Cumulative Effects Analysis of Wildlife Habitat and Threatened and Endangered Wildlife Species

Keetac Expansion Project

Prepared for
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1.0 Executive Summary

State and federal environmental guidelines require that a Cumulative Effects Analysis (CEA) be conducted for major projects that, along with similar past, present or reasonably foreseeable future projects, may cumulatively result in impacts to sensitive natural resources. This CEA analyzes the contribution of the Keetac Expansion Project to cumulative impacts on wildlife habitat and movement, and on endangered and threatened wildlife species along the Iron Range in northern Minnesota. The specific Study Area extends approximately from Grand Rapids to Babbitt, within a 5-mile buffer extending from the approximate centerline of the Iron Range between those points.

Existing vegetative cover type databases from presettlement and recent conditions were analyzed and compared to generate distribution maps of wildlife habitat types in past and current conditions, and to estimate the approximate change in wildlife habitat between current and presettlement conditions. The data sets were cross-walked to match up analogous cover types. These were then cross-walked to the MnDNR *Comprehensive Wildlife Conservation Strategy* (CWCS) habitat types, which most closely reflect the varying habitats of Minnesota wildlife. Relative changes in CWCS habitat between past and current conditions were then checked against a list of target wildlife species to identify those species or categories of species that are most and least susceptible to alterations in habitat availability. Projected future impacts to wildlife habitat were estimated from a list of known mining and other large projects that have either been permitted, but not executed, or that are currently undergoing the permitting process. Finally, the current remaining corridors for wildlife movement across the Iron Range were identified, and the impact of future projects on the ability of wildlife to continue utilizing these corridors was evaluated.

Comparisons of past and present vegetative cover indicate notable losses since presettlement of upland forest, especially pine forests, as well as loss of lowland conifer and deciduous forest. This reflects the early logging history of the Iron Range. Some reduction in wetlands was also noted; however, there are several sources of potential errors in comparing the various databases, and much of the reduction in wetland area identified in the analysis is attributable to those sources of error. The Iron Range lies within a part of the State that retains 80+% of its presettlement wetlands, and the CEA for wetland impacts indicated only a 4% loss of presettlement wetlands.

Approximately 16% of the Study Area is now in some type of developed cover. Analysis of the cumulative impacts of future projects indicates that over three-quarters of those impacts will occur in

areas that are developed or in aspen/birch and upland shrub cover. Future habitat losses attributable to mining projects will largely avoid upland and lowland forested habitats. Future operations within the Keetac facility boundary do not contribute significantly to further loss of forested cover types. If current demographic trends and development patterns continue, cumulative impacts due to non-mining development will be greater than those attributable to mining.

The Keetac Expansion Project does not involve mining actions that would impact existing wildlife corridors, and therefore does not contribute to cumulative negative effects on wildlife corridors. Analysis of 18 identified existing wildlife corridors indicates that four will likely become impassable within the next 30 years as a result of other planned mining activities. An additional five corridors will retain some function but will be significantly degraded by future mining plans. Wide-ranging mammals such as wolves and lynx are not likely to be affected by these cumulative impacts, and the inherently greater mobility of birds will reduce the impact of corridor degradation on most bird species. Smaller mammal, amphibian, reptile and insect species live in, rather than pass through, corridors, or take much longer time to traverse a corridor. These species will be most affected by cumulative corridor impacts. Use of increasingly marginal-quality corridors will increase exposure of wildlife to mining human activities and development, and will likely result in higher incidence of wildlife mortality within those corridors.

With regard to listed species and species of greatest conservation need (SGCN species), the cumulative effects of mining and other industrial projects are not expected to negatively impact the regional wolf, lynx or bald eagle populations. Cumulative impacts on habitat and corridors will not negatively affect wolf food resources and dispersal behavior. The Keetac Expansion Project lies outside of the current boundaries of designated lynx critical habitat. It is not believed that either the Keetac Project, or other proposed industrial projects, will have negative cumulative effects on Canada lynx. No cumulative effects to the survival and persistence of State-listed or SGCN species are anticipated to result from the Keetac Expansion Project or other mining and industrial projects.

2.0 Introduction and Background

2.1 Definition and Purpose

Minnesota Rules on Environmental Review require that the Regional Governmental Unit (RGU) consider the "cumulative potential effects of related or anticipated future projects" when determining the need for an environmental impact statement (MN Rules 4410.1700, subpart 7(B)). For the Keetac Expansion Project, the MN Department of Natural Resources (MnDNR) is the RGU. The applicant, U. S. Steel, is to identify any past, present or reasonably foreseeable future projects that may interact with the project in such a way as to cause cumulative impacts, and to describe the nature of the cumulative impacts and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to cumulative impacts.

As summarized in the federal Council on Environmental Quality (CEQ) guidelines on cumulative effects, general cumulative effects are analyzed by evaluating whether the affected resource, ecosystem, or human community has the capacity to accommodate additional effects. These include both direct and indirect effects on a given resource, ecosystem and human community and include actions by private and governmental bodies (40 CFR §1508.7). Cumulative effects may occur when similar impacts accumulate or when diverse impacts have a synergistic effect. Cumulative effects should be analyzed over the entire life of the potential project impact and not just the life of the project. Finally, cumulative effects analysis should focus on truly meaningful effects.

Ecosystems in Minnesota have been affected by both human and natural disturbances since before the State's establishment in 1858. Conversion of native prairie to agriculture is a well-known example of human disturbance, while fires and flooding are examples of natural disturbances. Many of the forested areas in the northern part of the state remain forested with native species and appear to have been less impacted by disturbance. However, both human activities (e.g., mining, urbanization and logging) and natural disturbances (e.g., fire, windstorms, and insect infestation) have altered the character of the original ecosystems in the Arrowhead Region of northeastern Minnesota.

2.2 Ecological Conditions in the Iron Range

Mining activity on the Mesabi Iron Range has contributed to general habitat loss and at the same time created a unique impact on the landscape in the Arrowhead Region. The locations and orientation of

mineralized deposits, and thus the mining activities, are in a relatively narrow (0.5-3.0 miles wide), linear (100 miles long) band of iron formation stretching approximately from Grand Rapids to Babbitt. Iron ore mining includes activities such as sheer-walled mine pits, stockpiles, haul roads and railroads, tailings basins, and associated structural development. The length and extent of 125 years of mining activity and associated infrastructure in its entirety not only results in losses of wildlife habitat over time, but could potentially culminate in a 100-mile long landscape barrier that severs wildlife travel corridors, which may have impacts on dispersal, migration, and/or seasonal movements.

Cumulative impacts affecting wildlife may include the loss or fragmentation of habitat over time and loss of wildlife travel corridors in the Iron Range. Wildlife populations move less frequently between tracts of suitable habitat when passage is blocked by mining operations, roads, towns and other types of development.

Each additional lost travel corridor through the Iron Range contributes to the cumulative advancement toward a threshold of diminished ecological function for wildlife movement. Once beyond that threshold, species' normal/historic movement and dispersal patterns could be irreversibly altered. Negative consequences for some species would be both short- and long-term, including effects on reproduction, food procurement, summer/winter range accessibility, annual migration, and natal dispersal, which in turn can lead to declines in overall population stability and persistence. Long-term consequences could include population isolation, increased genetic isolation, decreased metapopulation dynamics, inbreeding depression, speciation, and other yet unknown or unforeseen outcomes (McEuen 1993).

Cumulative effects were assessed in this study by evaluating and comparing reasonably foreseeable future impacts with the combined effects of this action with other past and present mining actions within a reasonable area of potential biological effect. These specific analyses evaluate potential cumulative effects using guidance from the CEQ handbook for considering cumulative effects under the National Environmental Policy Act (NEPA) (CEQ 1997). The affected resources that are related to cumulative effect issues are used to determine the appropriate geographic and temporal scope for each analysis. The geographic and temporal scope in turn is used to identify the specific past, present, and reasonably foreseeable future actions to be considered.

Lane et al. (2003) concluded that past management practices produced a landscape pattern that contains less habitat for species needing large habitat patches, and poorer quality habitat for species requiring older and more diverse forest vegetation. The MFRC (1999) summarized 1977-1998 MnDNR data and concluded that some wildlife (e.g., otter, fisher, marten) increased, and some were stable or within normal cyclical patterns (e.g., bobcat, ruffed grouse). More recent data show that white-tailed deer, which were in decline historically, have recently increased dramatically (MnDNR 2008), and that moose may have declined, although long term trends are not clear (MnDNR 2008).

2.3 Ecological Conditions at the Keetac Project Site

The Keetac Project site lies within the Nashwauk Uplands subsection of the North Superior Uplands section in the Laurentian Mixed Forest province, according to the *Field Guide to the Native Plant Communities of Minnesota* (MnDNR 2003). The Nashwauk Uplands subsection historically consisted of red and white pine, balsam fir, white spruce, and aspen-birch forest communities. Wetlands consisted of swamps and bogs (MnDNR 2006). Original elevations ranged between 1425 and 1635 feet, but mine pits and stockpiles have expanded that range to between 1300 and 1700 feet.

Construction and development of previous iron mines in the vicinity of the Keetac Project Site has converted much of the area to pits and stockpiles with limited value to wildlife. The pits have barren rock shores, sometimes steep or vertical rock walls, and little or no shallow areas or vegetated shorelines. They are not managed for fisheries. Mining features also include tailings basin, which is a mixture of open water and exposed tailing sediments. Waste rock stockpiles have begun to revegetate and provide some browse and cover for wildlife, but their value is greatly reduced compared to habitat that existed in the area prior to mining. Logging has virtually eliminated mature and older forests. Mining, in combination with roads, transmission lines, and railroads has fragmented wildlife habitat throughout the region. Although this project will involve the loss of some wildlife habitat, the fragmentation impact is lessened because site development will occur in previously disturbed sites, or will involve expansion of previous mine areas rather than creation of entirely new mine areas.

The Project Site contains a variety of vegetation communities, ranging from upland mixed hardwood-conifer forest, mesic hardwood forest, marshes and bare ground with little to no soil development. However, there are extensive areas that are still in active mining operations, are being reclaimed and/or are regenerating from prior disturbance.

A total of seventeen vegetation community types were identified on the Project Site. The most prevalent types include:

Upland Conifer-Deciduous Mixed – These are primarily areas of young forest dominated by balsam poplar (*Populus balsamifera*), quaking aspen (*Populus tremuloides*) and paper birch (*Betula papyrifera*). Ground layer species are dominated by wild sarsaparilla (*Aralia nudicaulis*), bigleaf aster (*Aster macrophyluus*) and bluebead lily (*Clintonia borealis*). Principal shrubs are beaked hazel (*Corylus cornuta*), bush honeysuckle (*Diervilla lonicera*), and Mountain maple (*Acer spicatum*). In somewhat older forested areas, generally on higher spots, the dominant canopy species is jack pine (*Pinus banksiana*). Balsam fir (*Abies balsamifera*) seedlings are generally present, and in some areas black spruce (*Picea mariana*) also occurs.

Marsh – Most marshy areas at the Project Site are dominated by reed canary grass (*Phalaris arundinacea*), and/or a variety of sedges and grasses. Duckweeds (*Lemna* sp.) are frequently present near edges of open water. The south end of the tailings basin is primarily a palustrine emergent wetland, with areas of shrubby wetland. This area was not thoroughly mapped, since there are no anticipated Project impacts that would occur there. In addition, many of the marsh areas around the periphery of the tailings basin are mitigation wetlands of varying ages and levels of establishment. Further details and analyses about wetlands and other surface waters are provided in the Wetland Cumulative Effects Analysis report.

Aspen/White Birch– This refers to areas on the Project Site that have been previously disturbed and are in varying stages of regeneration, primarily with aspen and balsam poplar. Most of these areas are likely on a trajectory to mature into the fire dependent Upland Conifer-Deciduous Mixed. Currently they tend to be dense mosaics of aspen and balsam poplar saplings, at 25%-50% canopy cover, with sparse ground cover and thin patches of leaf litter and mosses.

Grasslands – These areas describe a vegetation community type found on the slopes of the tailings basin containment dike, as well as within other areas around the tailings basin. It is essentially a mixture of grass species such as brome (*Bromus* sp.), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*) and bluegrass (*Poa* sp.) and leguminous herbs, especially sweet clover (*Melilotus officinale*), red and white clovers (*Trifolium pratense* and *T. repens*) and bird's foot trefoil (*Lotus corniculatus*). Reclamation mixes are intended to secure exposed soils and fix nitrogen into the soils. In the areas around the tailings basin, vegetation communities that have established range

from near-monocultures of yellow sweet clover to more-diverse communities dominated by smooth brome (*Bromus inermis*), timothy, and bluegrass.

The combination of upland and wetland habitats within the Keetac Project Site provide likely habitat for mammals such as white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), coyote (*Canis latrans*), gray wolf (*Canis lupus*), bobcat (*Lynx rufus*), beaver (*Castor canadensis*), pine marten (*Martes americana*), fisher (*Martes pennanti*), mink (*Mustela vison*), red squirrel (*Tamiasciurus hudsonicus*), red fox (*Vulpes vulpes*), bats, snowshoe hare (*Lepus americanus*), other small mammals, and possibly moose (*Alces alces*), and Canada lynx (*Lynx canadensis*). Birds include or may include bald eagles, cormorants, swans, osprey, and hawks. Wetlands may provide habitat for amphibians, great blue heron (*Ardea herodias*), common snipe (*Gallinago gallinago*), belted kingfisher (*Megaceryle alcyon*), and swamp sparrow (*Melospiza georgiana*). Forests and/or open areas may provide habitat for raptors, owls, woodpeckers, and numerous passerine bird species. Ruffed grouse (*Bonasa umbellus*) may also be present. On the west side of the reclaimed Keetac tailings basin, sharp-tailed grouse (*Tympanuchus phasianellus*) have established a stable population. On the east side of the tailings basin, a pair of bald eagles has constructed a nest.

2.4 Previous Cumulative Effects Studies

Emmons and Olivier Resources (EOR) completed an analysis of future impacts to remaining wildlife corridors in the Mesabi Iron Range in their 2006 "*Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota*." This analysis was conservative because it treated all historic mining features as lost habitat and absolute impediments to travel, and did not take into account the ameliorating effects of human revegetation efforts, natural succession, and the size and topography of mining impacts. Historic mining impacts may range from relatively small, gently-sloped spoil piles and natural ore mine pits less than 50 feet deep, to large, steep-sided taconite pits that may be up to several hundred feet deep. The EOR analysis therefore conservatively estimated the number and size of wildlife travel corridors. However, until now, it remained the only available report on travel corridors in the Iron Range. The EOR study estimated the loss of all vegetative cover types used as wildlife habitat in the Arrowhead Region to be 8,727 acres. In the EOR study, forestry accounted for 83.8% of habitat loss, mining contributed 10.5%, and non-mining development resulted in an additional 5.7% loss of habitat.

2.5 Study Areas

Defining the affected resource of interest for a cumulative effects analysis is important in determining the geographic and temporal boundaries of the analysis. This in turn helps identify the past, present and reasonably foreseeable future actions that will also be included in the analysis. For example, cumulative effects related to water quality would be limited to the watershed of interest and would not consider the effect of a nearby action in a different watershed.

The approach utilized for this evaluation of habitat loss and landscape barriers has been to choose an appropriate analysis area ("Study Area") and a baseline time and condition. Then, the cumulative disturbance (habitat loss) of past, present, and reasonably foreseeable future mining and associated infrastructure development on that baseline condition was assessed. In addition, the presence of landscape barriers to wildlife corridors caused by past, present, and proposed future actions on dispersal, migration, and/or seasonal movement on species of interest was assessed. These then may be compared with the impacts proposed by the current action ("Project Site"), and the contribution of the Keetac Project Site to the cumulative effect in the Study Area can be quantified and discussed.

2.6 Study Scope

In accordance with the Scoping Environmental Action Worksheet (SEAW), cumulative impacts to wildlife in general, and threatened and endangered species in particular were to be evaluated. The following sections provide an introduction and background to many of the species examined in this study.

2.6.1 Target Wildlife

Target wildlife includes species selected for further evaluation that may be effected by the current action and the cumulative effect of all actions within the Study Area. "Species of Greatest Conservation Need" and "Umbrella Species" were two main groups used to comprise the list of Target Wildlife.

2.6.1.1 Species of Greatest Conservation Need

To have a meaningful analysis of wildlife cumulative effects, this study largely focused on species with some form of conservation need. Assessment of existing wildlife resources was based on the Minnesota Comprehensive Wildlife Conservation Strategy (CWCS), an ecoregional-based wildlife management approach developed by MnDNR as part of *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota's Wildlife* (MnDNR 2006). The CWCS identifies Species of Greatest

Conservation Need (SGCN) by ecoregional subsections (MnDNR 2003) based on a statewide approach. In this study, the list of target wildlife is limited to species that have the potential to occur within the Study Area.

2.6.1.2 Umbrella Species

In addition to the list of species generated from CWCS, black bear, moose, and white-tailed deer were added to the list of target wildlife. These latter three species are considered "umbrella" species. Umbrella species have habitat needs that incorporate the needs of other wildlife species, and are at least as comprehensive as the rest of the community being assessed. If the minimum habitat needs of an umbrella species are met, then the needs of other wildlife species should also be met.

2.6.1.2.1 Black bear (Ursus americanus)

Black bears are intelligent large mammals that are shy and secretive, yet also somewhat adaptable to the presence of humans. Black bears are found primarily in the forested regions of 39 states and 11 Canadian provinces, and also in the American southwest and Mexico. In Minnesota, their habitat consists of mixed forests comprised of hardwoods such as maple (*Acer* spp.) and birch (*Betula papyrifera*), and conifers such as balsam fir (*Abies balsamifera*) and spruce (*Picea* spp.). Black bears in Minnesota also utilize white cedar (*Thuja occidentalis*) swamps (Feldhamer et al. 2003). Principal food sources in the north woods of Minnesota include: fruits, especially raspberries and blueberries; grasses and forbs; insects and their larvae, especially bees; and the buds, leaves and fruits or nuts of trees. Less than 10% of black bears' diets is animal matter, and this is mainly carrion (MnDNR 1998a). Black bears hibernate through the winter months. Following emergence from their dens in the spring, bears movements are initially limited. However, in late summer and early fall, as bears are preparing for hibernation, they will travel great distances in order to find and consume food to increase fat stores (Feldhamer et al. 2003),

2.6.1.2.2 Moose (Alces alces)

Moose are large herbivores associated with spruce, fir and pine (*Pinus* spp.) boreal forests in North America, and they forage in uplands as well as in lakes, ponds and wetlands. The moose found in northern Minnesota are at the southern edge of the species' range in North America. Moose accumulate large stores of fat during the short growing season in northern Minnesota, consuming aquatic plants, shrubs such as willow, and woody browse. Young moose stay with their mothers for 12-18 months, then typically spend a brief period of wandering before establishing a permanent home

range at 2-3 years. The typical home range of a moose in northern Minnesota has been estimated at 1.5 to 36 square miles (Feldhamer et al. 2003).

Moose utilization of wildlife corridors would occur during two types of movement – migration and dispersal. Migration occurs seasonally, with individual moose moving between summer and winter ranges. In northern Minnesota, migration distances of 8-21 miles have been observed in moose (Phillips et al 1973). While migration is a repeated pattern of movements between seasonal ranges, dispersal involves individual moose leaving a previously used area to settle another. Dispersal distances vary greatly, and some moose may not disperse at all (Feldhamer et al. 2003). The available wildlife corridors crossing the Iron Range may limit migratory or dispersal routes for moose. However, this limitation is not likely to decrease individual moose reproductive potential, increase mortality or constrain regional dispersal. This is because of the abundance of suitable habitat for moose on either side of the Iron Range, particularly to the northwest.

2.6.1.2.3 White-tailed deer (Odocoileus virginianus)

The white-tailed deer is a large herbivore that is widely distributed in North America, occurring in 45 of the lower 48 states, as well as southern Canada and Mexico. Home ranges vary with sex and age, and also seasonally and across habitat types. In northern Minnesota, the home range is approximately 1 square mile for a female white-tailed deer, and about twice that for a male.,. Movement is greatest in mature males during the breeding season, and lowest among females around the time of giving birth to young. Deer are least active in the winter, and most active in the spring and fall (Feldhamer et al. 2003).

White-tailed deer undergo seasonal migrations in response to cold and snow, traveling up to 15 miles to congregate in sheltered areas of closed canopy coniferous forest. Mature white cedar forests are preferred, but spruce and balsam fir forests are also utilized. Once winter ends, deer spread out into their summer ranges.

2.6.2 Threatened and Endangered Species

Minnesota's Endangered Species Rules (MN Rules 6212.1800 to 6212.2300) impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as Endangered or Threatened. The federal Endangered Species Act of 1973, as amended (16 U.S.C §1531-1544) required the U.S. Department of the Interior to identify species as Endangered or

Threatened according to a separate set of definitions, and imposes a separate set of restrictions pertaining to those species.

Potential cumulative effects to state and federal Threatened and Endangered species as well as Species of Special Concern are discussed in this report. Effects related to past, present, and reasonably foreseeable future actions, based on knowledge of the species within the state, are being evaluated through a semi-quantitative summary of species that may be affected. This evaluation includes determining whether the various species are particularly vulnerable to decline due to the proposed action at the Project Site as well as the cumulative effects of future actions within the Study Area as a whole. Available information regarding losses from other proposed projects with the potential to affect the species of interest have been included in the analysis.

Evaluation in this portion on the cumulative effects analysis has been limited to species that are state and/or federally-listed as Threatened or Endangered and that may occur or are known to occur in the Study Area. Though these species also appear in the SGCN wildlife list, they are being evaluated in closer detail as focal species in terms of cumulative effects to local and regional populations. These include the federally-Threatened gray wolf, the federally-Threatened Canada lynx, the recently delisted bald eagle, along with the state-Threatened species: eastern spotted skunk, peregrine falcon, trumpeter swan, Wilson's pharalope, wood turtle, Blanding's turtle, and the Laurentian tiger beetle. No state or federally-Endangered species were found to potentially occur in the Study Area. State-listed Species of Special Concern will not be evaluated on an individual basis, but potential impacts to these species will be discussed in the Target Wildlife portions of this report. Sensitive state and federally-listed plant species are being evaluated in a separate report, as part of the Keetac Expansion Project Environmental Impact Statement.

2.6.2.1 Federally-Listed Species

2.6.2.1.1 Gray Wolf (Canis lupus)

Gray wolf currently remains a federally-listed Threatened species in the state of Minnesota. The grey wolf was originally delisted by the Department of Interior on March 28, 2008. This delisting was challenged and the courts remanded the delisting on September 29, 2008 due to legal procedural issues with the delisting process. The Department of Interior on January 17, 2009 once again noticed the delisting of the grey wolf in the Federal Register. The official delisting was scheduled to take place 30 days later (USFWS 2009a). However, on January 20, 2009, President Obama ordered the withdrawal of all notices in the Federal Register, including the proposed new regulations related to

gray wolf delisting, until they can be reviewed by new administration (USFWS 2009b). The outcome of this review is unknown at this time or whether additional legal challenges will be made to this delisting process. Therefore, at this point in time, the gray wolf remains a federally-listed species, and was evaluated in this report. The Keetac site is within the overall range of the gray wolf. According to the U.S. Fish and Wildlife Service (USFWS) website (2009), the gray wolf is recovering nationwide, especially in Minnesota. Populations of gray wolves have become reestablished in several western states from their low point in the mid-1970s when only northeast Minnesota, among the lower 48 states, had a reproducing population. Gray wolf populations in the western Great Lakes Region (i.e., Minnesota, Wisconsin, and Michigan) have exceeded recovery goals for several years (Erb and Benson 2004). State-wide wolf numbers and geographic range increased from the late 1970s through 1998, and have stabilized since then (Erb 2008).

In northern Minnesota, the principal prey of the gray wolf includes white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), beaver (*Castor canadensis*), hare (*Lepus americanus*), and muskrat (*Ondatra zibethicus*), with occasional small mammals, birds, and large invertebrates. Most wolves live in 2-12 member family packs and defend territories of 20-214 square miles. In Minnesota, the average pack size is 4.9-5.5 individuals (Erb and Benson 2004; Erb 2008).

The *Recovery Plan for the Eastern Timber Wolf* (USFWS 1992) identifies five main factors critical to the long-term survival of this species. These critical factors are: 1) large tracts of wild land with low human densities and minimal accessibility by humans; 2) ecologically sound management; 3) availability of adequate wild prey; 4) adequate understanding of wolf ecology and management; and 5) maintenance of populations that are either free of, or resistant to, parasites and diseases new to wolves, or are large enough to successfully contend with their adverse effects.

In addition, wolves are sensitive to human disturbance, generally avoiding populated areas, noise, and other anthropogenic disturbance. Vehicle collisions are a major cause of wolf mortality (Fuller 1989; Kohn et al. 2000; Mech 1977).

2.6.2.1.2 Canada Lynx (Lynx canadensis)

Canada lynx populations in the United States are currently protected under the Endangered Species Act as a federally-listed Threatened species. Lynx populations in the U. S. are dynamic and linked to the Canadian metapopulation, although breeding has been documented within the U. S. populations. Lynx population cycles are related to snowshoe hare populations, and mortality due to starvation has

been documented during periods of hare scarcity (Pool 1994, Slough and Mowat 1996). 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). Since 2000, the USFWS documented five road-killed lynx in Minnesota on a variety of roads, one of which was killed by an automobile on a gravel road with a design speed of 30 mph (USFWS 2007). Lynx may also be subject to competition (Buskirk et al. 2000), habitat loss and predation.

Staples (1995) described lynx as generally tolerant of humans including moderate levels of snowmobile traffic (Mowat et al. 2000) and ski resort activities (Roe et al. 1999). In a study area with sparse roads in north-central Washington state, logging roads did not appear to affect habitat use by lynx (McKelvey et al. 2000c). By contrast, lynx in the more heavily-roaded southern Canadian Rocky Mountains crossed highways within their home ranges less than would be expected (Apps 2000).

