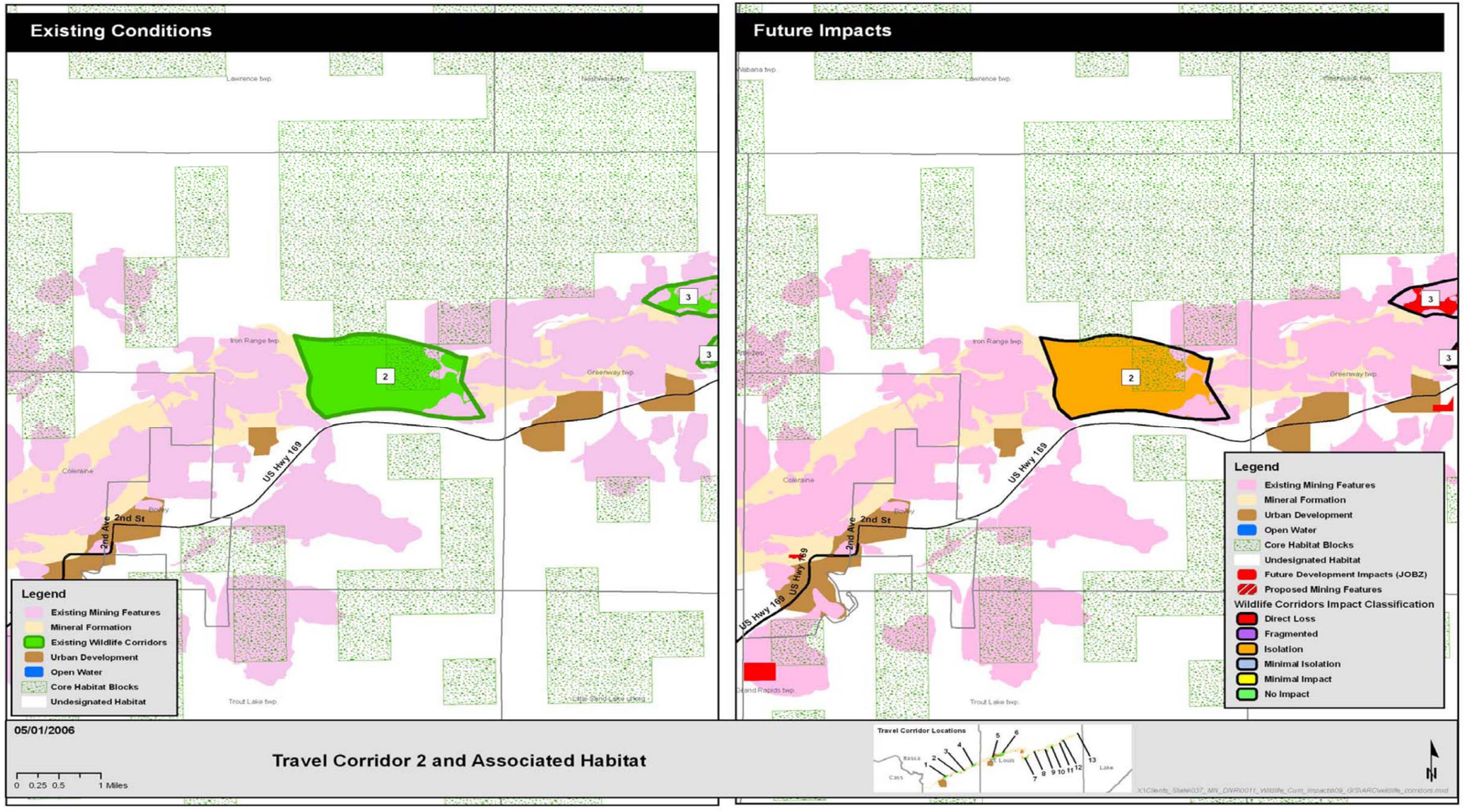


Figure 6.7 Wildlife Travel Corridor #2