2.6.2.1.3 Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is a state Species of Special Concern. The bald eagle was removed from the federal Threatened species list in June 2007. After a period of decline due to hunting and widespread use of DDT, bald eagle populations in the lower 48 states rose dramatically beginning in 1972. As a result, the species was removed from federal Endangered Species Act protection. It continues to be listed by the State of Minnesota as a Species of Special Concern. In addition, the bald eagle is federally protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

In Minnesota, bald eagles typically nest in large trees within 500 feet of large lakes or rivers. Activities that occur within one-quarter to two miles of nests may have adverse effects on breeding eagles. The US Fish and Wildlife Service eagle management guidelines suggest that human activity within this tertiary zone can be seen by eagles and, depending on the level of screening and habituation of individual eagles, may cause them to abandon a nest. Bald Eagle nesting territories in Minnesota generally have a 10-mile radius that varies with habitat quality (Guinn 2004). But as eagles become more numerous in an area, eagles seeking to establish new territories would select lower quality habitat and move into closer proximity to human activity.

2.6.2.2 State-Listed Species

Seven state-threatened species were identified as potentially occurring in the 5-mile or 15-mile buffers that define the study area.

2.6.2.2.1 Eastern Spotted Skunk (Spilogale putorius)

Eastern spotted skunks are non-territorial, social mammals that are uncommon in the study area. They are typically found further south in Minnesota where they occupy open habitats that provide patches of shelter such as fence rows, thickets, and riparian woodlands that can provide den sites and cover. In agricultural areas, they may be found around farm buildings, hay stacks, or rock piles. They are omnivorous, and primarily insectivorous, but will utilize a variety of food resources such as fruit, grain, small animals such as birds, reptiles, amphibians, and mammals. Dens are usually in covered sites aboveground. Eastern spotted skunks are not true hibernators and may forage on mild winter days. The NHIS database reports only one occurrence of this species, reported by a trapper, in the Laurentian Mixed Forest Province. The skunk is not known from the immediate vicinity of the Keetac site, nor within the 5-mile buffer study area.

2.6.2.2.2 Laurentian Tiger Beetle (Cicindela denikei)

The Laurentian tiger beetle is known from sites in northern counties, north of the Laurentian Divide. Where present, the beetle occupies open rocky or sandy habitats such as edges of and gravel pits, roadside edges, rock outcrops, and openings in coniferous forests. The species preys on small arthropods. Adults ambush or chase prey. Larvae ambush prey from hiding places in subsurface burrows, so the presence of a loose substrate is critical for reproduction and foraging. The species has not been reported from the study area, but dozens of sites have been documented in the Laurentian Mixed Forest Province. Despite the lack of documentation in the study area, it is plausible that anthropogenic disturbance in the Iron Range creates appropriate habitat that is relatively open with sandy, gravelly, or rocky substrates.

2.6.2.2.3 Peregrine Falcon (Falco peregrinus)

Peregrine falcons are aerial predators that nest on cliff edges near rivers or lakes. In recent decades, recovering populations frequently nest in urban areas on high ledges on buildings, smokestacks or bridges. Many individuals migrate to Central and South America, but some overwinter in the United States. Peregrine falcons are extremely fast fliers, and much of their prey consists of smaller birds they capture in mid-flight. They will also eat fish, lizards and small mammals. Historically, peregrine falcons nested along Lake Superior and along cliffs near the Mississippi River in southeastern

Minnesota. In recent years, peregrine falcons have been reported nesting on cliff sites along mine pits in the Iron Range. The NHIS database reports nest sites in the study area approximately 3 miles, 24 miles, and 26 miles away from the Keetac site.

2.6.2.2.4 Trumpeter Swan (Cygnus buccinator)

Viable populations of trumpeter have been reintroduced and reestablished in Minnesota. They may overwinter in the state or in states south of Minnesota. They nest and forage in wetlands with unpolluted open water and abundant emergent vegetation. Preferred nest sites are hummocks, floating islands, or the tops of beaver or muskrat lodges. They feed on aquatic plants as well as fish and crustaceans. One trumpeter swan nest has been reported in the study area near a forested wetland, approximately 20 miles from the Keetac project site.

2.6.2.2.5 Wilson's Phalarope (Phalaropus tricolor)

Wilson’s phalarope is a wetland bird that occupies habitats of wet meadows, wet prairies or similar wetlands with pools of open water. Nest sites are in wet meadows or adjacent upland prairies. Human-altered landscapes are sometimes utilized as long as the requirements of short vegetation and nearby open pools of water are met. This species migrates to South America during the winter. Food resources include crustaceans and aquatic and terrestrial invertebrates. Fourteen reports of the species have been reported in the Laurentian Mixed Forest Province, including documentation of nesting and foraging during the breeding season.

2.6.2.2.6 Wood Turtle (Glyptomys insculpta)

Wood turtles are found in and around small and medium fast-moving streams and rivers, typically with sand or gravel substrates and with adjacent forest. Turtles may venture short distances away from streams and rivers to forage in shrub swamps and uplands. Open, sandy sites are preferred for nesting. Coarse woody debris in streams provides an important habitat resource. Woody debris is used for basking and aggregations of debris may provide overwintering shelter. Wood turtles have been documented in the study area near the Partridge and St. Louis Rivers.

2.6.2.2.7 Blanding's Turtle (Emydoidea blandingii)

Blandings turtles are found in and around shallow lakes, calm water near rivers and streams, and wetland complexes. Upland sites are preferred for nesting, and nest sites may not be immediately adjacent to wetland or aquatic habitats. Overwintering occurs in muddy bottoms of calm waters such as in marshes, ponds and backwaters. Blanding's turtles reach reproductive age relatively late, and have low rates of reproduction and juvenile survival. Mortality from vehicles can be high when turtles cross roads seeking nesting sites or dispersing among wetlands.

3.0 Methods

3.1 Study Areas and General Approach

The analysis of cumulative effects on wildlife corridors and habitat due to mining and other large-scale human uses of land focused on an area (Study Area) which includes all land within five miles of current mining features (2007 MnDNR data) within the Iron Range (Figure 1). Beyond the five mile buffer, extensive anthropogenic disturbances in the Arrowhead Region are minimal and nearly all wildlife corridors have rejoined into natural habitat; therefore, analysis beyond this project impact zone was deemed unnecessary because the cumulative effect of habitat loss or fragmentation of wildlife corridors is generally no longer significantly detectable.

To analyze Keetac's contribution to past, present, and reasonably foreseeable future wildlife cumulative impacts, the study area is the "Project Site", as defined by the project boundaries, including proposed mining expansion (Figure 2).

Because mining figures significantly in the assessment of cumulative effects, Figure 3 illustrates current (2007) mining features in the Iron Range according to MnDNR data. These are areas of open pits, stockpiles, tailings basins and other mining features, and are thus very closely correlated with the iron formation deposit in the Iron Range.

The general approach to determining cumulative effects on wildlife habitat and sensitive wildlife species follows four basic steps:

1. Determine the pre-development vegetative cover/habitat types and their acreages;

2. Determine current vegetative cover/habitat types and their acreages and compare them with pre-development acreages. The datasets that were used to produce the pre-development and current condition cover types were cross-walked to match up similar types.

3. Determine reasonably foreseeable future mining impacts and compare losses with the current condition. From this, cumulative effects to wildlife corridors are analyzed.

4. Compare losses and gains in specific habitat types with the wildlife species that utilize those types. This provides an estimate of the wildlife species that are most or least likely to be affected by the cumulative impacts of mining activities on wildlife habitat.

In order to complete these steps, the baseline, or pre-development conditions, were evaluated. Next, the current conditions were mapped and cross-walked to the pre-development types. After comparing the past and present conditions, the impacts on wildlife species were evaluated. Specific methods to complete these steps are detailed below.

3.2 Baseline Ecological Impacts

Marschner's map of the original vegetation of Minnesota, which was recreated by Miron Heinselman in 1975, was used to define the baseline vegetative condition in both the Keetac Project Site and throughout the Study Area. This map was compiled from the original land surveys of Minnesota during the period 1850 to 1905 at a 1:500,000 scale. Due to limitations in mapping scale and effort, as well as errors in interpretation, there are limits to its usefulness in accurately describing pre-settlement habitats; however, this map remains the best available representation of the original ecosystems of Minnesota before European settlement.

To improve mapping accuracy, the USFWS' National Wetland Inventory (NWI) data layer was overlain and combined with Marschner's map. Though mapped in the early to mid 1990s, the NWI map of wetlands within the area of interest was found to be a sufficiently accurate representation of pre-settlement wetlands. This is in part because northern Minnesota, including the Iron Range, retains a majority of its pre-settlement wetlands. In test comparisons of NWI wetlands to areas identified as wetlands by the Original Land Survey (Barr 2008) within other mine projects in the Iron Range, there was found to be only a 1% margin of difference. The NWI was also mapped at a much finer scale, and is therefore presumed to be more accurate than the underlying Marschner layer, even when NWI wetlands overlay pre-settlement lands classified as uplands. There was one exception where the NWI data required manipulation. Open mine pits that existed at the time of NWI mapping were labeled as "Inland Open Fresh Water" most likely because the pits contained standing water. Since these areas do not likely represent pre-settlement conditions, they were deleted from the dataset. Any Marschner wetlands occurring outside of NWI wetland boundaries were preserved in the final map of pre-settlement vegetation. Upland communities unaffected by NWI overlay retained their Marschner classifications. The final map of pre-development vegetation is included as Figure 4.

Due to lack of available information on Marschner's mapping, the following assumptions were made:

- "Conifer Bogs and Swamps" was interpreted as including open and forested bogs as well as deciduous, coniferous, and coniferous-deciduous mixed swamp forests.

- "Wet Prairie" was presumed to describe non-forested wetlands, such as meadows and marshes.

- Any classes outside of "Conifer Bogs and Swamps", "River Bottom Forest", "Wet Prairie", and "Open Water (Lakes)" was presumed to represent upland communities.

The acreages of various presettlement cover types derived from the combination of the Marschner and NWI data are tabulated and discussed in Section 4, Results and Discussion.

Impacts to predevelopment cover types were further analyzed to determine the affect of mining activity, infrastructure development, and other human land uses. These impacts are grouped according to level of disturbance and provide acreage and relative loss of each presettlement habitat in the Study Area and the Keetac Project Site, and the relative contribution of Keetac impacts to all impacts in the Study Area. This information is summarized in Table 9 of Section 4, Results and Discussion. The area disturbed was derived from the 2007 MnDNR Mine Features mapping layer (including natural ore pits, taconite pits, infrastructure, and other previous mining disturbances, excluding the "undisturbed/natural ground" mining feature), the railroad layer obtained from the MnDOT (a 20-foot buffer was added to this linear feature), and the development, cropland, and barren land use categories from the National Land Cover Dataset (NLCD 2001), created by the Multi-Resolution Land Characteristics Consortium (MRLC), a federal multi-agency land mapping partnership. These impacts to pre-settlement habitat are illustrated in Figure 5.

3.3 Current Ecological Impacts

Current land cover conditions were mapped in order to draw comparisons with the pre-development cover. Comparing the past and current land covers provides an estimate of how many acres of each habitat type have been disturbed or lost by post-settlement activities to date in the Study Area and Project Site.

To provide a more comprehensive understanding of current conditions, a map was created by overlaying several land cover data sources. It is intended to capture human-settlement changes such as mining and development as well as habitat changes that may have occurred through human land use (e.g. forestry and farming) and natural vegetative succession, thus providing a more accurate presentation of present-day vegetation. The United States Geological Survey (USGS) GAP land cover was used as a base. This map was created in the early-1990s at a minimum 1-acre resolution.

Though slightly out of date, it is the most recent high-quality large-scale land cover data available. The natural communities were used from this database, including wetlands (in lieu of NWI wetland data). GAP classifies land covers in four levels of increasing accuracy. For this study, a combination of Levels 2 and 3 were used, choosing whichever cover class provided a best match with Marschner, NWI, and CWCS data sets. Though GAP does include "Developed" classes (cities, roads, residential, etc.), it was found that the NLCD provided a far better representation of development existing conditions. The development classes (Open, Low, Medium, and High Intensity) from NLCD as well as the anthropogenic land covers, barren land and cropland, were overlain on the GAP land cover, and the underlay was erased. Some GAP development areas were not captured by NLCD, and were left in place in the final layer. The MnDOT railroad layer was then overlain on the GAP land cover layer and given higher priority. Because railroads are not included in either GAP or NLCD, the railroad layer "overwrites" areas of other land uses, such as development and natural habitats. This linear feature was given a 20-foot buffer. And finally, the 2007 MnDNR Mine Features layer was overlain and given top-priority, overwriting all other layers where they intersect. The mining feature, "undisturbed/natural ground" are areas that have not yet been mined, but are surrounded by mining activity and have been permitted for future mining. Since many of these areas are large and provide wildlife habitat or allow for wildlife movement, they were not considered as previous or current mining impacts in this analysis.

The resulting current conditions land cover layer is presented in Figure 6. The current conditions land cover acreages in the Study Area and Keetac Project Site, grouped according to anthropogenic and natural land covers, are discussed in Section 4, Results and Discussion.

Some areas of mining activity may have naturally revegetated, providing some wildlife habitat and corridor value. To address vegetative recovery on previous mining lands, the areas overlain by 2007 Current Mine Features layer were examined and tabulated. These include both human and natural environments as identified in GAP. Because the GAP data (and NLCD) interprets mining features literally, e.g. "barren land" , "open water", these were considered to be active mining impacts, while natural habitats were considered to be areas that may have revegetated. While the GAP data is neither perfectly accurate or precise, this data was used to analyze and document possible vegetative succession in areas impacted by mining to provide a more complete picture on cumulative wildlife habitat and corridor losses. Figure 7 illustrates the natural habitat communities that may have regenerated in current mining features.

The pre-development cover types, derived from the combination of Marschner and NWI data, were cross-walked to the current conditions, which, as described above, are derived from the combination of NLCD 2001 and GAP data sets. Table 1 provides the cross-walked cover types between past and present. Also shown in Table 1, in the left column, is an additional cross-walk to habitat types used in the MnDNR Comprehensive Wildlife Conservation Strategy (MnDNR 2006). The development of this cross-walk and the use of the CWCS data is discussed further in Section 2.6, Target Wildlife.

3.4 Foreseeable Future Ecological Impacts

An assessment similar to those used for past and current conditions was carried out by identifying projected cumulative disturbance 30 years in the future (total time of construction, operation and closure of current mining proposals) as related to the compilation of proposed future actions. Also included in this layer were other large-scale future land uses, such as power plant creation and expansion, to provide context to reasonably foreseeable future corridor losses and habitat losses within the Study Area. No assessment on impacts to wildlife from mining activities that may occur more than 30 years into the future is provided in this study.

To assess the potential impact of future mining activities and other large-scale land uses on habitat types on the overall Mesabi Iron Range, the acreages of mining and other large projects that have either been permitted, but not executed, or that are currently undergoing the permitting process was calculated. The reasonably foreseeable future impacts include all permits currently approved or under review by the MnDNR Division of Minerals.

Currently identified future mining projects include the following:

- Essar Steel (formerly Minnesota Steel)
- U. S. Steel Keetac
- U. S. Steel Minntac
- Mittal Minorca East Reserve/Ispat Inland
- PolyMet Mining Inc. (Northmet Project)
- Northshore (Peter Mitchell Mine Pits Expansion)
- Proposed Cliffs Erie Pellet Railroad Loading Project
- Mesabi Nugget (Phase II Project)
- Hibbing Taconite

Other large projects in the Study Area:

- Excelsior Energy (Mesaba Project)
- Blandin Paper Mill Expansion
- Hoyt Lakes to Babbitt Connector Highway

When available, information on the type of mine expansion or creation (e.g. tailing basin expansion or mine pit expansion) was included. In other cases when detailed plans were not available, the 2007 Current Mine Features layer was subtracted from the compilation layer of future projects. Project boundaries that extend outside of current mine features were considered to be future impacts. Figure 8 shows the compilation layer of future impacts clipped to the current conditions layer described in the previous section. "High Impact" areas include all mining pits, in-pit activities, and facilities. "Moderate Impact" areas include all other mining features. Section 3.5 provides further clarification on impact ratings. With this data, the amount and relative loss of wildlife corridors and habitat attributable to mining and other future actions were tabulated (Section 4, Results and Discussion).

Data that is missing or unavailable for this analysis include planned residential developments, City or County infrastructure developments, additional MnDOT highway creation or road widening, etc. Therefore, due to the cumulative effect of these additional future land uses, actual wildlife habitat and corridor impacts may be greater than that determined in this study due to other land uses.

In terms of spatial scale, forestry impacts more acreage of wildlife habitat than mining. Although impermanent, forestry impacts wildlife habitat quality by reducing the acreage of mature forest. However, timber harvesting practices on federal, state, and county land are shifting to include a greater amount of longer-rotation harvests and harvests that promote the regeneration of conifers (MFRC 2005). In addition, if current climate trends and harvesting trends continue, the acreage of late-successional forest would increase, especially of spruce-fir and mixed conifer-deciduous stands (Mehta et al. 2003). No data could be found on recently logged forests or on future logging plans, which are subject to market fluctuation in for pulp, timber and biomass. Existing second-growth forest was identified by the GAP land cover dataset according to vegetative community type.

3.5 Wildlife Corridor and Habitat Analyses

To describe wildlife movement corridors through the Iron Range, land uses and landscape features were categorized as to their value for wildlife movement. The ability of wildlife to move through a mine feature is an important consideration (e.g. a species' physical ability to climb a stockpile), and another consideration is the availability of resources necessary to sustain a slow-moving species'

life-history requirements (i.e. food, space, shelter) while in the corridor. Justification and rationale is provided below for the valuation assigned to land use categories and landscape features.

Each type of human-based land use was qualitatively assigned as either "High Impact" or "Moderate Impact" based on type of disturbance (Figure 9). MnDNR 2007 Current Mining Features "High Impact" areas are those mining features that create a physically-impenetrable barrier to wildlife. These include all mining pits, in-pit activities, and hardscape such as operations plants and buildings. Mining pits are considered to be true and permanent physical barriers due to their steep or vertical cliff rock faces.

"Moderate Impact" areas have experienced a change in topography, community structure, diversity and function from the original habitat but do not create physically impenetrable barriers for many species. These areas include stockpiles, tailings basins, borrow areas, settling ponds, and haul roads. Wildlife may avoid using these areas because of perceived risk or the inherent difficulty in crossing them. Alternately, wildlife may be attracted to using haul roads, which may alter natural use of the landscape and affect territory ranges, and may significantly increase the risk of mortality by vehicle strike or other human conflict. Additionally, "Moderate Impact" areas may be accessible to but lack food and shelter for certain slow-moving species.

"Moderate Impact" areas are furthermore distinguished from "High Impact" areas because they may naturalize and revegetate over time. Though they may never regain the habitat diversity and ecosystem function present before mining, they may allow for wildlife movement to areas of suitable core habitat and may provide some amount of food or cover during passage. Habitat quality in corridors is less important for fast-moving species, such as wolves, than it is for slow-moving species such as amphibians, which may require a corridor to meet all of its life-history needs in order to successfully cross (Beier and Loe 1992). In many cases, after several decades, natural revegetation of inactive mining areas results in low-diversity, even-aged hardwood forests dominated by early successional species such as quaking aspen and birch. These areas are often ecologically impaired, with significantly diminished soil ecology (i.e. soil organic matter, mycorrhizal fungi, macroinvertebrates, and soil seed bank) (Klemow 2000). In other cases, some types of mining impacts have naturally reverted to wetlands or were deliberately repurposed as wetland mitigation. For example, starting in 2000, Keetac began developing 135 acres of wetland mitigation in the tailings basin. Subsequently, those areas have all developed into wetlands that meet permitted success criteria. Starting in 2005, Keetac began monitoring an additional 400 acres of on-site

mitigation wetlands in the tailings basin, and they also appear to be developing into wetlands successfully. It is acknowledged that not all mining impacts are a total, permanent loss for wildlife. However, because of the uncertain ecological outcome of reclaimed land, it is not assumed in this study that revegetation of an old mine feature wholly replaces the original habitat.

Other land uses in the Study Area identified using the NLCD 2001, GAP, and MnDOT land cover layers, such as development, roads, railroads, lakes, and large rivers were also assigned “High Impact” and “Moderate Impact” values. All development uses - High, Medium, and Low Intensity - were considered as “High Impact”. These include city centers, residential areas, commercial development, and larger roads and right-of-ways. Low intensity development was included in this category because most areas under this classification are directly adjacent to High and Medium density development and are surrounded by a close network of roads. A fourth class, Open Space Development, was classified as “Moderate Impact”. These areas include such land uses as urban parks (often with forested cover) and golf courses, but more importantly, include smaller roads and road right-of-ways. Most areas of GAP development that were not overlain by the NLCD development classes are identified as “Mixed Development”. These occur as isolated low-intensity human land uses outside of city centers and were also given the “Moderate Impact” value. As described above, these are land features that some wildlife might cross, but with some measure of difficulty and/or peril. Railroads were similarly classified as “Moderate Impacts” for the same reason. “Croplands” are anthropogenic disturbances in the Iron Range, though they are not a significant land cover feature in the Iron Range. These were given “Moderate Impact” categories.

Lakes and large rivers, though entirely natural landscape features, do present physical or behavioral movement impediments for many terrestrial species of wildlife (Harris and Reed 2002), though in winter, many non-hibernating species will readily cross frozen water bodies. In this study, lakes and large rivers were considered as a “Moderate Impact” when assessing wildlife corridors, but were considered a natural land cover feature when assessing wildlife habitat loss. Small streams and rivers were not included in the assessment of movement barriers for wildlife.

Harrison (1992) recommends corridor widths to be wide enough to accommodate natal dispersal patterns and contain suitable habitat so that the species does not wander outside of the corridor and risk mortality. Corridors must also be wide enough to mitigate edge effects. And finally, corridor width should be dependant on corridor length. Corridors may be narrow if they are also short enough for wildlife to pass without stopping.

Potential existing wildlife corridors were identified according to the following parameters:

1) Largely undeveloped with few "moderate impact" barriers that dominate the corridor,

2) No significant barriers presented by "high impact" land uses,

3) At least 300 feet across at its narrowest point to buffer against edge effects from adjacent land uses, and

4) Relatively linear and non-complex, i.e. not significantly interrupted by several small "High Impact" features.

"Moderate Impact" land uses are included in corridors, but are of uncertain value for wildlife crossing. Some moderate impacts would not alter certain species' movement at all, but are completely impassable for others. Therefore the best corridors are ones with the most natural, unimpacted lands. Areas that contain natural, undeveloped habitats were considered "High Value" corridors. Areas that contain "Moderate Impact" land uses were considered "Moderate Value" as wildlife corridors. Areas that contain undeveloped natural land, but that bottle-necked and dead-ended into a mining project or a municipality were considered "Moderate Value". Figure 10 depicts wildlife corridors currently present in the Study Area. These will be discussed further in Section 4, Results and Discussion.

3.6 Target Wildlife

The following sections describe how the final list of target species was created and how data on these and Threatened and Endangered Species for assessing cumulative effects were utilized.

3.6.1 Species of Greatest Conservation Need

As mentioned in the Introduction, for this study, MnDNR's list of SGCN was utilized as a proxy for general wildlife in the Iron Range, including the Keetac project site. According to the MnDNR (2006), the definition of a SGCN is an "animal species whose populations are rare, declining, or vulnerable in Minnesota and meet one or more of the following criteria:

- Species whose populations are identified as being rare, declining, or vulnerable in Minnesota
- Species at risk because they depend upon rare, declining, or vulnerable habitats (such as native prairies and grasslands; lakeshores and riparian corridors; wetlands; brushlands; unimpounded river and stream channels; unfragmented interior forest).

- Species subject to other specific threats that make them vulnerable, such as:
    - Over-exploitation
    - Invasive species
    - Disease
    - Contaminants
    - Lack of citizen understanding and stewardship (such as killing large snakes thought to be venomous).
- Species with certain characteristics that make them vulnerable, such as species that:
    - Require large home ranges/use multiple habitats
    - Depend upon large habitat patch sizes
    - Need special resources
    - Depend upon an ecological process (e.g. fire) that no longer operates within the natural range of variation
    - Are limited in their ability to recover on their own due to low dispersal ability or low reproductive rate
    - Have a highly localized or restricted distribution (endemics)
    - Concentrate their populations during some time of the year (such as bats clustering in hibernacula and migratory stop-overs).
- Species whose Minnesota populations are stable, but are declining in a substantial part of their range outside of Minnesota (such as common loon or black tern)."

To specify species occurrence according to habitat type within the Study Area, the Study Area was first mapped according to Marschner's Pre-settlement Vegetation. Marschner mapped 16 vegetative/ecosystem categories, ranging from marshes to pine groves, although not all types occur in the Study Area. It is reasonable to assume that prior to European settlement, human-induced habitat loss and barriers to wildlife movement were minimal. Since there is no direct data crosswalk between Pre-settlement Vegetation and SGCN wildlife habitat, this analysis follows the same approach used by MnDNR in the CWCS. MnDNR uses "Table 7.12 CWCS Level 2 – Marschner Crosswalk" (in which Level 2 was grouped into broader categories) and "Table 7.8 CWCS Level 2 Compared to CWCS Level 4" (which included all Level 2 classes) as a base to equate Pre-settlement Vegetation to CWCS Level 2 Habitats (MnDNR 2006). In some cases, the habitats made a one-for-one translation; in others, two CWCS Level 2 Habitats were described by one of Marschner's habitats, and vice-versa. "Open water (lakes)" includes larger rivers in the database, and so was crossed-over directly to CWCS "River-Very Large." Human-created habitats were included in CWCS Level 2, but were not present in the pre-settlement condition. For example, grasslands were not a native vegetative community in this area of Minnesota prior to human disturbance. Natural grasslands in the pre-settlement condition would have been infrequent and temporary, resulting in natural events such as wind-throw or fire. However, these were still included as a representation of existing conditions.

After Marschner's data was translated to CWCS Level 2 data, the table "Species in Greatest Conservation Need by Habitat Type 04.04.06" (MnDNR 2006), which correlates CWCS Level 2 data with actual species of SGCN wildlife, was used to further narrow down potential species occurrence in the Study Area. CWCS Level 2 habitat types that do not occur in the Study Area, such as "prairies" were removed from analysis. "Shorelines-dune-cliff/talus" is a natural CWCS habitat that consists of sparsely vegetated cliffs and rock outcrops mainly occurring along certain large rivers and lakes (MnDNR 2006). Superficially, the vertical cliffs and exposed bedrock of open pit mining may visually resemble this habitat type. However, the CWCS did not include mine pits in the description of this habitat type. Therefore, it was excluded in attempt to follow the intent of CWCS habitat classifications.

To capture species occurrences in the current condition, the CWCS list of species was crosswalked to GAP habitats and NLCD development classes. The "Table 7.5 CWCS-GAP Level 4 Habitat Categories" and "Table 7.8 CWCS Level 2 Compared to CWCS Level 4" (MnDNR 2006) were used to crosswalk CWCS Level 2 to the GAP land cover categories. Again, the translation was typically direct and one-for-one with a few exceptions. The NLCD development classes translate directly to GAP Level 4 development classes. CWCS Level 2 did not have either an upland or wetland "Deciduous-Conifer Mixed" habitat; therefore, both "Conifer" and "Deciduous" classes for uplands and wetlands were conservatively combined to capture species potentially occurring in GAP "Deciduous-Conifer Mixed" habitat. As with Marschner's "Open water (lakes)", the GAP class "Aquatic" also includes larger rivers. The cross-walk of CWCS types to predevelopment (Marschner-NWI) and current conditions (GAP-NLCD 2001) is shown on Table 1.

In order to restrict the list of SGCN to only those species that may occur in the Study Area, the lists of potential species identified by CWCS habitat types above were cross-checked against species occurrence by Ecological Subsection (MnDNR 2003). The Study Area is mainly comprised of the Nashwauk Uplands, along with areas of St. Louis Moraines, Tamarack Lowlands, Laurentian Uplands, Border Lakes, Chippewa Plains, and Toimi Uplands (Figure 11). The Little Fork-Vermillion Uplands is in very close proximity to the Study Area, but has no unique species occurrences not already captured by the seven Subsections intersecting the Study Area. CWCS' "Appendix E, Occurrences of Species in Greatest Conservation Need by Ecological Subsection" (MnDNR 2006) was utilized as a filter to identify those species that occur within these seven Subsections. Note that most Subsections significantly extend outside of the 5-mile buffer Study Area.

Consequently a species listed as occurring within a Subsection does not necessarily occur within the Study Area.

To better verify actual wildlife species presence or absence in the Iron Range, NHIS data (August 2008 query) was used in a 15 mile buffer around current mining features to capture occurrences of widely-distributed species of wildlife that may occur within the Study Area, minimizing the error of exclusion. Cross-referencing CWCS occurrences with NHIS data confirmed that many of these species in the Target Wildlife list have in fact been observed by NHIS surveyors within 15 miles of current mining features in the Iron Range formation. Mapping NHIS wildlife and wildlife assemblages in a 15-mile buffer around MnDNR Mining Features also allowed for the capture of species that were filtered out due to limitations of the land cover data. For example, GAP data does not classify small-large rivers; however, CWCS Level 2 data does ("River – headwaters to large"). The wood turtle was listed as only occurring within this type of river, and was filtered out as a result. However, since NHIS data indicates numerous occurrences of wood turtles in the Study Area, the wood turtle was added back into the final list of target wildlife species.

The resulting list of target wildlife is included as Table 2. These species are known to occur or may occur in the Study Area, including the Keetac Project Site. Species listed as occurring in GAP habitats that did not have crosswalk equivalents in habitats based on Marschner's vegetation data were further evaluated to see if their presence could be attributed to changes in land use since pre-settlement times. Though Table 2 includes fishes, insects, and mollusks, to limit the scope of this study to terrestrial cumulative effects, further discussion will only include mammals, birds, amphibians, and reptiles. Many SGCN species are state-listed as Threatened, Endangered, or Species of Special Concern, and these were also identified in Table 2.

Table 3 depicts the list of SGCN associated with CWCS Level 2 habitat types. Impacts to these habitat types may have an effect on the species associated with that habitat. These findings were used to evaluate the cumulative effects habitat loss of target species. Table 4 shows the type and number of habitats used by each species. Species that are habitat "generalists" (those that utilize four or more habitat types) may be less likely at risk from habitat and corridor loss than habitat "specialists" (those that use only one to three habitat types).

Target SGCN wildlife (excluding fish and mollusks, i.e. obligate aquatic species) were grouped according to "corridor users" and "corridor dwellers", following Beier and Loe (1992). These

categories were included in the Table 2 list of SCGN target wildlife. “Corridor users” are those species able to pass directly or quickly through a corridor of a given size without requiring pause to rest or feed. In this study, “corridor users” would be the large (gray wolf) and medium (Canadian lynx, badger) mammals and birds. “Corridor dwellers” are those species with behavioral barriers (Harris and Reed 2002) or limited dispersal ability that might require several days to several generations to pass through a corridor of a given size. In this study, “corridor dwellers” include the small terrestrial mammals (e.g. rock vole, eastern spotted skunk), and the herpetofauna (e.g. four-toed salamander, wood turtle). It is noted that, in fact, many species of birds will have the ability to cross corridors more easily (e.g. raptors) than others (e.g. ground-dwellers); however, to research the behavior and habitat needs of each species goes beyond the scope of this assessment. Therefore, all birds were grouped as “corridor users” on the simple basis of being flighted.

With species now associated to their respective habitats, identified as corridor users or corridor dwellers, and whether they are habitat specialists or generalists, impacts to certain habitats from anthropogenic land uses to-date and from future mining and other large projects can now be associated with potential impacts to exact species. For example, if there was a corridor consisting of one habitat type that was to become open pit mine in the future condition, a species that is a corridor dweller as well as a habitat specialist for that one habitat type may be more at risk of adverse impacts from that activity than would be a corridor user that utilizes that particular habitat, along with three other habitat types.

3.6.2 Habitat Specialist Species

In addition to analyses of general categories of wildlife habitat, impacts to a subset of the SGCN were evaluated on an individual species basis according to habitat specialization. The SGCN categorization of habitat utilization (MnDNR 2006) was consulted to determine which species occupy a limited set of habitat types. Species that are found in three or fewer habitats were considered to be habitat specialists. Impacts to these species were evaluated according to changes in the amount of potential habitat in the study area. Assessment of impacts was restricted to amphibian, bird and mammal species.

3.6.3 Umbrella Species

Current conditions and impacts to umbrella species were assessed by determining habitat and corridor requirements for each species and evaluating cumulative changes in habitat. Impacts to

specific populations were not assessed. Instead, the potential for cumulative effects to affect each species were qualitatively described.

3.7 Threatened and Endangered Species

Impacts related to past, present, and reasonably foreseeable future actions to Threatened and Endangered species were described based on habitat and corridor loss in consideration with each species natural history and abundance and distribution in the state. This included a determination of whether each species is vulnerable to decline. Impacts to specific populations were not assessed. Instead, the potential for cumulative effects to affect each species was qualitatively described. This approach was intended to be complementary to the "Target Wildlife" aspect of the study, which also includes these federal and state-listed species. These species are treated as "focus species" and were evaluated in greater detail, using available survey data and the biological opinions of subject matter experts.

4.0 Results and Discussion

4.1 Wildlife Habitat

Mapping of vegetative cover types in both pre-development and current conditions provides an evaluation of the change in wildlife habitat in both the Study Area and on the Keetac Expansion Project. The results of the mapping and the implications for habitat changes are discussed below.

4.1.1 Study Area

4.1.1.1 Predevelopment Conditions versus Current Conditions

A summary of the acreage of various vegetative cover types in both pre-development and current conditions is provided in Table 5. In general, the table shows the following trends:

- loss of upland pine forest and mixed conifer-hardwood forest;
- loss of lowland conifer forest, lowland mixed conifer-deciduous forest and lowland deciduous forest;
- loss of emergent wetlands (marshes);
- gains in aspen/birch forest;
- increase in grassland cover;
- developed cover types totaling over 162,000 acres, or approximately 16% of the study area.

The loss of upland forest, especially pine forest, is consistent with the history of northern Minnesota and of the Upper Midwest in general. Timber production in the 19th and early 20th centuries effected tremendous change on the landscape from New England to Minnesota. Continued logging most likely accounts for the increase in aspen/birch coverage. Some logging most likely also occurred in lowland conifer and mixed forests as well.

However, some of the changes in cover type shown in Table 5 may be misleading, and are likely the result of errors or misinterpretations in the original Marschner data and/or the other datasets. In addition, while some degree of cross-walking between data set classifications is possible, it is

nevertheless difficult to generate one-to-one comparisons between datasets as diverse as the four that were used to generate Table 5 (Marschner, NWI, NLCD 2001, and GAP).

The degree of loss of lowland conifer forest shown in Table 5 is probably higher than the actual conditions on the ground. While there has undoubtedly been some loss of bogs and other lowland forests, it is most likely not a 36% drop in acreage. According to the Minnesota Board of Soil and Water Resources, the Study Area lies within a part of the State that still has over 80% of its presettlement wetlands remaining. In addition, the *Cumulative Wetland Effect Analysis: Mine Expansion Project* report (Barr 2008) conducted for the Keetac Expansion found only a 4% decrease in wetland area between presettlement and current conditions. The decrease shown in Table 5 is clearly an overestimate. The source of this error may be the Marschner maps, which seem to overestimate coverage of forested wet areas. This in turn may be a result of the Public Land Survey methods, which did not include detailed delineation of wet areas. As a result, wet areas on the Marschner maps do not always correspond well with topographic maps. The relatively large drop in lowland forested cover seen in Table 5 is probably in part due to overestimation of wet lowland forested areas in the Marschner mapping.

Similarly, the loss of marsh area is likely overestimated. In this case, one possible source of the error is misinterpretation of Type 2 inland fresh meadow or other emergent wetland types as grass land in the aerial interpretations upon which the NWI maps are based.

Regardless of potential errors or their sources in the calculation of changes in cover type, the comparison of past and present conditions shows a loss of upland forested area, some loss of wetland and a relatively large increase in developed cover.

In order to relate the changes in cover types to wildlife habitat, the current condition cover types were cross-walked to habitat types in the MnDNR Comprehensive Wildlife Conservation Strategy (CWCS) (MnDNR 2006a). Table 6 adds the CWCS habitat types to Table 5. This yields the relative change in habitat types based on the change in acreages in the pre-development cover types and the current condition types. The change in CWCS habitat types is summarized in Table 7.

4.1.1.2 Current Mining Impacts on Habitat

Based on Minnesota Geological Survey mapping of the iron formation of the Mesabi Iron Range, the entire iron ore deposit itself covers approximately 108,162 acres. Over one-third of that area, 36,962

acres, has already been open-pit mined. In addition, MnDNR has generated GIS mapping of mine features along the Iron Range, which include pits, tailings basins, stockpiles and infrastructure such as plants, shops and other facilities. According to the MnDNR data, mining features cover 118,315 acres along the Iron Range, including 36,962 acres of open mine pits, 78,620 acres of stockpiles and tailings basins, and 212 acres of facilities and infrastructure. A total of 2,494 acres are permitted, yet unmined, areas in a more or less natural state. In addition, several towns, such as Nashwauk, Keewatin, and Chisholm are located partly within the Iron Formation.

The 37,174 acres of mine pits, facilities and infrastructure are high impact areas, i.e., permanent impacts to habitat. The stockpile and tailings basins are areas of moderate impact, meaning that they are potentially recoverable.

Certain habitats are new and non-indigenous to the Iron Range, most notably grasslands. While this is a conversion from a native forest cover to a non-native one, some species do benefit and have perhaps expanded their range as a result. These include sharp-tailed grouse, eastern meadowlark, buff-breasted sandpiper, and others. Cropland and even developed areas also provide habitat to species benefiting from such disturbances, including common nighthawk, bobolink, and upland sandpiper.

Within the 2007 MnDNR mining features considered as “moderate impact” are areas that are classified by NLCD 2001 to be vegetated. According to calculations, over 40,000 acres have revegetated either naturally or through human efforts. Deciduous forest, evergreen forest, and scrub-shrub are the most common revegetated habitats.

4.1.2 Keetac Expansion Project

A summary of the acreages of predevelopment and current condition vegetative cover types was also prepared, following the same methods as those for the larger Study Area. The summary is found in Table 8. The changes in predevelopment cover types within the Survey Area and on the Keetac Expansion Project site are further broken down in Table 9, which summarizes the degree to which each predevelopment cover type has been altered by mining activity, infrastructure development, and other human land uses. The contribution of these activities to loss of predevelopment cover types is shown under the “Study” column, alongside the contribution of the Keetac Expansion Project. The percentage contribution of the Keetac project to the overall loss of a particular cover type is also given.

As with the larger study area, the Keetac Expansion Project area has seen large reductions in both upland and lowland forest cover, and a significant increase in high and moderate impact developed areas. Unlike the larger Study Area, the Project area has also seen significant reduction in aspen/birch forest. Within the Study Area, aspen/birch forest has increased as an early-to-mid successional forest cover in former upland conifer and upland mixed forest. At the Keetac Expansion Project, however, upland forest removal has historically been primarily for expansion of mine features, precluding replacement with aspen/birch forest in most places.

Data in Table 9 indicate that the Keetac Project contribution to development impacts on most presettlement cover types is relatively small, less than 10% of the total impacts within the Study Area.

4.2 Potential Future Impacts

Potential future development impacts on current vegetation cover types were calculated for each of the current or reasonably foreseeable future projects listed in Section 3.4. The results are provided in Table 10, Impacts of Future Projects on Current Cover Types. The analysis indicates the following:

- Most potential future impacts will occur in aspen/birch forest communities. Aspen/birch forest accounts for approximately 35% of the projected potential impact to current cover types. Upland shrub communities account for another 16% of potential future losses.

- One-quarter of the projected future impacts would occur in areas that are already developed in some way, either as high impact development to cultivated crop lands.

- Over half of the projected potential future impacts are attributable to future U. S. Steel Minntac operations; however, this may be due in part to incomplete data on the extent of future operations, which in turn results in potential overestimation of future operations.

- Potential future operations within the Keetac facility boundary do not contribute significantly to further loss of upland or lowland conifer forest, lowland deciduous forest or upland conifer-deciduous forest.

Overall, over three-quarters of the projected future impacts will occur in areas that are in some state of development or in young, non-climax communities such as aspen/birch and upland shrub cover. Potential future habitat losses attributable to mining projects will largely avoid upland and lowland

forested habitats. Projected future habitat losses in all conifer or deciduous forested types are well under 5% of the current acreage for each of those types.

If all proposed mining projects were permitted and constructed, a total of 29,347 acres of vegetated cover types would be affected, along with 10,022 acres of areas already in some state of development. It is assumed that all permitted and future permitted mining projects will require reclamation and vegetation of disturbed land. In the future, habitat losses due to mining would decrease as vegetation establishes on disturbed lands. In addition, if current demographic trends and development patterns continue, cumulative impacts due to non-mining development will be greater than those attributable to mining.

4.3 Wildlife Corridors

Potentially suitable wildlife corridors were identified based on methods described in Section 3.5 and are mapped on Figure 16. The efforts in the previous section resulted in a map of existing potentially suitable wildlife corridors (Figure 10). These 18 corridors consist of natural habitats and areas of moderate impact, uninterrupted by high-impact land-use features.

Corridor 1 – Corridor 1 (Figure 15) contains a high proportion of High Quality corridor and is also the widest corridor in the Iron Range, at almost 6,000 and 3,700 feet in two sections, which helps to compensate for its long length. However, it is in very close proximity to the City of Grand Rapids and three major roads and a railroad cross the corridor. Both of these factors limit its value as a successful wildlife corridor. The easternmost half of this corridor consists of a high percentage of Moderate Impact mining features such as stockpiles and tailings basins that some species will not be able to navigate. Due to the size of this corridor, it is likely habitat for many species of "Corridor dwellers" that can safely cross the roads and railroads. There are no proposed future mining impacts within this corridor; however, it is likely that Grand Rapids will expand eastward within the 30 year timeframe.

Corridor 2 – Corridor 2 (Figure 15) is also one of the wider corridors, at about 8,600 feet across. This corridor is intersected by a railroad and a major roadway (US 169), though both of these are located in close proximity of each other. The short length of this corridor is an asset to wildlife. No mining impacts are proposed to occur within this corridor. It is possible that it will remain similar to the current condition within a 30 year timeframe.

Corridor 3 – Corridor 3 (Figure 15) occurs in two sections 2,800 and 1,400 feet wide, separated by a small, 600-foot wide open mining pit. The westernmost half is comprised mainly of Moderate Impact mining features, whereas the easternmost half contains a predominance of undeveloped natural habitat. The same highway and railroad cross this corridor as well. Here, these transportation corridors are separate from one another, creating two unique crossing hazards for wildlife. In the reasonably foreseeable future, this corridor will be lost as a result of Essar Steel's permit to mine. It is anticipated that within the next 30 years, Essar Steel will execute their permit to conduct open pit mining across the width of this corridor. With the loss of this corridor, wildlife will have to travel to Corridor 2 or Corridor 3, located 12 miles apart, to cross. This may not affect wide-ranging species such as wolves, but may adversely affect slow-moving and smaller species.

Corridor 4 – Corridor 4 (Figure 16) is located just west of the Keetac Project Site. It is a narrower corridor at about 800 feet in width. It contains no High Quality corridor habitat, as nearly the entire width of the corridor is blocked by a stockpile – which will not pose a problem for some wildlife, but will be unpassable for others. Because this corridor is comprised mostly of Moderate Impact mining features, it is not exceptionally suitable for "Corridor dwellers". However, the corridor also contains a river that provides valuable habitat to some semi-aquatic species. It is not likely that direct impacts to this river would be permitted; therefore, the regulatory set-backs protecting this river may provide habitat and safe passage for species not requiring wide corridors. Keetac plans to expand their open pit mine to the south of the existing mine. This will cut into the southernmost extent of the corridor only slightly – about 600 feet at the point where the corridor rejoins natural habitat. This area of future mining does not appear to be critical to maintaining current corridor function.

Corridor 5 – Corridor 5 (Figure 16) is a very narrow (350 feet) corridor of low ecological value. It exists by virtue of a small road and grassy right-of-way and is surrounded on both sides by the Hibbtac pit. In addition, an actively-used haul road intersects this corridor. However, it was included as a corridor because species that are "corridor users" and tolerant or adapted to open habitats may use this crossing. This corridor is expected to be lost as a result of the expansion of the Hibbtac pit. It is reasonably foreseeable that expansion of the Hibbtac pit will necessitate a change in the design or alignment of the road that would reduce or eliminate wildlife utilization of the corridor. If this corridor is impacted, the preservation of Corridor 4 will be more critical.

Corridor 6 – Corridor 6 (Figure 16) is a 2,400 foot wide Moderate Quality corridor nestled in between the City of Chisholm and the eastern extent of Hibbtac's open pit mine. It is intersected by US 169

and other, smaller roads. The northern end of the corridor is divided by partially revegetated stockpiles. The corridor is large enough to be suitable for species that are corridor dwellers, provided they can navigate the large stockpiles to the north. In the future condition, this corridor will be lost to the eastward expansion of Hibbtac's open pit mine. With the loss of this corridor, the marginal corridors to the east and west will increase in importance to wildlife.

Corridor 7 – Corridor 7 (Figure 16) is a 600 foot wide strip (at its narrowest point) nearly entirely consisting of moderately impacted habitat such as settling basins, stockpiles, and numerous medium-sized roads. This corridor likely has low wildlife due to its narrow, non-linear shape and its close proximity to urban development as well as to the level of disturbance within the corridor. No projects are proposed that will further impact this corridor, though it is reasonable to expect the City of Buhl to expand slightly eastward.

Corridor 8 – Corridor 8 (Figure 16) is a 560 foot wide strip (at its narrowest point) nestled in between two medium-sized open pit mines. Though narrow, this corridor contains High Quality corridor habitat because it consists mainly of natural habitat not interfered by mining or other development, except for US 169, several other smaller roads and a railroad (as is such with nearly all corridors in this study). The corridor is bottlenecked in between the two pits for a relatively short distance before High Quality corridor widens to one mile across, with Moderate Quality extending significantly beyond that. No new impacts are proposed that would affect this corridor. With the loss of Corridors 5 and 6, these small corridors will be separated from Corridor 4 by an average of 18 miles, which would be a significant impediment for individuals of numerous species that have small home ranges and/or limited dispersal ability, which may lead to a regional effect on populations of some species.

Corridor 9 – Corridor 9 (Figure 16) consists of one area that is interrupted by numerous small open pits, creating several mini-corridors ranging from 450 to 1,800 feet in width. These corridors are of Moderate Quality due to the predominance of Moderate Impact mining features and land uses within the corridors, plus their complex shapes caused by the pits, which may confuse wildlife, increasing the risk of mortality. In the future condition, the easternmost end of corridor will be lost due to the expansion of Minntac's open pit mining eastward of their existing pit. The westernmost corridor will not be affected by the action, and the next corridor eastward will be diminished in width. The other mini-corridors will become dead-ends into open pit mines

Corridor 10 – Corridor 10 (Figure 17) is a long 17-mile corridor containing High Quality corridor habitat. It is 2,700 feet wide at its narrowest point, and 3.3 miles at its widest (including Moderate Quality corridor habitat) where the corridor joins with contiguous habitat. This corridor is located within a large, natural S-shaped curve in the Iron Formation. It is surrounded to the east and west by several small towns and intersected by associated roads. The length of this corridor may be dangerous for some species of wildlife, because of the increased exposure to human presence on both sides of the corridor. No new impacts are proposed in this corridor, though the surrounding townships will likely expand and diminish the size of this corridor.

Corridor 11 – Corridor 11 (Figure 17) is a Moderate Quality corridor that is located in between the towns of Gilbert and Biwabik, and surrounds the very small town of McKinley and several small open mine pits, creating several mini-corridors. Corridor widths range from 850 to 2,500 feet. The corridor is nearly completely intersected by Moderate Impact mining and several roads. Some species may use this corridor, but at some level of risk. This Low Value corridor is scheduled to be partially lost through the future mining plans it Mittal Ispat Inland. Two new open pits are proposed that would eliminate the eastern-most mini-corridor. Except for the construction or widening of a haul road, no other projected mining plans are anticipated to affect this corridor.

Corridor 12 – Corridor 12 (Figure 17) is 1,800 feet wide at its narrowest point, where it is separated by a small open pit, and is located adjacent to the town of Biwabik. It contains High Quality corridor habitat because of the limited High Impact mining activity in the area. It is intersected by several roads associated with the town. The corridor is bounded on the east by a series of lakes and other water bodies, impassable by many non-swimming species. As a result, this corridor is longer in the summer months, forcing wildlife to travel a length of approximately 10 miles before encountering unencumbered habitat. No future mining impacts are known for this corridor, though it is likely that within 30 years, Biwabik will expand eastward, impacting the corridor.

Corridor 13 – Corridor 13 (Figure 17) is a 4,500 foot wide corridor, at its narrowest, running parallel to Corridor 12. It lies in close proximity to the City of Aurora and the Mesabi Nugget mine site, and is intersected by a few roads. It has a core area of High Quality corridor habitat, which is surrounded by Moderate Quality habitat with Moderate Impact mining features. It is bounded on the west by the same chain of long lakes as Corridor 12, and which similarly limit wildlife movement options. No future mining impacts are proposed for this corridor. There is a possibility of Aurora expanding westward into this corridor.

Corridor 14 – Corridor 14 (Figure 18) is a Moderate Quality, non-linear corridor located east of the Mesabi Nugget mine site. It is 3,800 feet across in its narrowest point. North of the corridor is impeded by a series of stockpiles. In the future condition, Mesabi Nugget proposes to create additional haul roads and other mine features through this corridor which would further limit, but not destroy, its value for wildlife.

Corridor 15 – Corridor 15 (Figure 18) is in close proximity to Corridor 14, separated by a large open mine pit. The same series of stockpiles impede this corridor. Haul roads and a smaller paved road runs through the length of the corridor. This corridor is 1,300 feet wide at its narrowest, at the point between two open pit mines. Future plans call for the minor expansion of the westerly open mine pit by Mesabi Nugget. While not directly impacting the entire corridor, its width will be reduced to about 900 feet.

Corridor 16 – Corridor 16 (Figure 18) is a wide (4,500 feet) and short (1.5 miles) corridor of Moderate Quality due to significant Moderate Impact mining features and the north and south points of the corridor. The northern mining feature is a very large tailings basin owned by Polymet. In the future, this area will continue to be used by Polymet for disposal of tailings. Aside from continued use of the permitted tailings basin, no impacts will be introduced to this corridor.

Corridor 17 – Corridor 17 (Figure 18) is a 1,200 feet wide strip in between two open pits owned by Northshore mining. It contains High Quality corridor habitat where it is not significantly impeded by mining features. A couple roads and haul roads cross this corridor. Its short length increases its value for wildlife. In the reasonably foreseeable future, this corridor will be lost to the expansion of Northshore's mine pits to join into one large pit.

Corridor 18 – Corridor 18 (Figure 18) is a 2,800 feet wide corridor occurring near the eastern edge of the Iron Formation. Several smaller roads repeatedly cross this corridor. The corridor follows the path of a river. The presence of several large natural water bodies, along with open mine pits likely direct wildlife movement through this corridor. Plans for this corridor include the expansion of the westerly pit, owned by North Shore Mining. This will reduce the corridor width to approximately 1,100 feet. However, future plans also include the creation of a new highway known as the "Hoyt Lakes to Babbitt Connection Highway" The creation of this highway and right-of-way would significantly lower the value of the remaining corridor.

In summary, of the 18 currently existing corridors, four will likely become completely impassable within the next 30 years as a result of planned mining activities. An additional five corridors will retain some functionality, but will be significantly degraded by future mining plans. Of these, Keetac will not be contributing to the cumulative effects of corridor impacts and losses. Corridor cumulative effects may be greater than estimated here due to other future land uses not covered in this report.