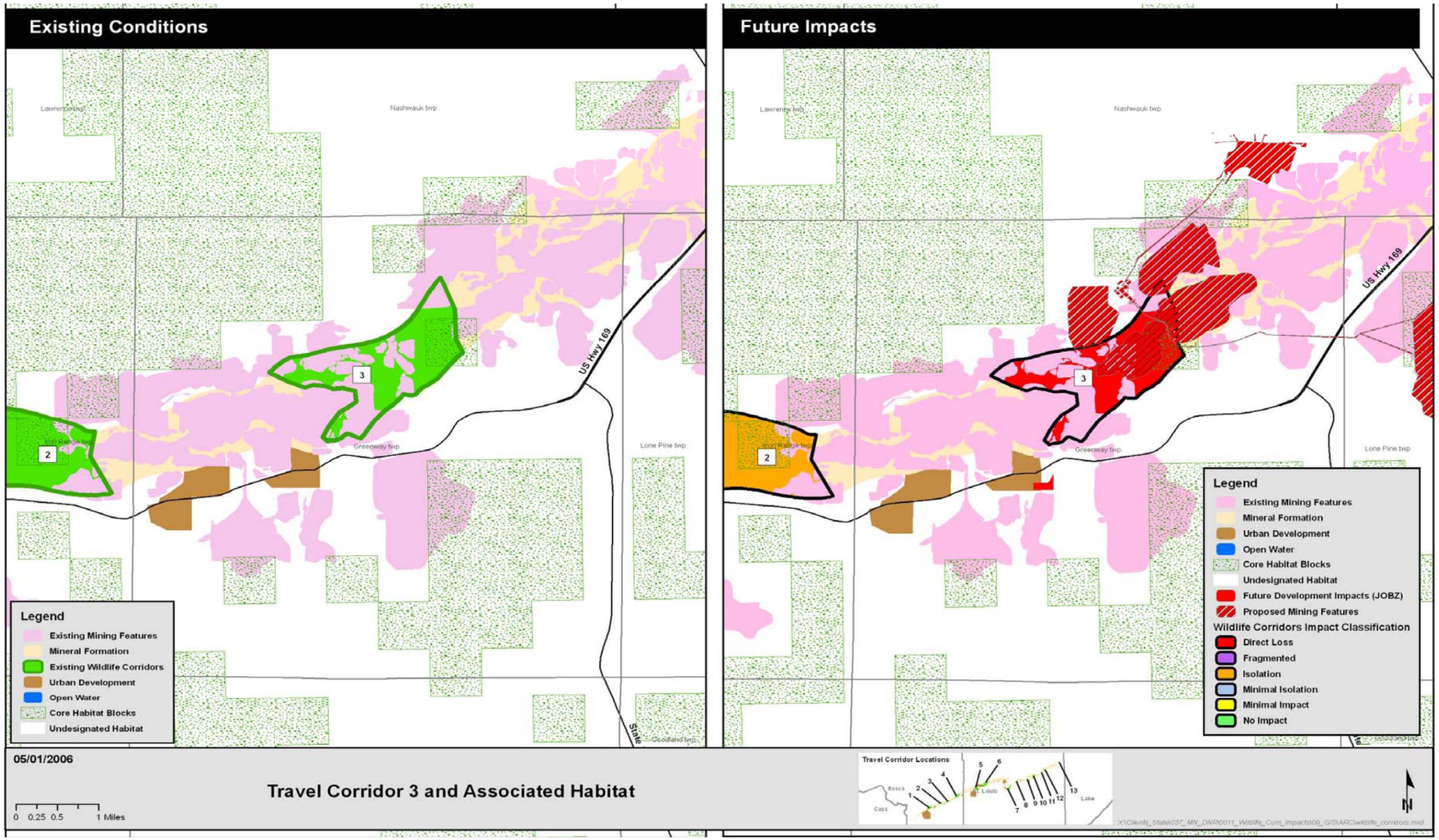


Figure 6.8 Wildlife Travel Corridor #3