Figure 19 shows the reasonably foreseeable future of remaining wildlife corridors. A total of 14 corridors will be left in the reasonably foreseeable future. As more corridors are lost, wildlife are forced to use increasingly marginal-quality corridors, which may also be partially impacted by future projects. As wildlife are increasingly exposed to mining activity, roads, and urban centers due to the degradation of available corridors, the incidence of wildlife mortality within the corridors is likely to increase. Impacts to corridors in the middle of the Iron Range particularly limit wildlife options, since many species will not be able to migrate around the Iron Range at either end. Wide-ranging mammals such as wolves and lynx are not likely to be affected by these cumulative effects. Birds in many cases will fly over open pits (though many species are naturally averse to flying across large, open areas). The smaller species will be the most heavily impacted by the cumulative effects of corridor impacts and losses. Corridor dwellers and habitat specialists will be sensitive to habitat degradation in corridors scheduled for impacts. Individuals may be unable to migrate to the nearest remaining corridor. Genetic exchange may still occur, albeit more slowly, in species with a contiguous distribution on both sides and around the Iron Range; otherwise, populations north of the Iron Range may become genetically isolated from populations south of the Iron Range. In addition, these cumulative effects to corridors leave fewer options for escape during a catastrophic event, and hinder wildlife geographical shifts that may be necessitated by climate change. Again, however, Keetac is not proposing future mining actions that would impact any existing corridors. Therefore, they will not be contributing to the cumulative effects of corridor impacts and losses.

4.4 Target Wildlife

The analyses of past and current cover types and the changes in those types were used to evaluate the cumulative impact of present and future mining activities on both sensitive wildlife species and other more common species. Tables 2, 3 and 4 in Section 3.6 list target species, their land cover preferences and their relative adaptability to a variety of habitat types. Table 11, Change in Preferred Habitat Types for SGCN Species, lists the SGCN target species and summarizes the change in preferred habitat types between predevelopment and current conditions. The implications of shifts in

habitat availability between presettlement and current times vary between habitat specialists, habitat generalists, rare species and common species. These implications are discussed in detail below.

4.4.1 Umbrella Species

4.4.1.1 Black bear (*Ursus americanus*)

Habitat for black bears is abundant in the study area. Bears can tolerate some anthropogenic disturbance and are regularly sited on or near mine sites. Wildlife corridors are most important to black bears in late summer and early fall. Nevertheless, due to the abundance of suitable foraging and denning habitat on either side of the Iron Range, traversing the Iron Range through one or more of the available wildlife corridors is likely not critical for the acquisition of resources. Dispersal may be necessary for genetic exchange and long-term survival of black bears in the area. Cumulative impacts from ongoing and proposed industrial projects in the study area are not anticipated to appreciably change the type or abundance of bear habitats and resources, and therefore, are not anticipated to appreciably affect bear populations.

4.4.1.2 Moose (*Alces alces*)

Habitat for moose is common in the study area. Moose can tolerate some anthropogenic disturbance and are regularly sited on or near mine sites. Moose utilization of wildlife corridors would occur during two types of movement – migration and dispersal. Migration occurs seasonally, with individual moose moving between summer and winter ranges. In northern Minnesota, migration distances of 8-21 miles have been observed in moose (Phillips et al 1973). While migration is a repeated pattern of movements between seasonal ranges, dispersal involves individual moose leaving a previously used area to settle another. Dispersal distances vary greatly, and some moose may not disperse at all (Feldhamer et al. 2003). The available wildlife corridors crossing the Iron Range may limit migratory or dispersal routes for moose. However, this limitation is not likely to decrease individual moose reproductive potential, increase mortality or constrain acquisition of resources. This is because of the abundance of suitable habitat for moose on either side of the Iron Range, particularly to the northwest. Dispersal may be necessary for genetic exchange and long-term survival of moose in the area. Cumulative impacts from ongoing and proposed industrial projects in the study area are not anticipated to appreciably change the type or abundance of moose habitats and resources, and therefore, are not anticipated to appreciably affect moose populations.

4.4.1.3 White-tailed deer (*Odocoileus virginianus*)

Habitat for deer is abundant in the study area. Deer can tolerate some anthropogenic disturbance and are regularly sited on or near mine sites. Land use changes resulting in forest fragmentation and creation of thickets and open space likely benefit deer populations. Deer can greatly affect plant communities, especially when population density is high. Herbaceous plant community composition is altered through intense grazing, and trees may be girdled and killed from winter browsing. Populations may be controlled, in part, by large predators such as wolves. The presence of wolves can therefore, have a trophic cascade effect on vegetation and habitat type and quality.

The wildlife corridors that traverse the Iron Range may limit migration pathways for deer. However, this limitation does not pose a threat to the viability of deer populations in northern Minnesota. The deer population in Minnesota is estimated to be near 1 million individuals (MnDNR 1998b). In 2007, over 250,000 deer were taken by hunters (MnDNR 2008). The abundance of suitable habitat for white-tailed deer on either side of the Iron Range, and tolerance for disturbed landscapes, minimizes any effect of limitations on deer movement across the Range. Cumulative impacts from ongoing and proposed industrial projects in the study area are not anticipated to appreciably change the type or abundance of deer habitats and resources, and therefore, are not anticipated to appreciably affect deer populations.

4.4.2 Habitat Specialist Species

Species discussed below are SGCN species that are considered habitat specialists because they typically utilize three or fewer habitat types. Wood turtle (*Glyptemys insculpta*) and Blanding's turtle (*Emydoidea blandingii*) are state-threatened species, as well as habitat specialists and are discussed individually below with other state-threatened species.

Several species of bird are considered to be habitat specialists and utilize open, herbaceous wetlands and/or shallow aquatic sites. The species include Ruddy Turnstone (*Arenaria interpres*), Dunlin (*Calidris alpina*), White-rumped Sandpiper (*Calidris fuscicollis*), Semipalmated Sandpiper (*Calidris pusilla*), Short-billed Dowitcher (*Limnodromus griseus*), Hudsonian Godwit (*Limosa haemastica*), American Golden-plover (*Pluvialis dominica*), American Avocet (*Recurvirostra americana*), Greater Yellowlegs (*Tringa melanoleuca*), Black Tern (*Chlidonias niger*), Trumpeter Swan (*Cygnus buccinator*), Least Bittern (*Ixobrychus exilis*), Red-necked Grebe (*Podiceps grisegena*), Wilson's Phalarope (*Phalaropus tricolor*), and Forster's Tern (*Sterna forsteri*). An additional group of birds utilize herbaceous wetlands as well as other habitat types such as upland grasslands, shrub wetlands,

and conifer swamps. These species include Le Conte's Sparrow (*Ammodramus leconteii*), Yellow Rail (*Coturnicops noveboracensis*), Marbled Godwit (*Limosa fedoa*), Swamp Sparrow (*Melospiza georgiana*), Virginia Rail (*Rallus limicola*), and Golden-winged Warbler (*Vermivora chrysoptera*). Rusty Blackbird (*Euphagus carolinus*) is reported to utilize shrub swamps. Losses of wetland habitat by individual species are likely overestimated in this study due to inconsistency among datasets (the cumulative effects analysis of wetlands estimates historic losses combined wetland types to be around 5 percent; Barr 2008). Although there have been a net loss of wetland habitats in the study area since the time of settlement, wetland and shallow aquatic habitats remain regionally abundant. Additional wetland loss will require in-kind compensatory mitigation, after efforts to avoid or minimize wetland impacts, so dramatic future reductions in habitat are not anticipated. Therefore, negative cumulative effects from industrial projects in the study area are not expected on any of these wetland bird species.

Several bird species occupy upland forest habitats such as aspen, hardwood and conifer forests. These birds include Northern Goshawk (*Accipiter gentiles*), Red-shouldered Hawk (*Buteo lineatus*), Black-throated Blue Warbler (*Dendroica caerulescens*), Whip-poor-will (*Caprimulgus vociferous*), Wood Thrush (*Hylocichla mustelina*), and Winter Wren (*Troglodytes troglodytes*). An additional group of species are considered specialists in upland and wetland conifer forests. These species include Bay-breasted Warbler (*Dendroica castanea*), Cape May Warbler (*Dendroica tigrina*), Connecticut Warbler (*Oporornis agilis*), Black-backed Woodpecker (*Picoides arcticus*), and Boreal Chickadee (*Poecile hudsonica*). Upland and wetland forests were historically abundant in the study area, and they remain abundant, although the composition has changed. Overall, there has been a decrease in upland and wetland conifer forests, a decrease in deciduous-conifer forests, and a decrease in older, uneven stands of hardwood, deciduous forests. The abundance of shrub uplands and early successional and even-aged aspen-birch forests has increased. While upland and wetland forests are still abundant, habitat characteristics, and associated resources for wildlife, have likely changed. Compared to historic forests, contemporary forests would have less coarse woody debris and standing snags, fewer masting trees, and fewer conifers. Several bird species may have been negatively affected by historic loss or conversion forests, as suggested by losses greater than 50 percent. Estimates are difficult to make, and the loss of conifer swamp and bog may be overestimated. However, many of these species are found in mixed pine/hardwood or pine forests, which undoubtedly have declined in abundance and distribution from repeated cycles of intensive logging. The species with high losses of habitat include Whip-poor-will, Winter Wren, Bay-breasted

Warbler, Cape May Warbler, Connecticut Warbler, Black-backed Woodpecker, and Boreal Chickadee. Cumulative impacts from ongoing and proposed industrial projects in the study area are not anticipated to appreciably change the type or abundance of forest habitats and resources, and therefore, are not anticipated to further appreciably affect forest bird species.

Some bird species utilize developed areas or grasslands as all or a portion of their habitat. These species include Eastern Meadowlark (*Sturnella magna*), Common Nighthawk (*Chordeiles minor*), Brown Thrasher (*Toxostoma rufum*), and Buff-breasted Sandpiper (*Tryngites subruficollis*). The Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) is found in grasslands and along riparian corridors. The Common Loon (*Gavia immer*) forages in deep lakes and nests on the edges of lakes. The habitats of these species has either expanded since the time of settlement or remained stable. Large changes in habitat are not expected as a result of industrial projects. Therefore, no negative cumulative effects are anticipated from loss or alteration of habitat from industrial projects.

The Smooth Green Snake (*Liochlorophis vernalis*) can be found in upland woodland, shrub, and grassy habitats. These habitats remain abundant in the study area. This species primarily eats insects and negative impacts may result in agricultural areas where insecticides are widely used. However, because the study area has limited agriculture and abundant upland habitats, negative cumulative effects on the smooth green snake are not anticipated. It is considered a corridor dweller, but because it lives in relatively open, or only partially closed areas, mine sites may provide habitat and dispersal corridors.

The Eastern Red-backed Salamander (*Plethodon cinereus*) is found in upland forests, where it relies on moist microsites. Leaf litter, rocks and coarse woody debris provide cover. Upland forests are extensive in the study area, although land management may have altered the quality of habitat. Intensive logging may reduce the moisture or duration of moisture in microsites as well as the amount of coarse woody debris. This species is considered to be a corridor dweller and is not expected to undertake long distance dispersal across hostile environments. Because it lacks lungs, it is dependent on moist skin for respiration, and would not be found in dry sites. Although mine sites may include upland forests, the amount of habitat and dispersal corridors for eastern red-backed salamanders is probably extremely limited. Cumulative effects from proposed mining or industrial projects are not expected to negatively affect the species beyond what has already occurred in the study area.

Two SGCN mammal species are also considered to be habitat specialists: Smoky Shrew (*Sorex fumeus*) and Northern Bog Lemming (*Synaptomys borealis*). The smoky shrew is found in upland and wetland conifer forests, and the northern bog lemming is found in wetland shrub swamps and conifer forests. As described above for forest birds, the amount and quality of forest habitats have changed, possibly affecting these species. Habitat loss for the smoky shrew since the time of settlement is estimated to be greater than 50 percent. This is also true for the Heather vole (*Phenacomys intermedius*) which is not considered a habitat specialist as defined for this study. Both species utilize mixed pine/deciduous and pine forests, which have been greatly reduced. Cumulative impacts from ongoing and proposed industrial projects in the study area are not anticipated to appreciably change the type or abundance of forest habitats and resources, currently available and therefore, are not anticipated to further affect forest mammal species. The mammal species discussed here are considered to be corridor dwellers with limited capability of long-distance dispersal. Mine activities may have reduced dispersal opportunities, but additional reduction is not anticipated from proposed projects.

4.5 Threatened and Endangered Species

4.5.1 Federally Listed Species

4.5.1.1 Gray Wolf

The MnDNR has conducted periodic gray wolf surveys since 1988. These surveys are opportunistic in nature; that is, wolf sightings, or evidence of wolf presence (tracks, scat), were noted by field biologists during the course of their other, daily field activities (Figure 12). The state, and specifically, the Iron Range, has not been systematically surveyed for the presence of wolves. Therefore, the absence of wolf data in an area does not indicate an absence of wolves (Erb 2008). However, the MnDNR wolf survey data is most thorough available. Data are available for surveys conducted in 1988-1989, 1997-1998, 2003-2004, and 2007-2008 (Figure 12).

Wolves are known to regularly occur on the mine site. The forest and brush habitats at the Keetac project site are typical of wolf habitat. Wolf tracks were observed on the mine site in 2000; and calling surveys located wolves south of the mine site in 2004. Because of the territory size, these reports likely represent a single pack.

Mining activities are likely to reduce wolf habitat use around the mine area due to the loss of habitat. However, wolves have been seen near and around the Keetac facility, as well as other mine sites,

which is evidence that they tolerate some activity associated with mining. Furthermore, wolves may use mine sites and mine roads as dispersal corridors.

Vehicle traffic associated with mining activities would involve both train and truck traffic. Trains would run between the pellet loading and the main rail line. Haul trucks run on haul roads within the mine pits from active mining and shipping areas to either stockpiles or the primary crusher which is also located in the mine pit. Actively used haul roads within the mine area itself, are unlikely to be used by wolves because of the high level of noise, traffic, and disturbance.

The overall footprint of the mine site and rock stockpiles would remove approximately 1.5 square miles of habitat, or 0.7 to 7.5% of the wolf pack habitat. This reduction in habitat use is not expected to significantly affect the wolf population in the region.

The cumulative effects of industrial projects are not expected to negatively impact the regional wolf population, wolf food resources and dispersal corridors.

4.5.1.2 Canada Lynx

Over three-quarters of lynx records in Minnesota are from the northeastern portion of the State (McKelvey et al. 2000a). Of the 408 sightings reported to the Minnesota Natural Heritage and Nongame Research Program since 2000, 78% were in St. Louis, Lake, and Cook Counties (Figure 13). Approximately 100 lynx have been sighted in St. Louis County since 2000 (MnDNR 2006) and 14 (14%) of these lynx showed evidence of reproductive activity

The proposed project lies outside of the current boundaries of designated lynx critical habitat. Designated critical habitat encompasses much the Arrowhead region, but excludes much of the Iron Range due to historic loss of lynx habitat.

On May 1 and 2, 2008, ENSR International performed a two-day tracking survey and DNA scat analysis which covered a 250-square-mile study area centered on the Keetac Project (ENSR 2008). No sign of lynx was found in the study area, though snowshoe hare, the lynx' main prey species, was observed throughout. In 2007 a similar survey was conducted by ENSR for the Minnesota Steel EIS. The Minnesota Steel project is near the Keetac site and much of that study is directly relevant to Keetac. No lynx or sign of lynx were observed at that time either. Although preferred cover types for the snowshoe hare exist on the Minnesota Steel site (e.g., jack pine, fir-aspen-birch, aspen-birch), the forests there were believed to be too old or too young for high hare densities (Moen et al. 2005). The

"2007 Canada Lynx Assessment: Final Report", prepared for Minnesota Steel Industries (MSI) by ENSR Corporation, April 2007 summarizes recent data on the presence and distribution of lynx in the immediate vicinity of the project. The report found that

> "The proposed project may affect lynx found in the vicinity of the project site, but the project would not adversely affect lynx populations or their critical habitat. Lynx likely do not reside in the Study Area. However, lynx could travel through the area and it is reasonably foreseeable that mine project activities could impact movements through the area."

In August 2007, the USFWS and the Army Corps of Engineers both concluded in their Biological Opinion letters the proposed Minnesota Steel project, located just east of Keetac near Nashwauk, "may affect, but is not likely to adversely affect" Canada lynx. Both agencies concurred that this region in Minnesota is generally south of core Canada lynx range, though individuals may periodically travel through the area.

A field survey is currently being conducted in areas not previously surveyed in the Minnesota Steel EIS survey. The additional survey work, combined with the Minnesota Steel data (which covered most of a 6-mile radius around the Minnesota Steel project), will be available as part of the Keetac Expansion EIS. As of January 23, 2009 no potential signs or scat have been found during the additional field survey work being conducted for the Keetac EIS. According to the USFWS, lynx territories occurring more than 6 miles from the project site are not likely to be adversely effected by the project.

The Keetac site lies near or within the southernmost extent of lynx habitat, because of the natural transition to other forest communities sub-optimal for its main prey, the snowshoe hare. Lynx occurrences are most likely transient and incidental. The study area, including the Keetac site, likely functions only as a buffer zone to actual lynx habitat. Individuals may pass or enter into the Iron Range during natal dispersal, in search of mates, or seeking to expand territory.

Though highly unlikely, the project may effect an individual lynx, whether directly (e.g. road kill) or indirectly (e.g. further loss of habitat), but neither the Keetac Project Site, nor the western half of the Iron Range Study Area as a whole, appear to be within core lynx habitat. Most of the impacts within the Keetac site involve wetlands or previously-impacted lands, which are generally unsuitable for

lynx. A long history of mining in the project area, as well as the Iron Range Study Area as a whole, long ago altered or destroyed potential lynx habitat. It is not believed that either the Keetac Project or other proposed industrial projects, will have negative cumulative effects on Canada lynx.

4.5.1.3 Bald Eagle

NHIS data indicate 139 eagle nests occurring within the 15-mile of current mining features. Ninety-seven (~70%) of these were active in 2005 (Figure 14). The remaining 42 nests were found to be inactive, undetermined, or not surveyed in 2005. This is the date of the latest comprehensive survey for bald eagles performed by MnDNR, with the next state-wide survey scheduled for 2010 (MnDNR 2005). According to surveyors' notes, many of these nests have been present for up to 15 years and have fluctuated between active and inactive throughout the years. According to these data, bald eagles have tended to congregate towards either end of the Iron Range, with a sparse population in the middle. Eagle populations tend to be controlled by the presence of suitable foraging habitat (Guinn 2004). Both ends of the Iron Range have a significant number of large lakes, while the middle of the Iron Range generally has fewer natural water bodies large enough to support a bald eagle population, substantially fewer than the average bald eagle nesting territory size in Minnesota (10 mile radius, averaging 20 miles apart). This suggests the area may be saturated with bald eagles.

The nearest bald eagle nest to the Project Site, listed in MnDNR's Natural Heritage Information System (NHIS) records, is 2 miles to the west of the southern edge of the tailings basin (Figure 14). In addition, the Keetac Project Site contains an active breeding pair of bald eagles. This pair has not been previously detected by NHIS surveyors. Their nest occurs near the eastern edge of the tailings basin. This is the second nest that the pair has constructed in the near vicinity. Their first nest was constructed years prior within a large snag. In August of 2007, the snag fell, destroying the nest. The breeding pair returned to the area and subsequently built a new nest in another tree 200 feet to the southwest, further into the active tailings basin. It does not appear that activities at the tailings basin disrupt use of the nest. The fact that the nesting pair of bald eagles returned to the same tailings basin to build a new nest after losing their first one, strongly indicates that the pair is habituated to human activity and is not being harmed or harassed by current mining activities. Although an additional volume of tailings will be pumped to the tailings basin as a result of the Expansion, no real change in activity at the tailings basin will be evident as a result of the Expansion. Because future activities in the tailings basin (potential installation of a perimeter berm) will not occur near the new nest site, it is not believed that future mining activities in the vicinity of the nest will adversely affect

the pair. It is unlikely that a second pair will occupy the Keetac Project Site, due to the presence of the resident pair, the general lack of suitable nesting trees, and the sub-optimal foraging opportunities in the area.

Bald eagles may never have been common in the Iron Range, particularly near the Keetac Project Site due to lack of sizeable bodies of water to support their prey base (Guinn 2004). Mine pits that have been reclaimed as open water habitat, including the stocking of fish, may have created bald eagle habitat in the central-portions of the Iron Range. It is possible that due to mining, bald eagle density in the central Iron Range may now actually be higher than would have occurred prior to human settlement. Therefore, it is not believed that future mining within the Iron Range Study Area will have a negative cumulative effect on bald eagles.

4.5.2 State Listed Species

4.5.2.1 Eastern Spotted Skunk (*Spilogale putorius*)

The NHIS database reports only one occurrence of this species, reported by a trapper, in the Laurentian Mixed Forest Province. The skunk is not known from the immediate vicinity of the Keetac site, nor within the 5-mile buffer study area. An analysis of potential habitats utilized by the eastern spotted skunk suggest that habitat acreage has increased in the study area since presettlement conditions due to land development and increases in grassland, shrubland and upland deciduous forests. This species is considered to be a corridor dweller rather than a corridor user. Due to its ability to live in fragmented habitats among farm sites, it would likely be able to utilize both moderate and high quality dispersal corridors. Edge effects within corridors are unlikely to have negative impacts. Because this species tolerates human disturbance and activities, and is apparently rare in the region, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects.

4.5.2.2 Laurentian Tiger Beetle (*Cicindela denikei*)

The species has not been reported from the study area, but dozens of sites have been documented in the Laurentian Mixed Forest Province. Despite the lack of documentation in the study area, it is plausible that anthropogenic disturbance in the Iron Range creates appropriate habitat that is relatively open with sandy, gravelly, or rocky substrates. Overall, it is estimated that habitat for this species has increased since presettlement conditions, and open habitat with appropriate substrate has increased dramatically. If the species is present along roads in mine areas, some mortality from vehicles can be expected. However, much of the area that has been disturbed for mining is not part of

active mining operations. Available habitat that is not impacted by heavy vehicle traffic is abundant. This species is considered to be a corridor dweller rather than a corridor user. Due to its ability to live in disturbed areas and along roadsides, it may benefit more from moderate dispersal corridors compared to high quality corridors. Edge effects within corridors are unlikely to have negative impacts and may actually be beneficial. Because of the availability of habitat, and lack of reports of this species in the study area, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects.

4.5.2.3 Peregrine Falcon (*Falco peregrinus*)

Peregrine falcons have been reported nesting on cliff sites along mine pits in the Iron Range. The NHIS database reports nest sites in the study area approximately 3 miles, 24 miles, and 26 miles away from the Keetac site. Numerous additional cliff sites along active or abandoned mine pits could provide nest locations. Since presettlement conditions, open areas have increased in the study area, to the loss of forested areas. These open areas may provide foraging opportunities for the peregrine falcon since the species does not forage in forests. Because of the availability of habitat, and the few reports of this species in the study area, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects.

4.5.2.4 Trumpeter Swan (*Cygnus buccinator*)

One trumpeter swan nest has been reported in the study area near a forested wetland, approximately 20 miles from the Keetac project site. Herbaceous and open water wetlands are abundant in the study area, likely providing unoccupied sites that could be utilized for foraging and nesting. Because of the availability of habitat, and the few reports of this species in the study area, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects.

4.5.2.5 Wilson's Phalarope (*Phalaropus tricolor*)

Fourteen reports of the species have been reported in the Laurentian Mixed Forest Province, including documentation of nesting and foraging during the breeding season. Although there are no reports from the study area, herbaceous wetlands such as shallow marshes and wet meadows are abundant in the study area and often occur within wetland complexes that provide both foraging and nesting sites. The species can tolerate some human disturbance, so suitable habitats on mine sites could be occupied. Because of the availability of habitat, and the few reports of this species in the study area, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects.

4.5.2.6 Wood Turtle (*Glyptemys insculpta*)

Wood turtles have been documented in the study area near the Partridge and St. Louis Rivers. Appropriate habitat is abundant in the study area in riparian and wetland ecosystems. Because of the availability of habitat, and absence of direct impacts to habitat, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects. Although this species is considered a corridor dweller, dispersal opportunities are likely abundant along riparian corridors. Long overland dispersal routes are not anticipated to be utilized by the wood turtle, so it is questionable how much historic north-south dispersal occurred across the Iron Range. Current dispersal routes likely coincide with stream and riparian corridors. When turtles travel in uplands for dispersal or nesting, vehicle mortality at road crossings could be high.

4.5.2.7 Blanding's Turtle (*Emydoidea blandingii*)

Blandings turtles are found in and around shallow lakes, calm water near rivers and streams, and wetland complexes. Appropriate habitat is abundant in the study area in riparian and wetland ecosystems. Because of the abundance of habitat in the study area, no cumulative effects to the survival and persistence of the species are anticipated as a result of industrial projects. Although this species is considered a corridor dweller, dispersal opportunities are likely abundant along riparian corridors. Long overland dispersal routes are not anticipated to be utilized by Blanding's turtle, so it is questionable how much historic north-south dispersal occurred across the Iron Range. Current dispersal routes likely coincide with stream and riparian corridors. When turtles travel in uplands for dispersal or nesting, vehicle mortality at road crossings could be high.

5.0 Summary

An analysis was conducted of past and present vegetative cover types and their wildlife habitat value along the Iron Range. This analysis was used to determine the contribution of the Keetac Expansion Project to the cumulative effects of past, present and reasonably foreseeable future mining and other large industrial projects on wildlife habitat and on sensitive wildlife species.

There have been notable losses since presettlement of upland forest, especially pine forests, as well as loss of lowland conifer and deciduous forest. Approximately 16% of the Study Area for the analysis is now in some type of developed cover. Analysis of the cumulative impacts of future projects indicates that over three-quarters of those impacts will occur in areas that are developed or in aspen/birch and upland shrub cover. Future habitat losses attributable to mining projects will largely avoid upland and lowland forested habitats.

The Keetac Expansion Project does not contribute to negative cumulative effects on wildlife corridors in the Iron Range. Though several of the remaining wildlife corridors may be become impassable due to projected mining and industrial projects in the reasonably foreseeable future, none of the losses will occur as a result of the Keetac Expansion Project.

The Keetac Expansion Project does not contribute to negative cumulative effects on wildlife habitat in the Iron Range. Wildlife habitat on the Iron Range may be lost to future mining and other industrial projects. However, impacts to wildlife habitat resulting from the Keetac Expansion Project will occur in habitat types that are still well-represented in the Iron Range.

The Keetac Expansion Project does not contribute to negative cumulative effects on the survival or persistence of state or federal threatened or endangered species on the Iron Range. The Project does not contribute to a negative cumulative effect on the survival or persistence of Species of Greatest Conservation Need or umbrella species that may occur on the Iron Range. Analysis of current and projected habitat availability indicates that the Keetac Expansion Project does not contribute to cumulative effects on habitat or mobility for the federally-protected gray wolf, Canada lynx or bald eagle.

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Tables

Table 1. Summary Crosswalk: Presettlement to Current Vegetation Cover Crosswalk with CWCS Level 2 Types for Wildlife Utilization

CWCS Level 2 Vegetation		Predevelopment Landcover[1]		Current Conditions Landcover[2]
Forest - Upland Deciduous (Aspen)	=	Aspen-Birch (trending to Conifers)	=	Aspen/White Birch
Forest - Upland Deciduous (Hardwood)	=	Big Woods - Hardwoods (oak, maple, basswood, hickory)	=	Upland Deciduous Forest
Forest - Upland Deciduous (Hardwood) and Upland Forest Conifer	=	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	=	Upland Conifer-Deciduous mix
Forest - Upland Conifer	=	White Pine & Mixed White Pine and Red Pine	=	Upland Conifer Forest, Pine
Shrub/Woodland - Upland	=	Jack Pine Barrens and Openings	=	Upland Shrub
Lake - Deep; Lake - Shallow; River - Headwater to Large; River - Very Large	=	Circ 39 Type 5, Circ39 = 90, Lakes	=	Aquatic
Wetland - Nonforest	=	Circ39 Types 1-4 & Wet Prairie	=	Marsh
Forest - Lowland Deciduous	=	Circ 39 Type 7 & River Bottom Forest	=	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest
Forest - Lowland Conifer	=	Circ39 Type 8 & Conifer Bogs and Swamps	=	Lowland Conifer Forest
Shrub - Lowland	=	Circ39 Type 6	=	Lowland Shrub
Developed	=	No Similar Presettlement Cover Class	=	20' buffer of MnDOT Railroads - Moderate Impact
Developed	=	No Similar Presettlement Cover Class	=	2007 DNR Mine Feature Shapefile - High Impact
Developed	=	No Similar Presettlement Cover Class	=	2007 DNR Mine Feature Shapefile - Moderate Impact
Cropland	=	No Similar Presettlement Cover Class	=	Cropland
Developed	=	No Similar Presettlement Cover Class	=	Developed
Surrogate Grassland	=	No Similar Presettlement Cover Class	=	Grassland
No Similar CWCS Level 2 Class	=	No Similar Presettlement Cover Class	=	Non-Vegetated
No Similar CWCS Level 2 Class	=	No Similar Presettlement Cover Class	=	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
Developed	=	No Similar Presettlement Cover Class	=	USGS NLCD 2001 - Developed High Intensity
Developed	=	No Similar Presettlement Cover Class	=	USGS NLCD 2001 - Developed Low Intensity
Developed	=	No Similar Presettlement Cover Class	=	USGS NLCD 2001 - Developed Medium Intensity
Developed	=	No Similar Presettlement Cover Class	=	USGS NLCD 2001 - Developed Open Space

[1] Predevelopment Cover Types derived from Marschner/PLS data and NWI (see Methods)

[2] Current Condition Cover Types derived from USGS NLCD 2001 for developed cover and GAP Landcover data for Natural/Non-developed areas (see Methods)

Table 2. List of Target Wildlife Species in Study Area

Class	Scientific Name	Common Name	Corridor User or Dweller
Amphibians	*Hemidactylium scutatum +*	Four-toed Salamander +	Dweller
Amphibians	*Plethodon cinereus*	Eastern Red-backed Salamander	Dweller
Birds	*Accipiter gentilis*	Northern Goshawk	User
Birds	*Aegolius funereus*	Boreal Owl	User
Birds	*Ammodramus leconteii*	Le Conte's Sparrow	User
Birds	*Ammodramus nelsoni +*	Nelson's Sharp-tailed Sparrow +	User
Birds	*Anas rubripes*	American Black Duck	User
Birds	*Arenaria interpres*	Ruddy Turnstone	User
Birds	*Asio flammeus +*	Short-eared Owl +	User
Birds	*Bartramia longicauda*	Upland Sandpiper	User
Birds	*Botaurus lentiginosus*	American Bittern	User
Birds	*Buteo lineatus +*	Red-shouldered Hawk +	User
Birds	*Calidris alpina*	Dunlin	User
Birds	*Calidris fuscicollis*	White-rumped Sandpiper	User
Birds	*Calidris pusilla*	Semipalmated Sandpiper	User
Birds	*Caprimulgus vociferus*	Whip-poor-will	User
Birds	*Catharus fuscescens*	Veery	User
Birds	*Chlidonias niger*	Black Tern	User
Birds	*Chordeiles minor*	Common Nighthawk	User
Birds	*Circus cyaneus*	Northern Harrier	User
Birds	*Cistothorus palustris*	Marsh Wren	User
Birds	*Cistothorus platensis*	Sedge Wren	User
Birds	*Coccyzus erythropthalmus*	Black-billed Cuckoo	User
Birds	*Contopus cooperi*	Olive-sided Flycatcher	User
Birds	*Contopus virens*	Eastern Wood-pewee	User
Birds	*Coturnicops noveboracensis +*	Yellow Rail +	User
Birds	*Cygnus buccinator ++*	Trumpeter Swan ++	User
Birds	*Dendroica caerulescens*	Black-throated Blue Warbler	User
Birds	*Dendroica castanea*	Bay-breasted Warbler	User
Birds	*Dendroica tigrina*	Cape May Warbler	User
Birds	*Dolichonyx oryzivorus*	Bobolink	User
Birds	*Empidonax minimus*	Least Flycatcher	User
Birds	*Euphagus carolinus*	Rusty Blackbird	User
Birds	*Falcipennis canadensis*	Spruce Grouse	User
Birds	*Falco peregrinus ++*	Peregrine Falcon ++	User
Birds	*Gavia immer*	Common Loon	User
Birds	*Haliaeetus leucocephalus +*	Bald Eagle +	User
Birds	*Hylocichla mustelina*	Wood Thrush	User
Birds	*Ixobrychus exilis*	Least Bittern	User
Birds	*Limnodromus griseus*	Short-billed Dowitcher	User
Birds	*Limosa fedoa +*	Marbled Godwit +	User
Birds	*Limosa haemastica*	Hudsonian Godwit	User
Birds	*Melanerpes erythrocephalus*	Red-headed Woodpecker	User
Birds	*Melospiza georgiana*	Swamp Sparrow	User
Birds	*Oporornis agilis*	Connecticut Warbler	User
Birds	*Phalaropus tricolor ++*	Wilson's Phalarope ++	User
Birds	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	User
Birds	*Picoides arcticus*	Black-backed Woodpecker	User
Birds	*Pluvialis dominica*	American Golden-plover	User
Birds	*Podiceps grisegena*	Red-necked Grebe	User
Birds	*Poecile hudsonica*	Boreal Chickadee	User
Birds	*Rallus limicola*	Virginia Rail	User
Birds	*Recurvirostra americana*	American Avocet	User
Birds	*Scolopax minor*	American Woodcock	User
Birds	*Seiurus aurocapillus*	Ovenbird	User
Birds	*Sphyrapicus varius*	Yellow-bellied Sapsucker	User
Birds	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	User
Birds	*Sterna forsteri +*	Forster's Tern +	User

Table 2. List of Target Wildlife Species in Study Area

Class	Scientific Name	Common Name	Corridor User or Dweller
Birds	*Sturnella magna*	Eastern Meadowlark	User
Birds	*Toxostoma rufum*	Brown Thrasher	User
Birds	*Tringa melanoleuca*	Greater Yellowlegs	User
Birds	*Troglodytes troglodytes*	Winter Wren	User
Birds	*Tryngites subruficollis*	Buff-breasted Sandpiper	User
Birds	*Tympanuchus phasianellus*	Sharp-tailed Grouse	User
Birds	*Vermivora chrysoptera*	Golden-winged Warbler	User
Birds	*Wilsonia canadensis*	Canada Warbler	User
Birds	*Zonotrichia albicollis*	White-throated Sparrow	User
Fishes	*Acipenser fulvescens* +	Lake Sturgeon +	N/A
Fishes	*Coregonus nipigon*	Nipigon cisco	N/A
Fishes	*Coregonus zenithicus* +	Shortjaw Cisco +	N/A
Fishes	*Cottus ricei*	Spoonhead sculpin	N/A
Fishes	*Couesius plumbeus*	Lake Chub	N/A
Fishes	*Etheostoma microperca* +	Least Darter +	N/A
Fishes	*Lepomis megalotis*	Longear Sunfish	N/A
Fishes	*Notropis anogenus* +	Pugnose Shiner +	N/A
Insects	*Cicindela denikei* ++	Laurentian Tiger Beetle ++	Dweller
Insects	*Epidemia epixanthe michiganensis*	Bog Copper	Dweller
Insects	*Erebia disa mancinus* +	Disa Alpine +	Dweller
Insects	*Hesperia leonardus leonardus* +	Leonard's Skipper +	Dweller
Insects	*Lycaeides idas nabokovi* +	Nabokov's Blue +	Dweller
Insects	*Oeneis macounii*	Macoun's Arctic	Dweller
Insects	*Phyciodes batesii*	Tawny Crescent	Dweller
Insects	*Polycentropus milaca* +	A Caddisfly +	Dweller
Insects	*Pyrgus centaureae freija* +	Grizzled Skipper +	Dweller
Insects	*Setodes guttatus* +	A Caddisfly +	Dweller
Mammals	*Canis lupus* +	Gray Wolf +	User
Mammals	*Lynx canadensis*	Canada lynx	User
Mammals	*Microtus chrotorrhinus*	Rock Vole	Dweller
Mammals	*Myotis septentrionalis* +	Northern Myotis +	User
Mammals	*Phenacomys intermedius* +	Heather Vole +	Dweller
Mammals	*Sorex fumeus* +	Smoky Shrew +	Dweller
Mammals	*Spermophilus franklinii*	Franklin's Ground Squirrel	Dweller
Mammals	*Spilogale putorius* ++	Eastern Spotted Skunk ++	Dweller
Mammals	*Synaptomys borealis* +	Northern Bog Lemming +	Dweller
Mammals	*Taxidea taxus*	American Badger	User
Reptiles	*Chelydra serpentina*	Common Snapping Turtle	Dweller
Reptiles	*Emydoidea blandingii* ++	Blanding's Turtle ++	Dweller
Reptiles	*Liochlorophis vernalis*	Smooth Green Snake	Dweller
Spiders	*Marpissa grata* +	A Jumping Spider +	Dweller

SGCN "Headwaters to Large River" Species (No NLCD 2001landcover representation)

Fishes	*Ichthyomyzon fossor* +	Northern Brook Lamprey +	N/A
Fishes	*Moxostoma valenciennesi*	Greater Redhorse	N/A
Insects	*Caraclea vertreesi* +	Vertree's Ceraclean Caddisfly +	Dweller
Insects	*Oxyethira ecornuta* +	A Caddisfly +	Dweller
Insects	*Oxyethira itascae* +	A Caddisfly +	Dweller
Molluscs	*Lasmigona compressa* +	Creek Heelsplitter +	N/A
Molluscs	*Ligumia recta* +	Black Sandshell +	N/A
Reptiles	*Clemmys insculpta* ++	Wood Turtle ++	Dweller

+ State-Listed Species of Special Concern

++ State-Listed Threatened Species

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Lake- Deep	Birds	*Gavia immer*	Common Loon
		Haliaeetus leucocephalus	Bald Eagle
	Fishes	*Acipenser fulvescens*	Lake Sturgeon
		Coregonus nipigon	Nipigon cisco
		Coregonus zenithicus	Shortjaw Cisco
		Cottus ricei	Spoonhead sculpin
		Couesius plumbeus	Lake Chub
		Etheostoma microperca	Least Darter
		Lepomis megalotis	Longear Sunfish
		Notropis anogenus	Pugnose Shiner
	Insects	*Polycentropus milaca*	A Caddisfly
		Setodes guttatus	A Caddisfly
	Reptiles	*Chelydra serpentina*	Common Snapping Turtle
Lake- Shallow	Birds	*Anas rubripes*	American Black Duck
		Chlidonias niger	Black Tern
		Cistothorus palustris	Marsh Wren
		Cygnus buccinator	Trumpeter Swan
		Falco peregrinus	Peregrine Falcon
		Ixobrychus exilis	Least Bittern
		Phalaropus tricolor	Wilson's Phalarope
		Podiceps grisegena	Red-necked Grebe
		Rallus limicola	Virginia Rail
		Sterna forsteri	Forster's Tern
	Reptiles	*Chelydra serpentina*	Common Snapping Turtle
		Emydoidea blandingii	Blanding's Turtle
Rivers - Headwaters to Large	Fishes	*Couesius plumbeus*	Lake Chub
		Etheostoma microperca	Least Darter
		Ichthyomyzon fossor	Northern Brook Lamprey
		Lepomis megalotis	Longear Sunfish
		Moxostoma valenciennesi	Greater Redhorse
		Notropis anogenus	Pugnose Shiner
	Insects	*Caraclea vertreesi*	Vertree's Ceraclean Caddisfly
		Oxyethira ecornuta	A Caddisfly
		Oxyethira itascae	A Caddisfly
	Molluscs	*Lasmigona compressa*	Creek Heelsplitter
		Ligumia recta	Black Sandshell
	Reptiles	*Clemmys insculpta*	Wood Turtle
Rivers -Very Large	Fishes	*Acipenser fulvescens*	Lake Sturgeon
	Birds	*Falco peregrinus*	Peregrine Falcon
		Haliaeetus leucocephalus	Bald Eagle
		Stelgidopteryx serripennis	Northern Rough-winged Swallow
	Insects	*Caraclea vertreesi*	Vertree's Ceraclean Caddisfly
	Molluscs	*Ligumia recta*	Black Sandshell
	Reptiles	*Chelydra serpentina*	Common Snapping Turtle
		Emydoidea blandingii	Blanding's Turtle

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Forest- Upland Deciduous (Aspen)	Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
		Plethodon cinereus	Eastern Red-backed Salamander
	Birds	*Accipiter gentilis*	Northern Goshawk
		Aegolius funereus	Boreal Owl
		Anas rubripes	American Black Duck
		Buteo lineatus	Red-shouldered Hawk
		Catharus fuscescens	Veery
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus virens	Eastern Wood-pewee
		Dendroica caerulescens	Black-throated Blue Warbler
		Empidonax minimus	Least Flycatcher
		Haliaeetus leucocephalus	Bald Eagle
		Hylocichla mustelina	Wood Thrush
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Pheucticus ludovicianus	Rose-breasted Grosbeak
		Scolopax minor	American Woodcock
		Seiurus aurocapillus	Ovenbird
		Sphyrapicus varius	Yellow-bellied Sapsucker
		Vermivora chrysoptera	Golden-winged Warbler
		Wilsonia canadensis	Canada Warbler
		Zonotrichia albicollis	White-throated Sparrow
	Insects	*Cicindela denikei*	A Tiger Beetle
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Microtus chrotorrhinus	Rock Vole
		Myotis septentrionalis	Northern Myotis
		Spilogale putorius	Eastern Spotted Skunk

Forest- Upland Deciduous (Hardwood)	Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
		Plethodon cinereus	Eastern Red-backed Salamander
	Birds	*Accipiter gentilis*	Northern Goshawk
		Anas rubripes	American Black Duck
		Buteo lineatus	Red-shouldered Hawk
		Caprimulgus vociferus	Whip-poor-will
		Catharus fuscescens	Veery
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus virens	Eastern Wood-pewee
		Dendroica caerulescens	Black-throated Blue Warbler
		Empidonax minimus	Least Flycatcher
		Haliaeetus leucocephalus	Bald Eagle
		Hylocichla mustelina	Wood Thrush
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Pheucticus ludovicianus	Rose-breasted Grosbeak
		Seiurus aurocapillus	Ovenbird
		Sphyrapicus varius	Yellow-bellied Sapsucker
		Wilsonia canadensis	Canada Warbler
		Zonotrichia albicollis	White-throated Sparrow
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Myotis septentrionalis	Northern Myotis
		Spilogale putorius	Eastern Spotted Skunk
		Taxidea taxus	American Badger

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Forest - Upland Conifer	Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
		Plethodon cinereus	Eastern Red-backed Salamander
	Birds	*Accipiter gentilis*	Northern Goshawk
		Aegolius funereus	Boreal Owl
		Anas rubripes	American Black Duck
		Caprimulgus vociferus	Whip-poor-will
		Catharus fuscescens	Veery
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus cooperi	Olive-sided Flycatcher
		Contopus virens	Eastern Wood-pewee
		Dendroica caerulescens	Black-throated Blue Warbler
		Dendroica castanea	Bay-breasted Warbler
		Dendroica tigrina	Cape May Warbler
		Empidonax minimus	Least Flycatcher
		Falcipennis canadensis	Spruce Grouse
		Haliaeetus leucocephalus	Bald Eagle
		Hylocichla mustelina	Wood Thrush
		Oporornis agilis	Connecticut Warbler
		Pheucticus ludovicianus	Rose-breasted Grosbeak
		Picoides arcticus	Black-backed Woodpecker
		Poecile hudsonica	Boreal Chickadee
		Seiurus aurocapillus	Ovenbird
		Sphyrapicus varius	Yellow-bellied Sapsucker
		Troglodytes troglodytes	Winter Wren
		Wilsonia canadensis	Canada Warbler
		Zonotrichia albicollis	White-throated Sparrow
	Insects	*Cicindela denikei*	A Tiger Beetle
		Lycaeides idas nabokovi	Nabokov's Blue
		Oeneis macounii	Macoun's Arctic
		Phyciodes batesii	Tawny Crescent
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Microtus chrotorrhinus	Rock Vole
		Myotis septentrionalis	Northern Myotis
		Phenacomys intermedius	Heather Vole
		Sorex fumeus	Smoky Shrew
		Taxidea taxus	American Badger

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Forest- Lowland Conifer	Birds	*Aegolius funereus*	Boreal Owl
		Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow
		Anas rubripes	American Black Duck
		Asio flammeus	Short-eared Owl
		Botaurus lentiginosus	American Bittern
		Catharus fuscescens	Veery
		Circus cyaneus	Northern Harrier
		Cistothorus palustris	Marsh Wren
		Cistothorus platensis	Sedge Wren
		Contopus cooperi	Olive-sided Flycatcher
		Coturnicops noveboracensis	Yellow Rail
		Dendroica castanea	Bay-breasted Warbler
		Dendroica tigrina	Cape May Warbler
		Falcipennis canadensis	Spruce Grouse
		Falco peregrinus	Peregrine Falcon
		Melospiza georgiana	Swamp Sparrow
		Oporornis agilis	Connecticut Warbler
		Picoides arcticus	Black-backed Woodpecker
		Poecile hudsonica	Boreal Chickadee
		Troglodytes troglodytes	Winter Wren
		Vermivora chrysoptera	Golden-winged Warbler
		Wilsonia canadensis	Canada Warbler
		Zonotrichia albicollis	White-throated Sparrow
	Insects	*Epidemia epixanthe michiganensis*	Bog Copper
		Erebia disa mancinus	Disa Alpine
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Myotis septentrionalis	Northern Myotis
		Phenacomys intermedius	Heather Vole
		Sorex fumeus	Smoky Shrew
		Synaptomys borealis	Northern Bog Lemming
Forest- Lowland Deciduous	Birds	*Anas rubripes*	American Black Duck
		Buteo lineatus	Red-shouldered Hawk
		Catharus fuscescens	Veery
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus virens	Eastern Wood-pewee
		Empidonax minimus	Least Flycatcher
		Haliaeetus leucocephalus	Bald Eagle
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Pheucticus ludovicianus	Rose-breasted Grosbeak
		Seiurus aurocapillus	Ovenbird
		Sphyrapicus varius	Yellow-bellied Sapsucker
		Troglodytes troglodytes	Winter Wren
		Zonotrichia albicollis	White-throated Sparrow
	Mammals	*Lynx canadensis*	Canada lynx
		Microtus chrotorrhinus	Rock Vole
		Myotis septentrionalis	Northern Myotis
		Spilogale putorius	Eastern Spotted Skunk

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Wetland- Non-forest	Birds	*Ammodramus leconteii*	Le Conte's Sparrow
		Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow
		Anas rubripes	American Black Duck
		Arenaria interpres	Ruddy Turnstone
		Asio flammeus	Short-eared Owl
		Bartramia longicauda	Upland Sandpiper
		Botaurus lentiginosus	American Bittern
		Calidris alpina	Dunlin
		Calidris fuscicollis	White-rumped Sandpiper
		Calidris pusilla	Semipalmated Sandpiper
		Chlidonias niger	Black Tern
		Circus cyaneus	Northern Harrier
		Cistothorus palustris	Marsh Wren
		Cistothorus platensis	Sedge Wren
		Coturnicops noveboracensis	Yellow Rail
		Cygnus buccinator	Trumpeter Swan
		Dolichonyx oryzivorus	Bobolink
		Falco peregrinus	Peregrine Falcon
		Ixobrychus exilis	Least Bittern
		Limnodromus griseus	Short-billed Dowitcher
		Limosa fedoa	Marbled Godwit
		Limosa haemastica	Hudsonian Godwit
		Melospiza georgiana	Swamp Sparrow
		Phalaropus tricolor	Wilson's Phalarope
		Pluvialis dominica	American Golden-plover
		Podiceps grisegena	Red-necked Grebe
		Rallus limicola	Virginia Rail
		Recurvirostra americana	American Avocet
		Sterna forsteri	Forster's Tern
		Tringa melanoleuca	Greater Yellowlegs
		Tympanuchus phasianellus	Sharp-tailed Grouse
	Mammals	*Canis lupus*	Gray Wolf
		Myotis septentrionalis	Northern Myotis
		Phenacomys intermedius	Heather Vole
		Spermophilus franklinii	Franklin's Ground Squirrel
		Synaptomys borealis	Northern Bog Lemming
	Reptiles	*Chelydra serpentina*	Common Snapping Turtle
	Spiders	*Marpissa grata*	A Jumping Spider

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Shrub- Lowland	Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
	Birds	*Aegolius funereus*	Boreal Owl
		Ammodramus leconteii	Le Conte's Sparrow
		Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow
		Asio flammeus	Short-eared Owl
		Bartramia longicauda	Upland Sandpiper
		Botaurus lentiginosus	American Bittern
		Circus cyaneus	Northern Harrier
		Cistothorus palustris	Marsh Wren
		Cistothorus platensis	Sedge Wren
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus cooperi	Olive-sided Flycatcher
		Coturnicops noveboracensis	Yellow Rail
		Dolichonyx oryzivorus	Bobolink
		Euphagus carolinus	Rusty Blackbird
		Falcipennis canadensis	Spruce Grouse
		Falco peregrinus	Peregrine Falcon
		Ixobrychus exilis	Least Bittern
		Melospiza georgiana	Swamp Sparrow
		Rallus limicola	Virginia Rail
		Scolopax minor	American Woodcock
		Tympanuchus phasianellus	Sharp-tailed Grouse
		Vermivora chrysoptera	Golden-winged Warbler
		Zonotrichia albicollis	White-throated Sparrow
	Insects	*Epidemia epixanthe michiganensis*	Bog Copper
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Microtus chrotorrhinus	Rock Vole
		Phenacomys intermedius	Heather Vole
		Spermophilus franklinii	Franklin's Ground Squirrel
		Spilogale putorius	Eastern Spotted Skunk
		Synaptomys borealis	Northern Bog Lemming

Shrub/woodland- Upland	Amphibians	*Hemidactylium scutatum*	Four-toed Salamander
	Birds	*Anas rubripes*	American Black Duck
		Bartramia longicauda	Upland Sandpiper
		Circus cyaneus	Northern Harrier
		Coccyzus erythropthalmus	Black-billed Cuckoo
		Contopus cooperi	Olive-sided Flycatcher
		Dolichonyx oryzivorus	Bobolink
		Falcipennis canadensis	Spruce Grouse
		Falco peregrinus	Peregrine Falcon
		Haliaeetus leucocephalus	Bald Eagle
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Picoides arcticus	Black-backed Woodpecker
		Scolopax minor	American Woodcock
		Toxostoma rufum	Brown Thrasher
		Tympanuchus phasianellus	Sharp-tailed Grouse
		Zonotrichia albicollis	White-throated Sparrow
	Insects	*leonardus*	Leonard's Skipper
		Lycaeides idas nabokovi	Nabokov's Blue
		Phyciodes batesii	Tawny Crescent
		Pyrgus centaureae freija	Grizzled Skipper
	Mammals	*Canis lupus*	Gray Wolf
		Lynx canadensis	Canada lynx
		Microtus chrotorrhinus	Rock Vole
		Myotis septentrionalis	Northern Myotis
		Spermophilus franklinii	Franklin's Ground Squirrel
		Spilogale putorius	Eastern Spotted Skunk
		Taxidea taxus	American Badger
	Reptiles	*Liochlorophis vernalis*	Smooth Green Snake

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Wetland- Non-forest	Birds	*Ammodramus leconteii*	Le Conte's Sparrow
		Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow
		Anas rubripes	American Black Duck
		Arenaria interpres	Ruddy Turnstone
		Asio flammeus	Short-eared Owl
		Bartramia longicauda	Upland Sandpiper
		Botaurus lentiginosus	American Bittern
		Calidris alpina	Dunlin
		Calidris fuscicollis	White-rumped Sandpiper
		Calidris pusilla	Semipalmated Sandpiper
		Chlidonias niger	Black Tern
		Circus cyaneus	Northern Harrier
		Cistothorus palustris	Marsh Wren
		Cistothorus platensis	Sedge Wren
		Coturnicops noveboracensis	Yellow Rail
		Cygnus buccinator	Trumpeter Swan
		Dolichonyx oryzivorus	Bobolink
		Falco peregrinus	Peregrine Falcon
		Ixobrychus exilis	Least Bittern
		Limnodromus griseus	Short-billed Dowitcher
		Limosa fedoa	Marbled Godwit
		Limosa haemastica	Hudsonian Godwit
		Melospiza georgiana	Swamp Sparrow
		Phalaropus tricolor	Wilson's Phalarope
		Pluvialis dominica	American Golden-plover
		Podiceps grisegena	Red-necked Grebe
		Rallus limicola	Virginia Rail
		Recurvirostra americana	American Avocet
		Sterna forsteri	Forster's Tern
		Tringa melanoleuca	Greater Yellowlegs
		Tympanuchus phasianellus	Sharp-tailed Grouse
	Mammals	*Canis lupus*	Gray Wolf
		Myotis septentrionalis	Northern Myotis
		Phenacomys intermedius	Heather Vole
		Spermophilus franklinii	Franklin's Ground Squirrel
		Synaptomys borealis	Northern Bog Lemming
	Reptiles	*Chelydra serpentina*	Common Snapping Turtle
	Spiders	*Marpissa grata*	A Jumping Spider