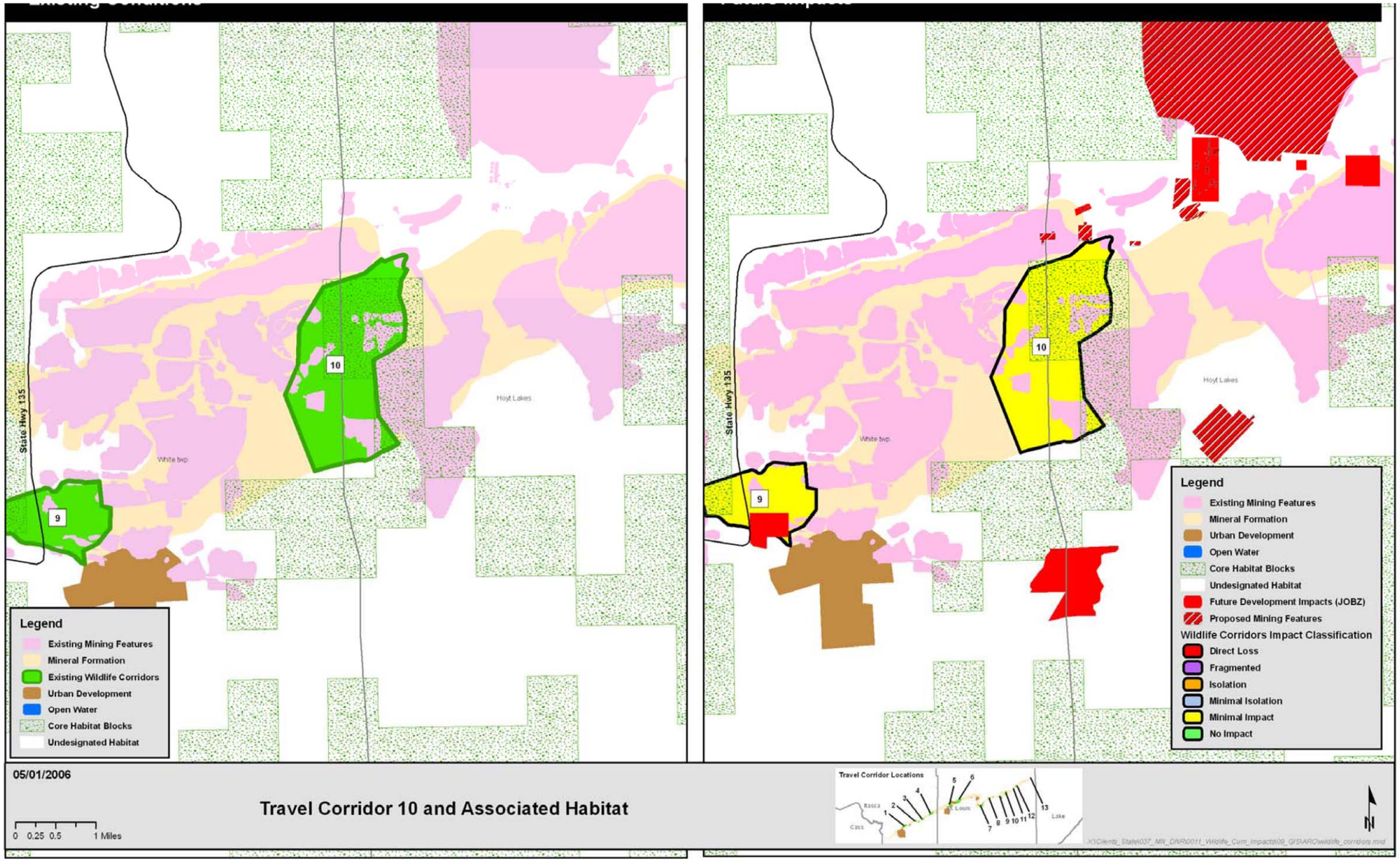


Figure 6.9 Wildlife Travel Corridor #10