Table 3. Target Wildlife By Presettlement Land Cover Type

CWCS Level 2 Vegetation	Class	Scientific Name	Common Name
Surrogate Grassland	Birds	*Ammodramus leconteii*	Le Conte's Sparrow
		Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow
		Anas rubripes	American Black Duck
		Asio flammeus	Short-eared Owl
		Bartramia longicauda	Upland Sandpiper
		Botaurus lentiginosus	American Bittern
		Circus cyaneus	Northern Harrier
		Cistothorus platensis	Sedge Wren
		Dolichonyx oryzivorus	Bobolink
		Falco peregrinus	Peregrine Falcon
		Limosa fedoa	Marbled Godwit
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Scolopax minor	American Woodcock
		Stelgidopteryx serripennis	Northern Rough-winged Swallow
		Sturnella magna	Eastern Meadowlark
		Tryngites subruficollis	Buff-breasted Sandpiper
		Tympanuchus phasianellus	Sharp-tailed Grouse
	Mammals	*Canis lupus*	Gray Wolf
		Myotis septentrionalis	Northern Myotis
		Spermophilus franklinii	Franklin's Ground Squirrel
		Spilogale putorius	Eastern Spotted Skunk
		Taxidea taxus	American Badger
	Reptiles	*Emydoidea blandingii*	Blanding's Turtle
	Spiders	*Marpissa grata*	A Jumping Spider
Cropland	Birds	*Bartramia longicauda*	Upland Sandpiper
		Dolichonyx oryzivorus	Bobolink
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Tryngites subruficollis	Buff-breasted Sandpiper
		Tympanuchus phasianellus	Sharp-tailed Grouse
	Mammals	*Canis lupus*	Gray Wolf
		Taxidea taxus	American Badger
Developed	Birds	*Chordeiles minor*	Common Nighthawk
		Falco peregrinus	Peregrine Falcon
		Melanerpes erythrocephalus	Red-headed Woodpecker
		Toxostoma rufum	Brown Thrasher
		Tryngites subruficollis	Buff-breasted Sandpiper
	Insects	*Cicindela denikei*	Laurentian Tiger Beetle
	Mammals	*Myotis septentrionalis*	Northern Myotis
		Spilogale putorius	Eastern Spotted Skunk
		Taxidea taxus	American Badger

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Amphibians		
Hemidactylium scutatum		**5**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Plethodon cinereus		**3**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Birds		
Accipiter gentilis		**3**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Aegolius funereus		**4**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Shrub - Lowland	
Ammodramus leconteii		**3**
	Surrogate Grassland	
	Shrub - Lowland	
	Wetland - Non-forest	
Ammodramus nelsoni		**4**
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Anas rubripes		**9**
	Forest - Upland Conifer	
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Lake - Shallow	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Arenaria interpres		**1**
	Wetland - Non-forest	
Asio flammeus		**4**
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Bartramia longicauda		**5**
	Cropland	
	Surrogate Grassland	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Botaurus lentiginosus		**4**
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Buteo lineatus		**3**
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Calidris alpina		**1**
	Wetland - Non-forest	
Calidris fuscicollis		**1**
	Wetland - Non-forest	
Calidris pusilla		**1**
	Wetland - Non-forest	
Caprimulgus vociferus		**2**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Hardwood)	
Catharus fuscescens		**5**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Chlidonias niger		**2**
	Lake - Shallow	
	Wetland - Non-forest	
Chordeiles minor		**1**
	Developed	
Circus cyaneus		**5**
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Cistothorus palustris		**4**
	Forest - Lowland Conifer	
	Lake - Shallow	
	Shrub - Lowland	
	Wetland - Non-forest	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Cistothorus platensis		**4**
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Coccyzus erythropthalmus		**6**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Contopus cooperi		**4**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Contopus virens		**4**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Coturnicops noveboracensis		**3**
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Cygnus buccinator		**2**
	Lake - Shallow	
	Wetland - Non-forest	
Dendroica caerulescens		**3**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Dendroica castanea		**2**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
Dendroica tigrina		**2**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
Dolichonyx oryzivorus		**5**
	Cropland	
	Surrogate Grassland	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Empidonax minimus		**4**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Euphagus carolinus		**1**
	Shrub - Lowland	
Falcipennis canadensis		**4**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Falco peregrinus		**8**
	Developed	
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Lake - Shallow	
	Rivers - Very Large	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Gavia immer		**1**
	Lake - Deep	
Haliaeetus leucocephalus		**7**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Lake - Deep	
	Rivers - Very Large	
	Shrub/woodland - Upland	
Hylocichla mustelina		**3**
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Ixobrychus exilis		**3**
	Lake - Shallow	
	Shrub - Lowland	
	Wetland - Non-forest	
Limnodromus griseus		**1**
	Wetland - Non-forest	
Limosa fedoa		**2**
	Surrogate Grassland	
	Wetland - Non-forest	
Limosa haemastica		**1**
	Wetland - Non-forest	
Melanerpes erythrocephalus		**7**
	Cropland	
	Developed	
	Surrogate Grassland	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub/woodland - Upland	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Melospiza georgiana		**3**
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Oporornis agilis		**2**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
Phalaropus tricolor		**2**
	Lake - Shallow	
	Wetland - Non-forest	
Pheucticus ludovicianus		**4**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Picoides arcticus		**3**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Shrub/woodland - Upland	
Pluvialis dominica		**1**
	Wetland - Non-forest	
Podiceps grisegena		**2**
	Lake - Shallow	
	Wetland - Non-forest	
Poecile hudsonica		**2**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
Rallus limicola		**3**
	Lake - Shallow	
	Shrub - Lowland	
	Wetland - Non-forest	
Recurvirostra americana		**1**
	Wetland - Non-forest	
Scolopax minor		**4**
	Surrogate Grassland	
	Forest - Upland Deciduous (Aspen)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Seiurus aurocapillus		**4**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Sphyrapicus varius		**4**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Stelgidopteryx serripennis		**2**
	Surrogate Grassland	
	Rivers - Very Large	
Sterna forsteri		**2**
	Lake - Shallow	
	Wetland - Non-forest	
Sturnella magna		**1**
	Surrogate Grassland	
Toxostoma rufum		**2**
	Developed	
	Shrub/woodland - Upland	
Tringa melanoleuca		**1**
	Wetland - Non-forest	
Troglodytes troglodytes		**3**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
Tryngites subruficollis		**3**
	Cropland	
	Developed	
	Surrogate Grassland	
Tympanuchus phasianellus		**5**
	Cropland	
	Surrogate Grassland	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Vermivora chrysoptera		**3**
	Forest - Lowland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Shrub - Lowland	
Wilsonia canadensis		**4**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
Zonotrichia albicollis		**7**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Fishes		
Acipenser fulvescens		**2**
	Lake - Deep	
	Rivers - Very Large	
Coregonus nipigon		**1**
	Lake - Deep	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Coregonus zenithicus		**1**
	Lake - Deep	
Cottus ricei		**1**
	Lake - Deep	
Couesius plumbeus		**2**
	Rivers - Headwaters to Large	
	Lake - Deep	
Etheostoma microperca		**2**
	Rivers - Headwaters to Large	
	Lake - Deep	
Ichthyomyzon fossor		**1**
	Rivers - Headwaters to Large	
Lepomis megalotis		**2**
	Rivers - Headwaters to Large	
	Lake - Deep	
Moxostoma valenciennesi		**1**
	Rivers - Headwaters to Large	
Notropis anogenus		**2**
	Rivers - Headwaters to Large	
	Lake - Deep	
Insects		
Caraclea vertreesi		**2**
	Rivers - Headwaters to Large	
	Rivers - Very Large	
Cicindela denikei		**3**
	Developed	
	Forest - Upland Conifer	
	Forest - Upland Deciduous (Aspen)	
Epidemia epixanthe michiganensis		**2**
	Forest - Lowland Conifer	
	Shrub - Lowland	
Erebia disa mancinus		**1**
	Forest - Lowland Conifer	
Hesperia leonardus leonardus		**1**
	Shrub/woodland - Upland	
Lycaeides idas nabokovi		**2**
	Forest - Upland Conifer	
	Shrub/woodland - Upland	
Oeneis macounii		**1**
	Forest - Upland Conifer	
Oxyethira ecornuta		**1**
	Rivers - Headwaters to Large	
Oxyethira itascae		**1**
	Rivers - Headwaters to Large	
Phyciodes batesii		**2**
	Forest - Upland Conifer	
	Shrub/woodland - Upland	
Polycentropus milaca		**1**
	Lake - Deep	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Pyrgus centaureae freija		**1**
	Shrub/woodland - Upland	
Setodes guttatus		**1**
	Lake - Deep	
Mammals		
Canis lupus		**9**
	Cropland	
	Forest - Upland Conifer	
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Lynx canadensis		**7**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Microtus chrotorrhinus		**5**
	Forest - Upland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Myotis septentrionalis		**9**
	Developed	
	Forest - Upland Conifer	
	Surrogate Grassland	
	Forest - Lowland Conifer	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Phenacomys intermedius		**4**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Sorex fumeus		**2**
	Forest - Upland Conifer	
	Forest - Lowland Conifer	

Table 4. Type and Number of CWCS Habitats Utilized by SGCN Species

Species	CWCS Habitat Type(s)	Number of CWCS Habitats Utilized
Spermophilus franklinii		**4**
	Surrogate Grassland	
	Shrub - Lowland	
	Shrub/woodland - Upland	
	Wetland - Non-forest	
Spilogale putorius		**7**
	Developed	
	Surrogate Grassland	
	Forest - Lowland Deciduous	
	Forest - Upland Deciduous (Aspen)	
	Forest - Upland Deciduous (Hardwood)	
	Shrub - Lowland	
	Shrub/woodland - Upland	
Synaptomys borealis		**3**
	Forest - Lowland Conifer	
	Shrub - Lowland	
	Wetland - Non-forest	
Taxidea taxus		**6**
	Cropland	
	Developed	
	Forest - Upland Conifer	
	Surrogate Grassland	
	Forest - Upland Deciduous (Hardwood)	
	Shrub/woodland - Upland	
Molluscs		
Lasmigona compressa		**1**
	Rivers - Headwaters to Large	
Ligumia recta		**2**
	Rivers - Headwaters to Large	
	Rivers - Very Large	
Reptiles		
Chelydra serpentina		**4**
	Lake - Deep	
	Lake - Shallow	
	Rivers - Very Large	
	Wetland - Non-forest	
Clemmys insculpta		**1**
	Rivers - Headwaters to Large	
Emydiodea blandingii		**0**
	Lake - Shallow	
	Rivers - Very Large	
Emydoidea blandingii		**3**
	Surrogate Grassland	
Liochlorophis vernalis		**1**
	Shrub/woodland - Upland	
Spiders		
Marpissa grata		**2**
	Surrogate Grassland	
	Wetland - Non-forest	

Table 5. Summary Presettlement & Current Vegetation Cover Crosswalk and Acreage

Predevelopment Landcover[1]	Area (acres)		Current Conditions Landcover[2]	Area (acres)	Gain (loss) in acres
Aspen-Birch (trending to Conifers)	261,391	=	Aspen/White Birch	277,692	16300
Big Woods - Hardwoods (oak, maple, basswood, hickory)	18,830	=	Upland Deciduous Forest	23,387	4557
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	59,860	=	Upland Conifer-Deciduous mix	5,293	(54567)
White Pine & Mixed White Pine and Red Pine	166,570	=	Upland Conifer Forest, Pine	67,950	(98620)
Jack Pine Barrens and Openings	56,583	=	Upland Shrub	101,459	44876
Circ 39 Type 5, Circ39 = 90, Lakes	52,293	=	Aquatic	56,604	4311
Circ39 Types 1-4 & Wet Prairie	23,657	=	Marsh	6,731	(16926)
Circ 39 Type 7 & River Bottom Forest	39,105	=	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	17,651	(21454)
Circ39 Type 8 & Conifer Bogs and Swamps	260,017	=	Lowland Conifer Forest	92,329	(167689)
Circ39 Type 6	64,872	=	Lowland Shrub	95,535	30663
No Similar Presettlement Cover Class	0	=	20' buffer of MnDOT Railroads - Moderate Impact	1,190	1190
No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - High Impact	37,157	37157
No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - Moderate Impact	78,626	78626
No Similar Presettlement Cover Class	0	=	Cropland	21,914	21914
No Similar Presettlement Cover Class	0	=	Developed	4,776	4776
No Similar Presettlement Cover Class	0	=	Grassland	64,931	64931
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	8,695	8695
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed High Intensity	1,577	1577
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Low Intensity	10,728	10728
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Medium Intensity	4,498	4498
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Open Space	23,976	23976
TOTAL[3]	1,003,178		**TOTAL[3]**	1,002,698	

[1] Presettlement Cover Types derived from Marschner/PLS data and NWI (see Methods)

[2] Current Condition Types - USGS NLCD 2001 for developed and GAP data for Natural areas (see Methods)

[3] Discrepancy in Presettlement versus Current Acreage Totals is an artifact of differing GIS datasets. The discrepancy is 480 acres, or less than 0.05% of the study area acreage, and is not a significant error.

Table 6. Summary Presettlement - Current Vegetation Cover Crosswalk and Acreage Change with CWCS Level 2 Types for Wildlife Utilization							
CWCS Level 2 Vegetation		**Predevelopment Landcover[1]**	**Area (acres)**		**Current Conditions Landcover[2]**	**Area (acres)**	**Change (acres)**
Forest - Upland Deciduous (Aspen)	=	Aspen-Birch (trending to Conifers)	261,391	=	Aspen/White Birch	277,692	16,300
Forest - Upland Deciduous (Hardwood)	=	Big Woods - Hardwoods (oak, maple, basswood, hickory)	18,830	=	Upland Deciduous Forest	23,387	4,557
Forest - Upland Deciduous (Hardwood) and Upland Forest Conifer	=	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	59,860	=	Upland Conifer-Deciduous mix	5,293	-54,567
Forest - Upland Conifer	=	White Pine & Mixed White Pine and Red Pine	166,570	=	Upland Conifer Forest, Pine	67,950	-98,620
Shrub/Woodland - Upland	=	Jack Pine Barrens and Openings	56,583	=	Upland Shrub	101,459	44,876
Lake - Deep; Lake - Shallow; River - Headwater to Large; River - Very Large	=	Circ 39 Type 5, Circ39 = 90, Lakes	52,293	=	Aquatic	56,604	4,311
Wetland - Nonforest	=	Circ39 Types 1-4 & Wet Prairie	23,657	=	Marsh	6,731	-16,926
Forest - Lowland Deciduous	=	Circ 39 Type 7 & River Bottom Forest	39,105	=	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	17,651	-21,454
Forest - Lowland Conifer	=	Circ39 Type 8 & Conifer Bogs and Swamps	260,017	=	Lowland Conifer Forest	92,329	-167,689
Shrub - Lowland	=	Circ39 Type 6	64,872	=	Lowland Shrub	95,535	30,663
Developed	=	No Similar Presettlement Cover Class	0	=	20' buffer of MnDOT Railroads - Moderate Impact	1,190	1,190
Developed	=	No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - High Impact	37,157	37,157
Developed	=	No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - Moderate Impact	78,626	78,626
Cropland	=	No Similar Presettlement Cover Class	0	=	Cropland	21,914	21,914
Developed	=	No Similar Presettlement Cover Class	0	=	Developed	4,776	4,776
Surrogate Grassland	=	No Similar Presettlement Cover Class	0	=	Grassland	64,931	64,931
No Similar CWCS Level 2 Class	=	No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	8,695	8,695
Developed	=	No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed High Intensity	1,577	1,577
Developed	=	No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Low Intensity	10,728	10,728
Developed	=	No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Medium Intensity	4,498	4,498
Developed	=	No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Open Space	23,976	23,976
		TOTAL[3]	1,003,178		**TOTAL[3]**	1,002,698	

[1] Predevelopment Cover Types derived from Marschner/PLS data and NWI (see Methods)

[2] Current Condition Cover Types derived from USGS NLCD 2001 for developed cover and GAP Landcover data for Natural/Non-developed areas (see Methods)

[3] Discrepancy in Presettlement versus Current Acreage Totals is an artifact of analysis of differing GIS datasets. The discrepancy is 480 acres, or less than 0.05% of the study area acreage, and is not a significant error.

Table 7. Summary Presettlement - Current Conditions Change in CWCS Level 2 Types

CWCS Level 2 Vegetation	Gain (loss) in acres
Forest - Upland Deciduous (Aspen)	16300.2
Forest - Upland Deciduous (Hardwood)	4556.7
Forest - Upland Deciduous (Hardwood) and Upland Forest Conifer	(54566.9)
Forest - Upland Conifer	(98620.1)
Shrub/Woodland - Upland	44876.4
Lake - Deep; Lake - Shallow; River - Headwater to Large; River - Very Large	4310.6
Wetland - Nonforest	(16926.4)
Forest - Lowland Deciduous	(21454.2)
Forest - Lowland Conifer	(167688.6)
Shrub - Lowland	30662.9
Cropland	21914.0
Surrogate Grassland	64931.2
Developed	162528.4
Other, With No Similar CWCS Level 2 Class	8695.2

Table 8. Presettlement and Current Vegetation Cover on the Keetac Expansion Project

Presettlement Landcover	Area (acres)		Current Conditions Landcover	Area (acres)	Gain (loss) in acres
Aspen-Birch (trending to	4,844.1	=	Aspen/White Birch	1,108.5	(3735.6)
Big Woods - Hardwoods & Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	1,055.3	=	Upland Deciduous Forest	53.1	(1002.3)
White Pine & Mixed White Pine and Red Pine	775.0	=	Upland Conifer Forest & Pine	24.3	(750.7)
Jack Pine Barrens and Openings	0	=	Upland Shrub	666.3	666.3
Circ39 = 5, Circ39 = 90, Lakes	227.3	=	Aquatic	287.2	59.8
Circ 39 Types 1-4 & Wet Prairie	1,002.1	=	Marsh	23.5	(978.6)
Circ39 = 7 & River Bottom Forest	146.5	=	Lowland Deciduous Forest	3.2	(143.3)
Circ39 = 8 & Conifer Bogs and Swamps	4,933.3	=	Lowland Conifer Forest	14.1	(4919.2)
Circ39 = 6	489.3	=	Lowland Shrub	262.1	(227.2)
No Similar Presettlement Cover Class	0	=	20' buffer of MnDOT Railroads - Moderate Impact	2.3	2.3
No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - High Impact	2,265.5	2265.5
No Similar Presettlement Cover Class	0	=	2007 DNR Mine Feature Shapefile - Moderate Impact	8,129.4	8129.4
No Similar Presettlement Cover Class	0	=	Cropland	10.4	10.4
No Similar Presettlement Cover Class	0	=	Developed	79.3	79.3
No Similar Presettlement Cover Class	0	=	Grassland	132.4	132.4
No Similar Presettlement Cover Class	0	=	Non-Vegetated	11.8	11.8
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	360.3	360.3
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Low Intensity	8.2	8.2
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Medium Intensity	1.4	1.4
No Similar Presettlement Cover Class	0	=	USGS NLCD 2001 - Developed Open Space	29.7	29.7
TOTAL	**13,472.9**		**TOTAL**	**13,472.9**	

Table 9. Development Impacts on Presettlement Cover Types for Study Area and Keetac Expansion Project

Presettlement Landcover	Data	Study (acres)	Keetac (acres)	Keetac Contribution (%)
Aspen-Birch (trending to Conifers)	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	23,787.5	3,291.9	14%
	2007 DNR Mine Feature Shapefile - High Impact	9,164.7	631.3	7%
	USGS NLCD 2001 - Developed Low Intensity	3,159.0	1.8	0%
	USGS NLCD 2001 - Developed Medium Intensity	1,402.2	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	478.6		0%
	Total:	**37,992.1**	**3,925.0**	**10%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	1,224.4	151.0	12%
	USGS NLCD 2001 - Cultivated Crops	9,159.5	6.6	0%
	USGS NLCD 2001 - Developed Open Space	10,002.9	44.5	0%
	USGS NLCD 2001 - Developed Grassland	24,773.7	62.9	0%
	20' buffer of MnDOT Railroads - Moderate Impact	373.6	0.0	0%
	Total:	**45,534.0**	**265.1**	**1%**
	Grand Total:	**83,526.1**	**4,190.0**	**5%**
Type 2, Inland Fresh Meadow	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	176.8	29.7	17%
	2007 DNR Mine Feature Shapefile - High Impact	37.3	0.4	1%
	USGS NLCD 2001 - Developed Low Intensity	41.0	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	12.5	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	9.2		0%
	Total:	**276.7**	**30.1**	**11%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	77.5	13.5	17%
	USGS NLCD 2001 - Cultivated Crops	502.2	0.0	0%
	USGS NLCD 2001 - Developed Open Space	290.9	0.4	0%
	USGS NLCD 2001 - Developed Grassland	372.8	0.8	0%
	20' buffer of MnDOT Railroads - Moderate Impact	14.0	0.0	0%
	Total:	**1,257.2**	**14.7**	**1%**
	Grand Total:	**1,534.0**	**44.8**	**3%**
Type 3, Inland Shallow Fresh Marsh	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	503.1	148.1	29%
	2007 DNR Mine Feature Shapefile - High Impact	38.2	2.6	7%
	USGS NLCD 2001 - Developed Low Intensity	21.9	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	4.1	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	2.3		0%
	Total:	**569.6**	**150.7**	**26%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	50.5	27.3	54%
	USGS NLCD 2001 - Cultivated Crops	167.5	3.6	2%
	USGS NLCD 2001 - Developed Open Space	122.1	8.9	7%
	USGS NLCD 2001 - Developed Grassland	154.3	0.1	0%
	20' buffer of MnDOT Railroads - Moderate Impact	7.4	0.0	0%
	Total:	**501.7**	**39.8**	**8%**
	Grand Total:	**1,071.3**	**190.5**	**18%**
Type 4, Inland Deep Fresh Marsh	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	501.3	46.2	9%
	2007 DNR Mine Feature Shapefile - High Impact	344.9	13.4	4%
	USGS NLCD 2001 - Developed Low Intensity	6.5	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	1.5	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	0.8		0%
	Total:	**855.0**	**59.6**	**7%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	35.9	7.9	22%
	USGS NLCD 2001 - Cultivated Crops	24.1	0.0	0%
	USGS NLCD 2001 - Developed Open Space	39.2	0.2	0%
	USGS NLCD 2001 - Developed Grassland	53.5	0.3	1%
	20' buffer of MnDOT Railroads - Moderate Impact	1.9	0.0	0%
	Total:	**154.6**	**8.4**	**5%**
	Grand Total:	**1,009.6**	**68.1**	**7%**

Table 9. Development Impacts on Presettlement Cover Types for Study Area and Keetac Expansion Project

Presettlement Landcover	Data	Study (acres)	Keetac (acres)	Keetac Contribution (%)
Type 5, Inland Open Fresh Water	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	873.8	15.8	2%
	2007 DNR Mine Feature Shapefile - High Impact	10.0	0.0	0%
	USGS NLCD 2001 - Developed Low Intensity	34.1	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	10.0	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	3.3		0%
	Total:	**931.3**	**15.8**	**2%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	40.4	10.3	25%
	USGS NLCD 2001 - Cultivated Crops	25.6	0.0	0%
	USGS NLCD 2001 - Developed Open Space	135.0	4.0	3%
	USGS NLCD 2001 - Developed Grassland	101.3	3.4	3%
	20' buffer of MnDOT Railroads - Moderate Impact	0.8	0.0	0%
	Total:	**303.1**	**17.6**	**6%**
	Grand Total:	**1,234.4**	**33.5**	**3%**
Type 6, Shrub Swamp	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	1,767.0	301.2	17%
	2007 DNR Mine Feature Shapefile - High Impact	234.5	8.0	3%
	USGS NLCD 2001 - Developed Low Intensity	248.3	0.6	0%
	USGS NLCD 2001 - Developed Medium Intensity	37.0	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	14.7		0%
	Total:	**2,301.5**	**309.8**	**13%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	283.7	19.3	7%
	USGS NLCD 2001 - Cultivated Crops	616.8	0.1	0%
	USGS NLCD 2001 - Developed Open Space	1,344.5	1.3	0%
	USGS NLCD 2001 - Developed Grassland	1,305.5	0.3	0%
	20' buffer of MnDOT Railroads - Moderate Impact	97.1	0.8	1%
	Total:	**3,647.5**	**21.8**	**1%**
	Grand Total:	**5,949.0**	**331.6**	**6%**
Type 7, Wooded Swamp	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	1,219.2	142.2	12%
	2007 DNR Mine Feature Shapefile - High Impact	78.9	0.0	0%
	USGS NLCD 2001 - Developed Low Intensity	60.9	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	2.0	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	0.0		0%
	Total:	**1,361.0**	**142.2**	**10%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	94.1	1.3	1%
	USGS NLCD 2001 - Cultivated Crops	83.5	0.0	0%
	USGS NLCD 2001 - Developed Open Space	343.7	0.2	0%
	USGS NLCD 2001 - Developed Grassland	248.1	0.4	0%
	20' buffer of MnDOT Railroads - Moderate Impact	23.4	0.0	0%
	Total:	**792.7**	**1.8**	**0%**
	Grand Total:	**2,153.7**	**144.1**	**7%**
Type 8, Bog	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	1,540.0	334.3	22%
	2007 DNR Mine Feature Shapefile - High Impact	181.9	0.0	0%
	USGS NLCD 2001 - Developed Low Intensity	179.7	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	9.3	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	3.5		0%
	Total:	**1,914.5**	**334.3**	**17%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	147.7	0.0	0%
	USGS NLCD 2001 - Cultivated Crops	105.3	0.0	0%
	USGS NLCD 2001 - Developed Open Space	615.9	0.0	0%
	USGS NLCD 2001 - Developed Grassland	315.4	0.2	0%
	20' buffer of MnDOT Railroads - Moderate Impact	23.0	0.0	0%
	Total:	**1,207.3**	**0.2**	**0%**
	Grand Total:	**3,121.7**	**334.5**	**11%**

Table 9. Development Impacts on Presettlement Cover Types for Study Area and Keetac Expansion Project

Presettlement Landcover	Data	Study (acres)	Keetac (acres)	Keetac Contribution (%)
Conifer Bogs and Swamps	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	14,122.9	3,472.9	25%
	2007 DNR Mine Feature Shapefile - High Impact	4,061.1	200.0	5%
	USGS NLCD 2001 - Developed Low Intensity	2,362.1	3.7	0%
	USGS NLCD 2001 - Developed Medium Intensity	1,069.6	1.2	0%
	Count of USGS NLCD 2001 - Developed High Intensity	403.0		0%
	Total:	**22,018.8**	**3,677.7**	**17%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	1,453.2	33.0	2%
	USGS NLCD 2001 - Cultivated Crops	5,764.1	0.1	0%
	USGS NLCD 2001 - Developed Open Space	5,207.9	23.6	0%
	USGS NLCD 2001 - Developed Grassland	15,532.6	59.5	0%
	20' buffer of MnDOT Railroads - Moderate Impact	271.0	0.4	0%
	Total:	**28,228.7**	**116.6**	**0%**
	Grand Total:	**50,247.5**	**3,794.3**	**8%**
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	11,234.1	192.5	2%
	2007 DNR Mine Feature Shapefile - High Impact	9,508.1	489.8	5%
	USGS NLCD 2001 - Developed Low Intensity	1,047.2	0.0	0%
	USGS NLCD 2001 - Developed Medium Intensity	689.9	0.2	0%
	Count of USGS NLCD 2001 - Developed High Intensity	195.0		0%
	Total:	**22,674.3**	**682.5**	**3%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	2,006.1	80.6	4%
	USGS NLCD 2001 - Cultivated Crops	652.0	0.0	0%
	USGS NLCD 2001 - Developed Open Space	1,740.3	19.6	1%
	USGS NLCD 2001 - Developed Grassland	3,095.5	4.5	0%
	20' buffer of MnDOT Railroads - Moderate Impact	72.8	1.1	1%
	Total:	**7,566.8**	**105.8**	**1%**
	Grand Total:	**30,241.1**	**788.2**	**3%**
Wet Prairie	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	350.4	96.1	27%
	2007 DNR Mine Feature Shapefile - High Impact	377.3	339.2	90%
	USGS NLCD 2001 - Developed Low Intensity	201.2	0.8	0%
	USGS NLCD 2001 - Developed Medium Intensity	100.4	0.1	0%
	Count of USGS NLCD 2001 - Developed High Intensity	102.3		0%
	Total:	**1,131.7**	**436.2**	**39%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	46.6	10.8	23%
	USGS NLCD 2001 - Cultivated Crops	506.0	0.0	0%
	USGS NLCD 2001 - Developed Open Space	376.1	0.2	0%
	USGS NLCD 2001 - Developed Grassland	351.6	0.0	0%
	20' buffer of MnDOT Railroads - Moderate Impact	6.2	0.0	0%
	Total:	**1,286.3**	**11.0**	**1%**
	Grand Total:	**2,418.0**	**447.2**	**18%**
White Pine	***High Impact***			
	2007 DNR Mine Feature Shapefile - Moderate Impact	788.2	58.5	7%
	2007 DNR Mine Feature Shapefile - High Impact	652.4	580.8	89%
	USGS NLCD 2001 - Developed Low Intensity	106.7	1.3	1%
	USGS NLCD 2001 - Developed Medium Intensity	35.7	0.0	0%
	Count of USGS NLCD 2001 - Developed High Intensity	0.0		
	Total:	**1,583.0**	**640.6**	**40%**
	Moderate Impact			
	USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)	54.6	5.3	10%
	USGS NLCD 2001 - Cultivated Crops	125.6	0.0	0%
	USGS NLCD 2001 - Developed Open Space	295.2	6.3	2%
	USGS NLCD 2001 - Developed Grassland	438.6	0.0	0%
	20' buffer of MnDOT Railroads - Moderate Impact	7.8	0.0	0%
	Total:	**921.8**	**11.6**	**1%**
	Grand Total:	**2,504.8**	**652.2**	**26%**

Table 10. Impacts of Future Projects on Current Cover Types

Current Conditions Landcover Types[1] (acres)																						
Project	20' buffer of MnDOT RRs - Mod. Impact	Aquatic	Non-Veg.	Pine	USGS NLCD 2001 - Barren Land	USGS NLCD 2001 - Cult. Crops	USGS NLCD 2001 - Dev. High Intensity	USGS NLCD 2001 - Dev. Low Intensity	USGS NLCD 2001 - Dev. Medium Intensity	USGS NLCD 2001 - Dev. Open Space	Upland Conifer Forest	Upland Conifer-Decid. mix	Aspen/ White Birch	Upland Decid. Forest	Upland Shrub	Crops	Devel.	Grass	Lowland Conifer Forest	Lowland Decid. Forest	Lowland Shrub	Marsh	TOTAL
Cliffs Erie Pellet Transfer Facility - Moderate	0.0	0.0	0.0	0.0	69.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	70.4
Essar Steel (MSI) - High	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	0.0	0.0	162.6	63.1	133.4	0.1	5.8	2.6	0.0	0.6	2.3	0.0	382.9
Essar Steel (MSI) - Moderate	0.1	71.3	0.0	3.9	0.1	0.0	0.0	0.0	0.0	38.8	5.0	0.0	459.5	148.3	298.6	0.7	7.8	43.9	12.6	12.5	60.4	1.2	1164.9
HibbTac - High	0.0	7.3	0.0	9.3	289.3	0.0	0.9	32.7	5.5	85.3	9.2	0.0	634.0	360.8	260.5	0.7	40.1	128.6	12.1	17.6	99.3	5.6	1999.0
HibbTac - Moderate	0.0	43.5	0.0	6.6	480.5	5.9	0.0	9.7	0.3	11.6	134.5	0.0	1522.3	50.8	449.3	6.3	17.2	11.8	87.5	71.8	232.6	3.5	3145.6
Hoyt Lakes to Babbitt Connection Hwy - High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	1.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	2.5
Hoyt Lakes to Babbitt Connection Hwy - Moderate	2.8	4.3	3.2	58.3	2.1	0.0	1.7	29.0	2.2	29.1	5.0	4.2	177.4	3.1	25.9	0.0	19.6	11.3	58.1	4.9	66.7	3.2	511.9
Keetac Facility Boundary - High	1.9	72.0	0.0	0.9	115.0	0.0	0.0	3.9	0.1	12.6	3.9	0.0	432.3	28.9	234.8	0.6	41.2	0.6	1.4	0.8	89.6	0.0	1040.7
Keetac Facility Boundary - Moderate	0.4	215.2	11.8	11.2	245.3	0.0	0.0	4.3	1.3	17.1	8.2	0.0	676.2	24.2	431.5	9.8	38.1	131.8	12.7	2.4	172.5	23.5	2037.4
Mesabi Nugget - High	0.0	5.1	0.0	4.8	88.2	0.0	0.0	0.0	0.0	0.3	10.2	0.0	133.2	0.4	63.0	0.0	24.5	11.2	13.0	20.5	22.0	0.0	396.4
Mesabi Nugget - Moderate	5.0	21.3	0.0	4.8	195.0	0.0	0.0	0.8	0.0	1.0	28.0	0.0	218.6	0.0	223.4	0.0	186.7	10.5	65.9	0.9	56.7	4.9	1023.5
Minntac - High	1.8	10.3	0.0	1.1	4.2	11.0	0.0	0.6	0.0	27.1	1.1	0.0	416.9	302.1	191.9	5.0	35.1	46.4	3.4	1.3	0.0	0.0	1059.4
Minntac - Moderate	34.2	1402.8	35.9	713.6	667.3	7.7	2.0	64.3	4.4	206.4	963.3	44.8	7239.4	801.4	3811.2	87.6	296.2	1294.5	816.3	390.6	1532.2	120.2	20536.4
Mittal Minorca East Reserve, Ispat Inland - High	0.0	0.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	231.2	5.5	11.1	6.4	0.0	97.1	0.0	13.0	4.0	0.0	396.8
Mittal Minorca East Reserve, Ispat Inland - Moderate	0.0	6.4	0.0	3.6	0.7	0.0	0.0	0.1	0.0	0.1	0.0	0.0	141.1	7.6	52.5	0.0	1.7	34.9	3.7	7.1	5.2	0.0	264.8
MN Power's Syl Laskin Energy Center - Moderate	0.0	0.5	0.0	5.2	6.4	0.0	0.0	0.0	0.0	7.9	0.0	3.0	171.4	2.6	11.7	0.0	0.0	50.7	3.4	20.0	2.7	0.0	285.4
North Shore Mining - High	1.2	10.7	202.7	16.5	85.1	0.0	0.0	1.6	2.0	0.5	31.8	1.1	690.4	26.3	91.1	0.0	53.6	15.0	143.6	0.0	134.4	50.5	1558.2
PolyMet Mining Project Boundary - High	0.0	0.8	0.0	145.3	0.0	0.0	0.0	0.0	0.0	0.0	65.5	0.0	77.6	3.4	23.9	0.0	3.8	0.0	85.5	0.0	42.6	2.2	450.7
PolyMet Mining Project Boundary - Moderate	22.3	10.7	0.4	743.9	220.9	0.0	0.0	0.0	0.0	0.0	250.9	2.3	665.9	19.6	60.3	0.0	160.5	4.3	703.7	0.6	160.7	13.5	3040.6
TOTAL	69.7	1888.4	253.9	1729.5	2469.6	24.6	4.6	147.2	16.0	472.2	1516.7	55.3	14051.4	1848.1	6375.1	117.2	933.1	1895.3	2023.1	564.7	2683.7	228.3	**39367.5**

[1] Current Condition Cover Types derived from GAP and NLCD 2001 data (see Methods)

Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Amphibians	**6 habitats**	**6 habitats**	**1,134,757**	**945,636**	**189,121**	**17%**
Hemidactylium scutatum	**6 habitats**	**6 habitats**	**628,106**	**571,315**	**56,791**	**9%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Plethodon cinereus	**4 habitats**	**4 habitats**	**506,651**	**374,321**	**132,330**	**26%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Birds	**11 habitats**	**13 habitats**	**0**	**0**	**0**	**NA**
Accipiter gentilis	**4 habitats**	**4 habitats**	**506,651**	**374,321**	**132,330**	**26%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Aegolius funereus	**5 habitats**	**5 habitats**	**812,710**	**538,797**	**273,912**	**34%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Ammodramus leconteii	**3 habitats**	**3 habitats**	**88,529**	**167,197**	**(78,668)**	**(89%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Ammodramus nelsoni	**4 habitats**	**4 habitats**	**348,546**	**259,525**	**89,021**	**26%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Anas rubripes	**10 habitats**	**10 habitats**	**938,306**	**714,025**	**224,281**	**24%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Arenaria interpres	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Asio flammeus	**4 habitats**	**4 habitats**	**348,546**	**259,525**	**89,021**	**26%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Bartramia longicauda	**4 habitats**	**5 habitats**	**145,112**	**290,570**	**(145,458)**	**(100%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Grassland	0	64,931	(64,931)	
Botaurus lentiginosus	**4 habitats**	**4 habitats**	**348,546**	**259,525**	**89,021**	**26%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Buteo lineatus	**4 habitats**	**4 habitats**	**379,186**	**324,022**	**55,164**	**15%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
Calidris alpina	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Calidris fuscicollis	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Calidris pusilla	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Caprimulgus vociferus	**3 habitats**	**3 habitats**	**245,260**	**96,629**	**148,630**	**61%**
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%

Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Catharus fuscescens	**6 habitats**	**6 habitats**	**805,773**	**484,300**	**321,473**	**40%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Chlidonias niger	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Chordeiles minor	**1 habitat**	**1 habitat**	**0**	**162,528**	**(162,528)**	
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
Circus cyaneus	**5 habitats**	**5 habitats**	**405,129**	**360,984**	**44,145**	**11%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Cistothorus palustris	**4 habitats**	**4 habitats**	**400,839**	**251,198**	**149,642**	**37%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Cistothorus platensis	**4 habitats**	**4 habitats**	**348,546**	**259,525**	**89,021**	**26%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Coccyzus erythropthalmus	**7 habitats**	**7 habitats**	**667,211**	**588,966**	**78,245**	**12%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Contopus cooperi	**5 habitats**	**5 habitats**	**607,901**	**362,565**	**245,336**	**40%**
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Contopus virens	**5 habitats**	**5 habitats**	**545,756**	**391,972**	**153,784**	**28%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Coturnicops noveboracensis	**3 habitats**	**3 habitats**	**348,546**	**194,594**	**153,952**	**44%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Cygnus buccinator	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Dendroica caerulescens	**4 habitats**	**4 habitats**	**506,651**	**374,321**	**132,330**	**26%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Dendroica castanea	**3 habitats**	**3 habitats**	**486,446**	**165,571**	**320,876**	**66%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Dendroica tigrina	**3 habitats**	**3 habitats**	**486,446**	**165,571**	**320,876**	**66%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Dolichonyx oryzivorus	**4 habitats**	**5 habitats**	**145,112**	**290,570**	**(145,458)**	**(100%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Grassland	0	64,931	(64,931)	
Empidonax minimus	**5 habitats**	**5 habitats**	**545,756**	**391,972**	**153,784**	**28%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%

Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Euphagus carolinus	**1 habitat**	**1 habitat**	**64,872**	**95,535**	**(30,663)**	**(47%)**
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
Falcipennis canadensis	**5 habitats**	**5 habitats**	**607,901**	**362,565**	**245,336**	**40%**
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Falco peregrinus	**6 habitats**	**7 habitats**	**457,422**	**580,117**	**(122,694)**	**(27%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
Gavia immer	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Haliaeetus leucocephalus	**7 habitats**	**7 habitats**	**654,632**	**550,035**	**104,597**	**16%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Hylocichla mustelina	**4 habitats**	**4 habitats**	**506,651**	**374,321**	**132,330**	**26%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Ixobrychus exilis	**3 habitats**	**3 habitats**	**140,822**	**158,869**	**(18,047)**	**(13%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
Limnodromus griseus	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Limosa fedoa	**2 habitats**	**2 habitats**	**23,657**	**71,662**	**(48,005)**	**(203%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Limosa haemastica	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Melanerpes erythrocephalus	**6 habitats**	**8 habitats**	**435,769**	**674,855**	**(239,086)**	**(55%)**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
Melospiza georgiana	**3 habitats**	**3 habitats**	**348,546**	**194,594**	**153,952**	**44%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Oporornis agilis	**3 habitats**	**3 habitats**	**486,446**	**165,571**	**320,876**	**66%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Phalaropus tricolor	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Pheucticus ludovicianus	**5 habitats**	**5 habitats**	**545,756**	**391,972**	**153,784**	**28%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Picoides arcticus	**4 habitats**	**4 habitats**	**543,029**	**267,030**	**275,999**	**51%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Pluvialis dominica	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Podiceps grisegena	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)

Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Poecile hudsonica	**3 habitats**	**3 habitats**	**486,446**	**165,571**	**320,876**	**66%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Rallus limicola	**3 habitats**	**3 habitats**	**140,822**	**158,869**	**(18,047)**	**(13%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
Recurvirostra americana	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Scolopax minor	**4 habitats**	**4 habitats**	**382,846**	**539,617**	**(156,771)**	**(41%)**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Seiurus aurocapillus	**5 habitats**	**5 habitats**	**545,756**	**391,972**	**153,784**	**28%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Sphyrapicus varius	**5 habitats**	**5 habitats**	**545,756**	**391,972**	**153,784**	**28%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Stelgidopteryx serripennis	**2 habitats**	**2 habitats**	**52,293**	**121,535**	**(69,242)**	**(132%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Sterna forsteri	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Sturnella magna	**1 habitat**	**1 habitat**	**0**	**64,931**	**(64,931)**	
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Toxostoma rufum	**2 habitats**	**2 habitats**	**56,583**	**263,988**	**(207,405)**	**(367%)**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
Tringa melanoleuca	**1 habitat**	**1 habitat**	**23,657**	**6,731**	**16,926**	**72%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
Troglodytes troglodytes	**4 habitats**	**4 habitats**	**525,551**	**183,222**	**342,330**	**65%**
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Tryngites subruficollis	**1 habitat**	**3 habitats**	**0**	**249,374**	**(249,374)**	
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
Tympanuchus phasianellus	**4 habitats**	**5 habitats**	**145,112**	**290,570**	**(145,458)**	**(100%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Grassland	0	64,931	(64,931)	
Vermivora chrysoptera	**3 habitats**	**3 habitats**	**586,280**	**465,555**	**120,726**	**21%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Wilsonia canadensis	**5 habitats**	**5 habitats**	**766,668**	**466,650**	**300,019**	**39%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Zonotrichia albicollis	**8 habitats**	**8 habitats**	**927,228**	**681,294**	**245,934**	**27%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Fishes	**1 habitat**	**1 habitat**	**522,930**	**566,037**	**(43,106)**	**(8%)**
Acipenser fulvescens	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Coregonus nipigon	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)

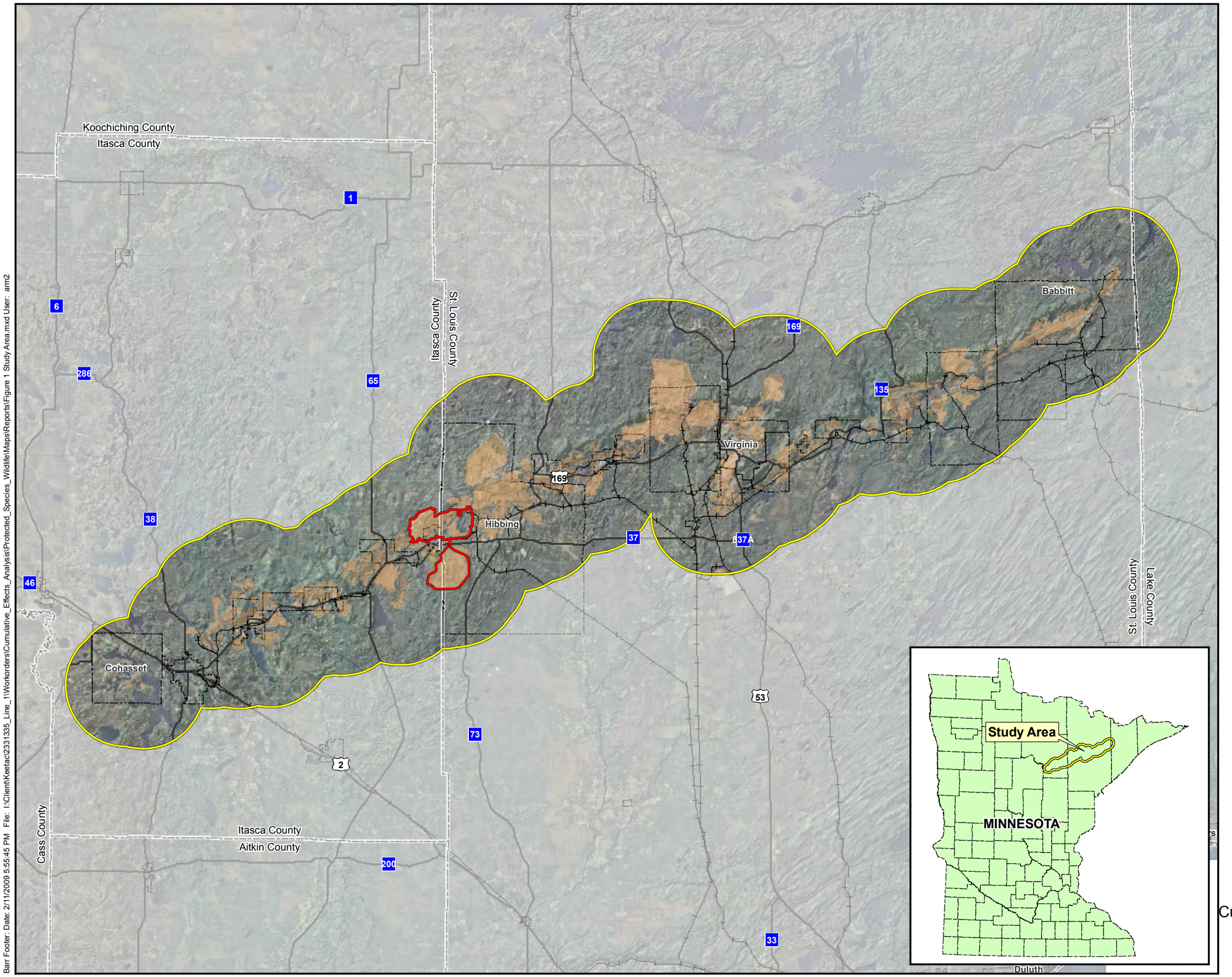
Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Coregonus zenithicus	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Cottus ricei	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Couesius plumbeus	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Etheostoma microperca	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Ichthyomyzon fossor	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Lepomis megalotis	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Moxostoma valenciennesi	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Notropis anogenus	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Insects	**8 habitats**	**8 habitats**	**2,239,811**	**1,702,236**	**537,575**	**24%**
Caraclea vertreesi	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Cicindela denikei	**4 habitats**	**4 habitats**	**487,821**	**513,462**	**(25,642)**	**(5%)**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Epidemia epixanthe michiganensis	**2 habitats**	**2 habitats**	**324,889**	**187,863**	**137,026**	**42%**
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Erebia disa mancinus	**1 habitat**	**1 habitat**	**260,017**	**92,329**	**167,689**	**64%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Hesperia leonardus leonardus	**1 habitat**	**1 habitat**	**56,583**	**101,459**	**(44,876)**	**(79%)**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
Lycaeides idas nabokovi	**3 habitats**	**3 habitats**	**283,012**	**174,701**	**108,311**	**38%**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Oeneis macounii	**2 habitats**	**2 habitats**	**226,429**	**73,242**	**153,187**	**68%**
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Oxyethira ecornuta	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Oxyethira itascae	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Phyciodes batesii	**3 habitats**	**3 habitats**	**283,012**	**174,701**	**108,311**	**38%**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Polycentropus milaca	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Pyrgus centaureae freija	**1 habitat**	**1 habitat**	**56,583**	**101,459**	**(44,876)**	**(79%)**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
Setodes guttatus	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Mammals	**10 habitats**	**12 habitats**	**5,730,965**	**4,916,637**	**814,327**	**14%**
Canis lupus	**9 habitats**	**10 habitats**	**911,780**	**757,220**	**154,561**	**17%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Grassland	0	64,931	(64,931)	
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Lynx canadensis	**8 habitats**	**8 habitats**	**927,228**	**681,294**	**245,934**	**27%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Microtus chrotorrhinus	**6 habitats**	**6 habitats**	**648,380**	**565,579**	**82,802**	**13%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%

Table 11. Change in Preferred Habitat Types for SGCN Species

Species Scientific Name	Predevelopment Landcover	Current Conditions Landcover	Pre-development Acres	Current Condition Acres	Acres Lost (acres gained)	Percent lost (Percent gained)
Myotis septentrionalis	**9 habitats**	**10 habitats**	**886,013**	**819,950**	**66,063**	**7%**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Phenacomys intermedius	**5 habitats**	**5 habitats**	**574,976**	**267,837**	**307,139**	**53%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Sorex fumeus	**3 habitats**	**3 habitats**	**486,446**	**165,571**	**320,876**	**66%**
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Spermophilus franklinii	**4 habitats**	**4 habitats**	**145,112**	**268,656**	**(123,544)**	**(85%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Spilogale putorius	**7 habitats**	**8 habitats**	**500,641**	**748,476**	**(247,835)**	**(50%)**
	Aspen-Birch (trending to Conifers)	Aspen/White Birch	261,391	277,692	(16,300)	(6%)
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 7, River Bottom Forest	Lowland Conifer-Deciduous mix, Lowland Deciduous Forest	39,105	17,651	21,454	55%
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
Synaptomys borealis	**3 habitats**	**3 habitats**	**348,546**	**194,594**	**153,952**	**44%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 6	Lowland Shrub	64,872	95,535	(30,663)	(47%)
	Circ39 = 8, Conifer Bogs and Swamps	Lowland Conifer Forest	260,017	92,329	167,689	64%
Taxidea taxus	**5 habitats**	**7 habitats**	**301,842**	**447,462**	**(145,620)**	**(48%)**
	Big Woods - Hardwoods (oak, maple, basswood, hickory)	Upland Deciduous Forest	18,830	23,387	(4,557)	(24%)
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
	Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)	Upland Conifer-Deciduous mix	59,860	5,293	54,567	91%
	No Similar Presettlement Cover Class	Cropland	0	21,914	(21,914)	
		Developed	0	162,528	(162,528)	
		Grassland	0	64,931	(64,931)	
	White Pine, Mixed White Pine and Red Pine	Upland Conifer Forest, Pine	166,570	67,950	98,620	59%
Molluscs	**1 habitat**	**1 habitat**	**104,586**	**113,207**	**(8,621)**	**(8%)**
Lasmigona compressa	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Ligumia recta	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Reptiles	**4 habitats**	**4 habitats**	**237,119**	**342,932**	**(105,813)**	**(45%)**
Chelydra serpentina	**2 habitats**	**2 habitats**	**75,950**	**63,335**	**12,616**	**17%**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Clemmys insculpta	**1 habitat**	**1 habitat**	**52,293**	**56,604**	**(4,311)**	**(8%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
Emydoidea blandingii	**2 habitats**	**2 habitats**	**52,293**	**121,535**	**(69,242)**	**(132%)**
	Circ39 = 5, Circ39 = 90, Lakes	Aquatic	52,293	56,604	(4,311)	(8%)
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Liochlorophis vernalis	**1 habitat**	**1 habitat**	**56,583**	**101,459**	**(44,876)**	**(79%)**
	Jack Pine Barrens and Openings	Upland Shrub	56,583	101,459	(44,876)	(79%)
Spiders	**2 habitats**	**2 habitats**	**23,657**	**71,662**	**(48,005)**	**(203%)**
Marpissa grata	**2 habitats**	**2 habitats**	**23,657**	**71,662**	**(48,005)**	**(203%)**
	Circ39 = 1-4, Wet Prairie	Marsh	23,657	6,731	16,926	72%
	No Similar Presettlement Cover Class	Grassland	0	64,931	(64,931)	
Grand Total	**11 habitats**	**13 habitats**	**9,993,825**	**8,658,348**	**1,335,478**	**13%**