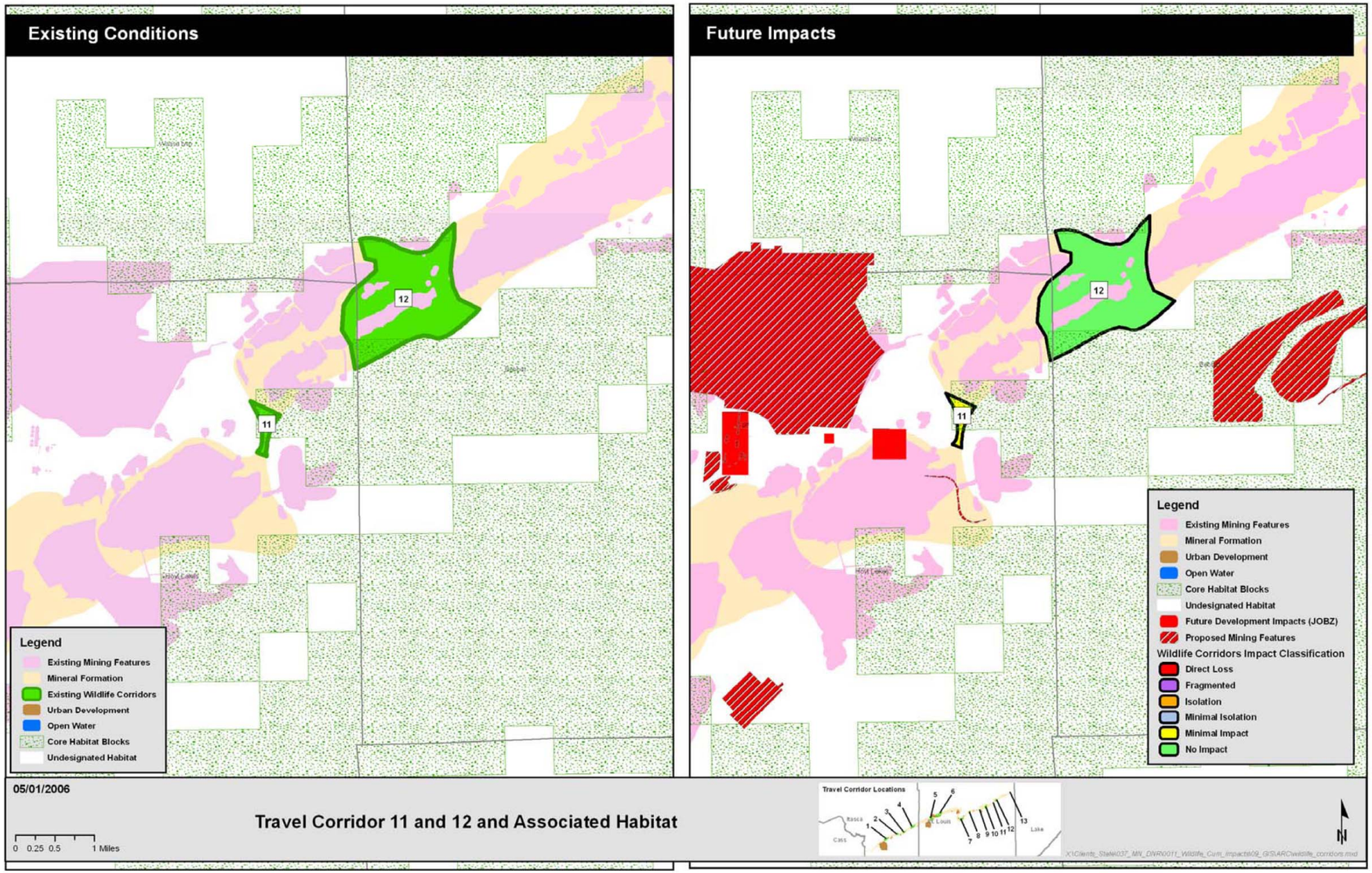


Figure 6.10 Travel Corridors 11 and 12 and Associated Habitat