Figures



Keetac Facility Boundary
Iron Range Study Area
DNR 2007 Mine Features
Cities
Counties
Roads and Highways
Railroads

10 5 0 10
Miles

Figure 1
STUDY AREA
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

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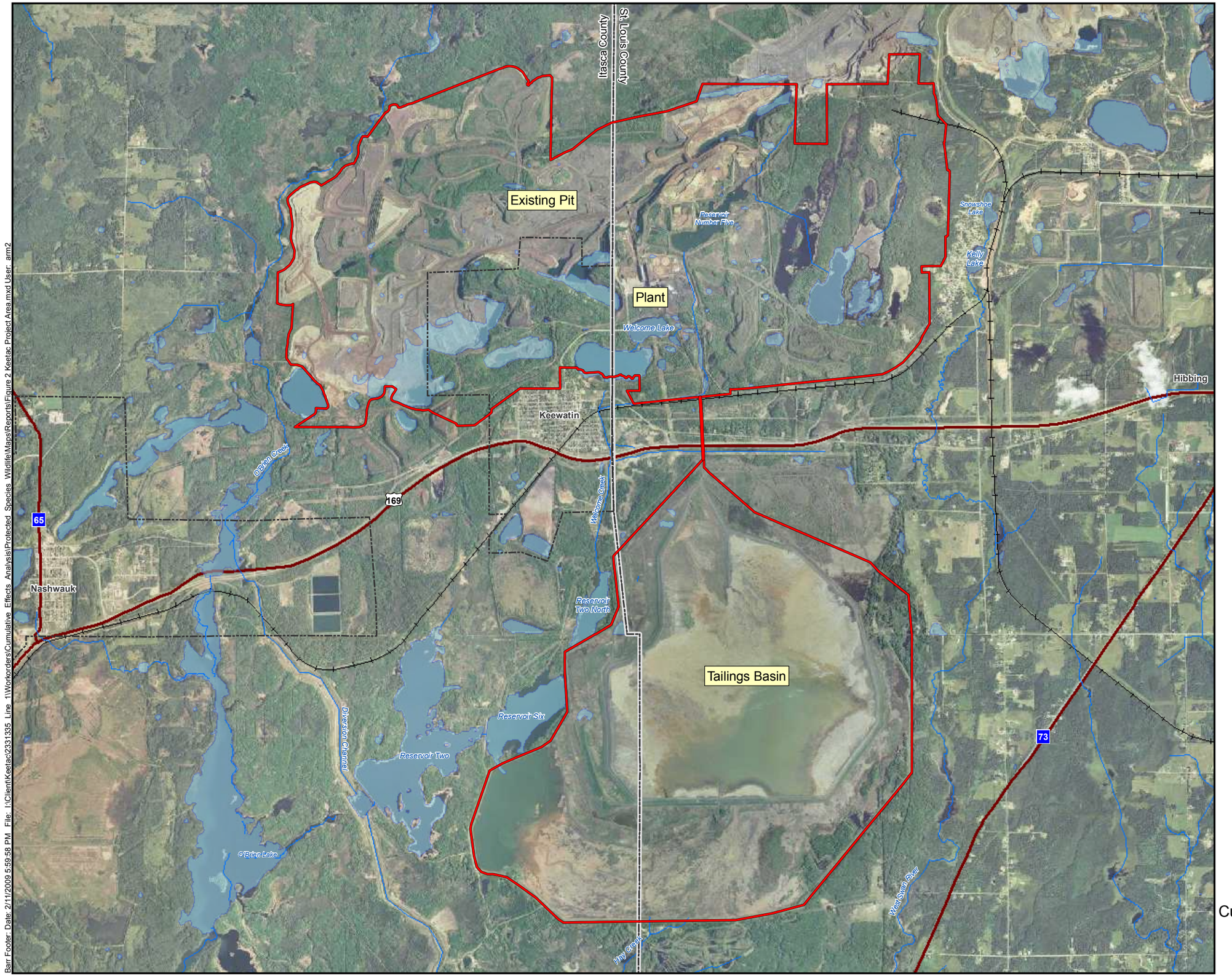

Keetac Facility Boundary
County
Cities
Streams
Lakes and Reservoirs
Roads and Highways
Railroads

4,000 2,000 0 4,000

Feet

Figure 2
KEETAC PROJECT SITE
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/11/2009 5:59:58 PM File: I:\Client\Keetac\2331335 Line -1\Workorders\Cumulative Effects Analysis\Protected Species\Wildlife\Maps\Reports\Figure 2 Keetac Project Area.mxd User: arm2

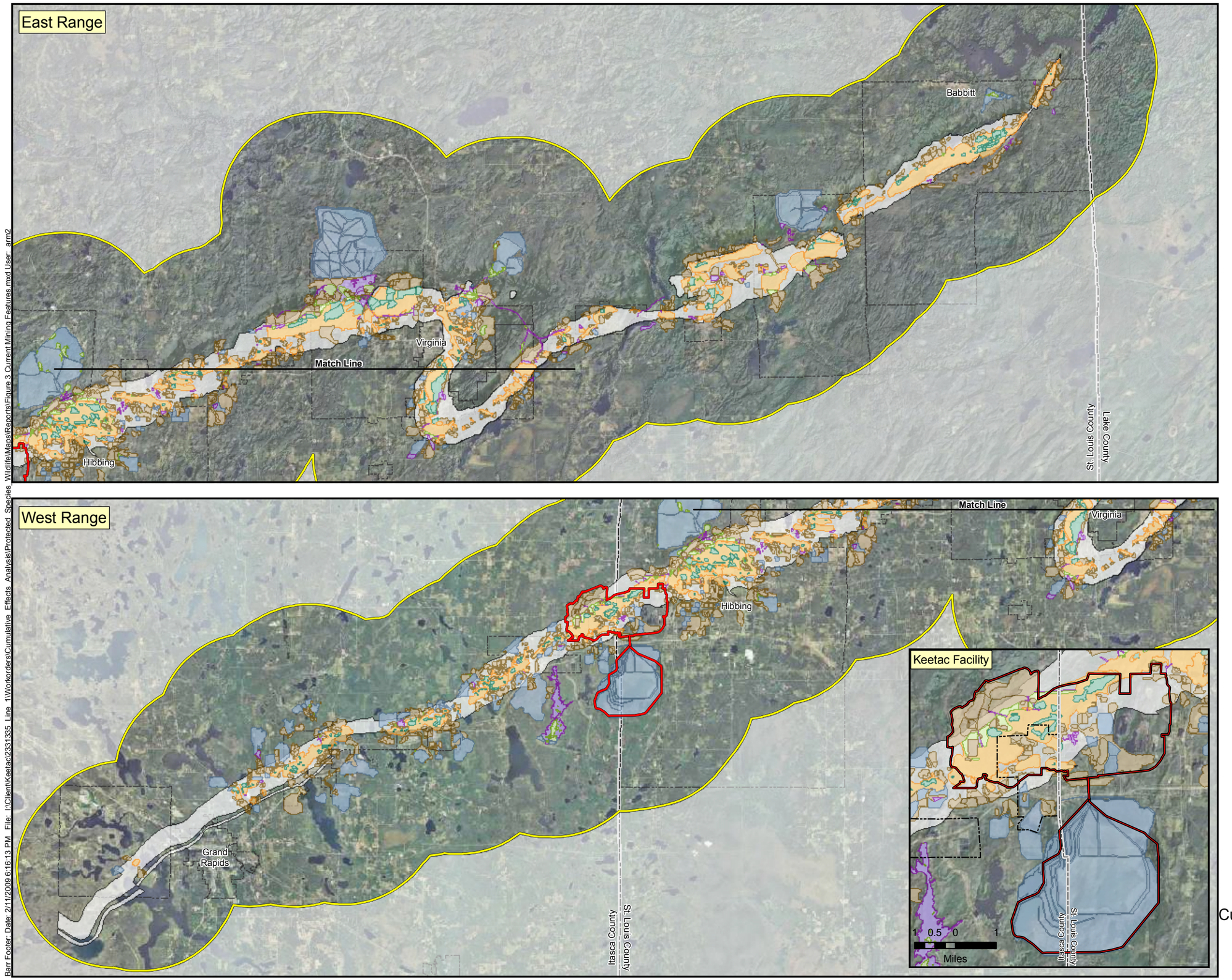

Figure 3
CURRENT MINING FEATURES
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

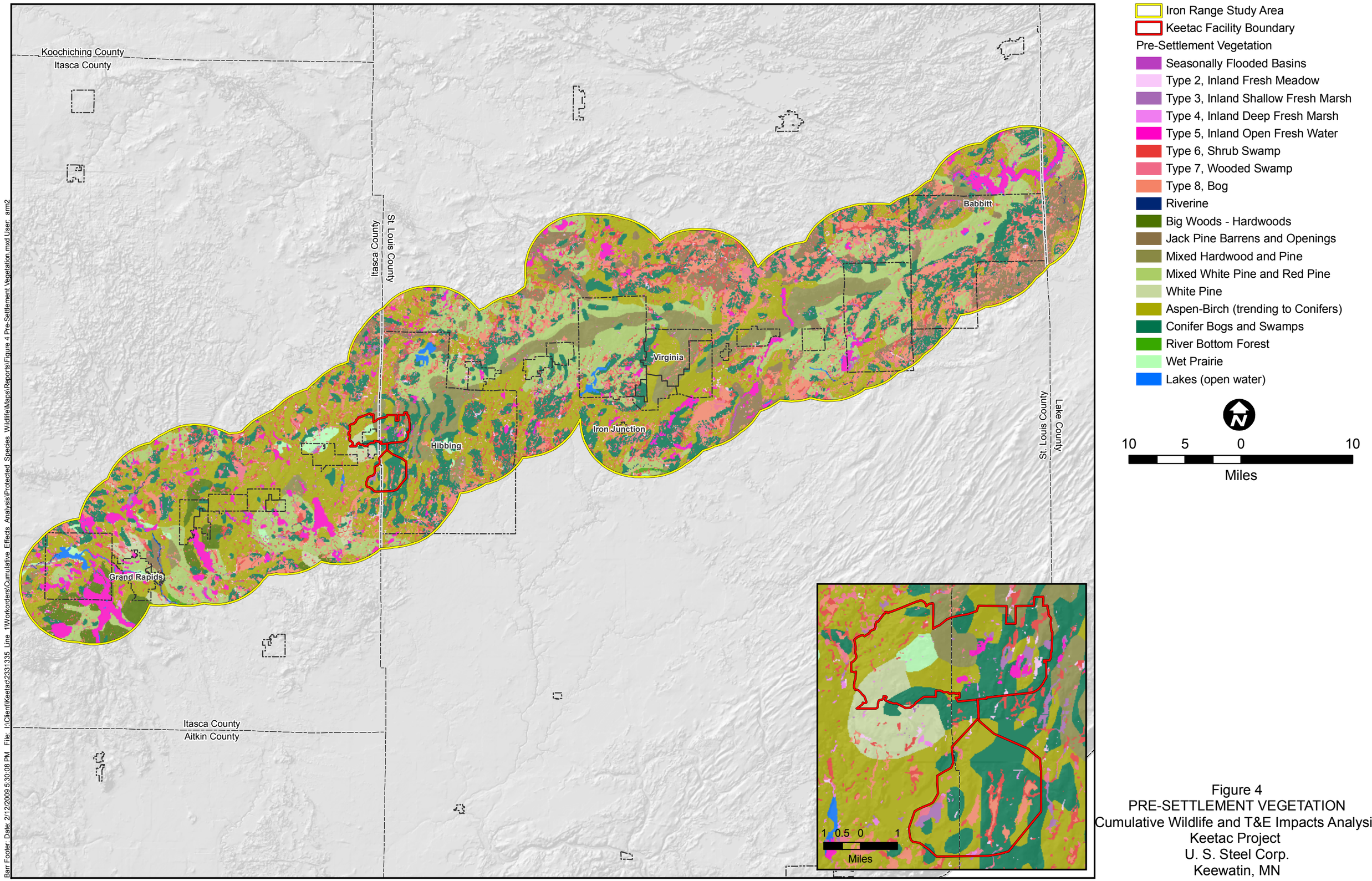

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Figure 4
PRE-SETTLEMENT VEGETATION
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

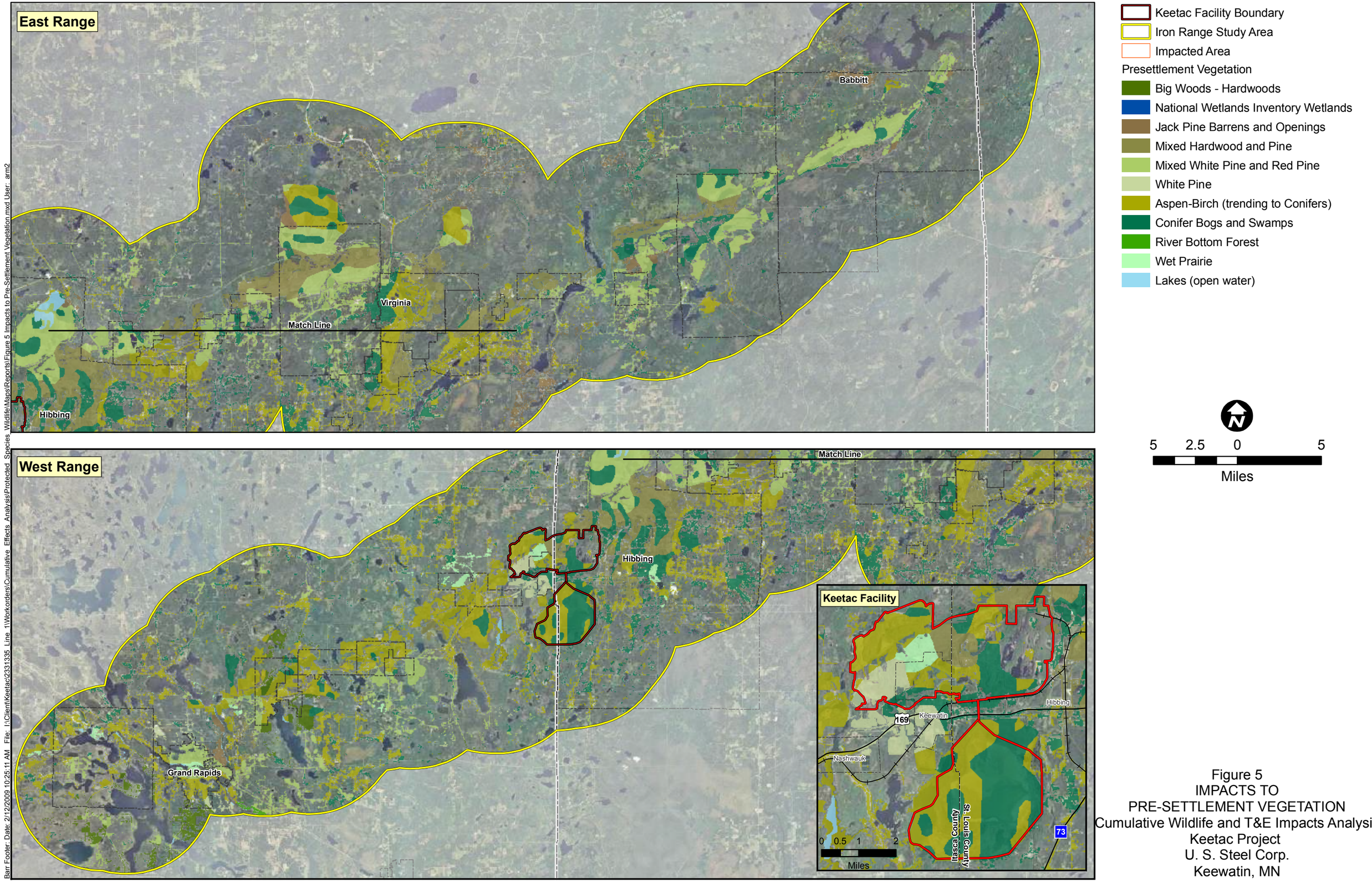

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Figure 5
IMPACTS TO
PRE-SETTLEMENT VEGETATION
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

East Range

West Range

Match Line

Babbitt

Virginia

Hibbing

Grand Rapids

Keetac Facility

Keewatin

Nashwauk

169

73

Itasca County

St Louis County

0 0.5 1 2

Miles

- Iron Range Study Area
- Keetac Facility Boundary

Existing Land Cover

- 2007 DNR Mine Feature Shapefile - High Impact
- 2007 DNR Mine Feature Shapefile - Moderate Impact
- 20' Buffer of MnDOT Railroads - Moderate Impact
- USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
- GAP-Barren Land
- USGS NLCD 2001 - Developed High Intensity
- USGS NLCD 2001 - Developed Medium Intensity
- USGS NLCD 2001 - Developed Low Intensity
- GAP- Mixed Development
- USGS NLCD 2001 - Developed Open Space
- GAP-Cropland
- USGS NLCD 2001 - Cultivated Crops
- Aquatic (Open Water)
- Grassland
- Lowland Conifer Forest
- Lowland Conifer-Deciduous mix
- Lowland Deciduous Forest
- Lowland Shrub
- Marsh
- Aspen/White Birch
- Pine
- Upland Conifer Forest
- Upland Conifer-Deciduous mix
- Upland Deciduous Forest
- Upland Shrub

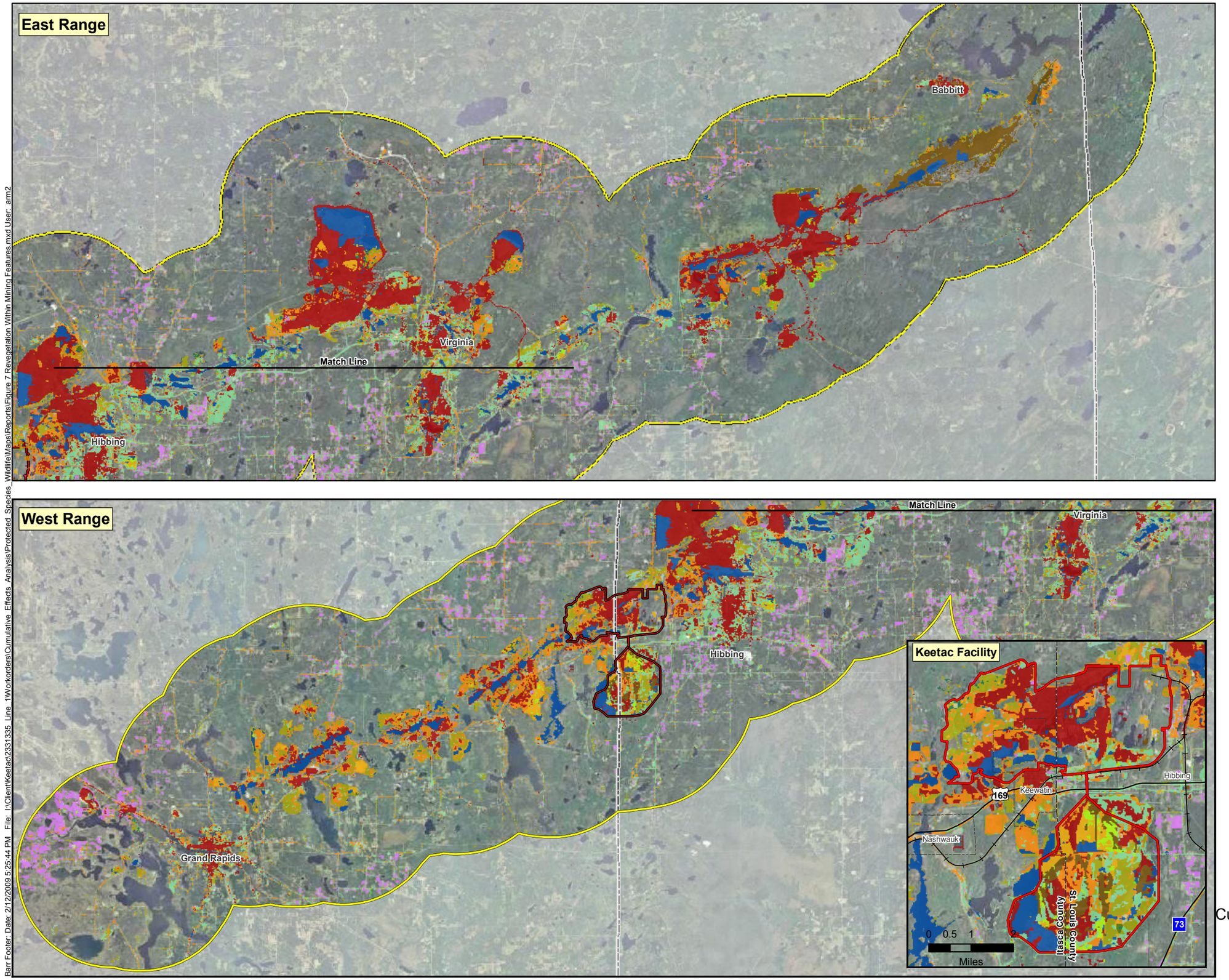
N

5 2.5 0 5

Miles

Figure 6
CURRENT CONDITIONS
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/11/2009 6:38:20 PM File: I:\Client\Keetac\2331335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species\Wildlife\Maps\Reports\Figure 6 Current Conditions.mxd User: arm2



Iron Range Study Area

Keetac Facility Boundary

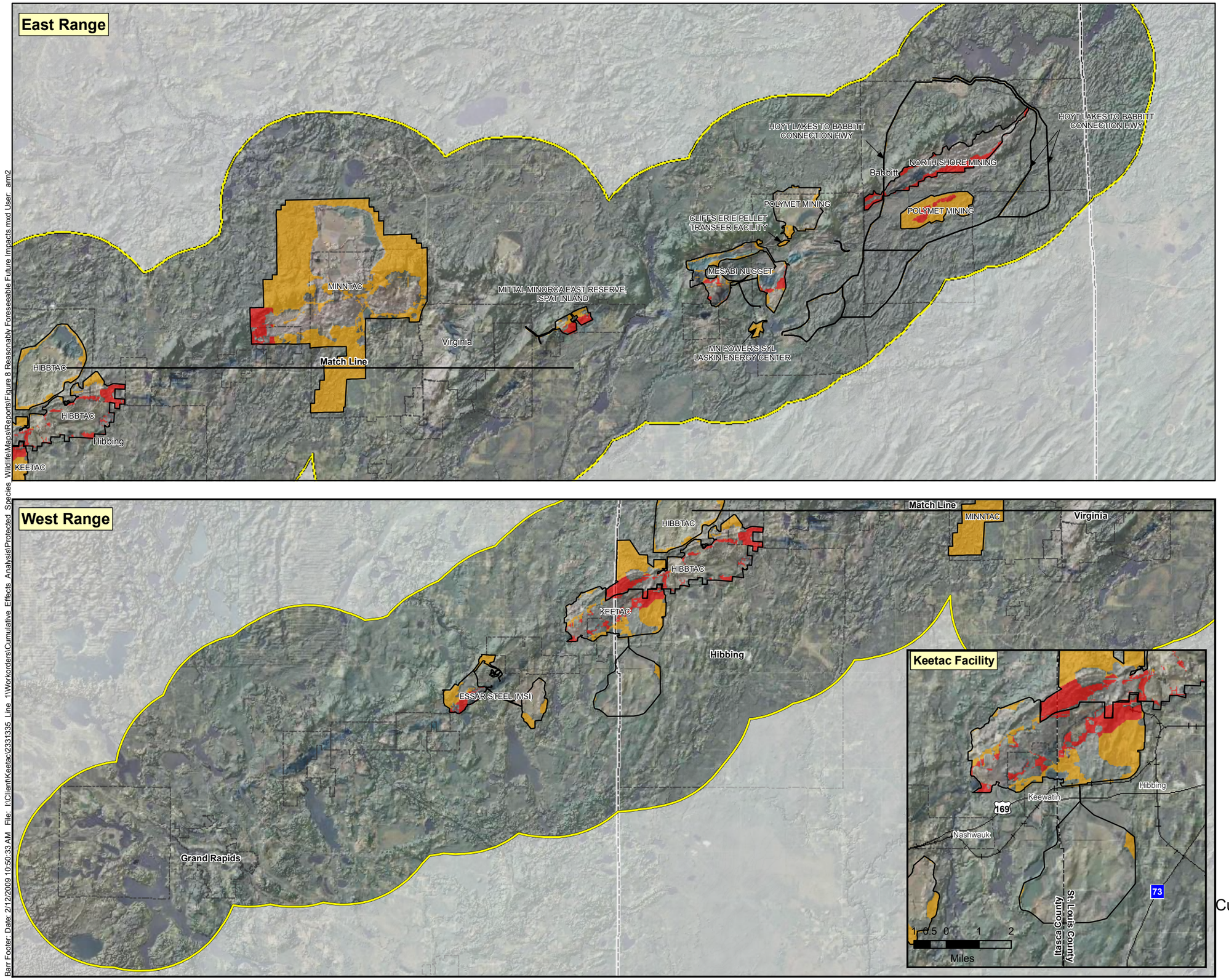
Existing Land Cover

- Barren Land
- Mixed Development
- Cropland
- Aquatic (Open Water)
- Grassland
- Lowland Conifer Forest
- Lowland Conifer-Deciduous mix
- Lowland Deciduous Forest
- Lowland Shrub
- Marsh
- Aspen/White Birch
- Pine
- Upland Conifer Forest
- Upland Conifer-Deciduous mix
- Upland Deciduous Forest
- Upland Shrub

5 2.5 0 5

Miles

Figure 7
REVEGETATION WITHIN MINING FEATURES
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN



Iron Range Study Area

Future Project Impact Areas

High Impact

Moderate Impact

5 2.5 0 5

Miles

Figure 8
REASONABLY FORESEEABLE FUTURE IMPACTS
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/12/2009 10:50:33 AM File: I:\Client\Keetac\2331335 Line -1\Workorders\Cumulative Effects Analysis\Protected Species_WildlifeMaps\Reports\Figure 8 Reasonably Foreseeable Future Impacts.mxd User: arm2

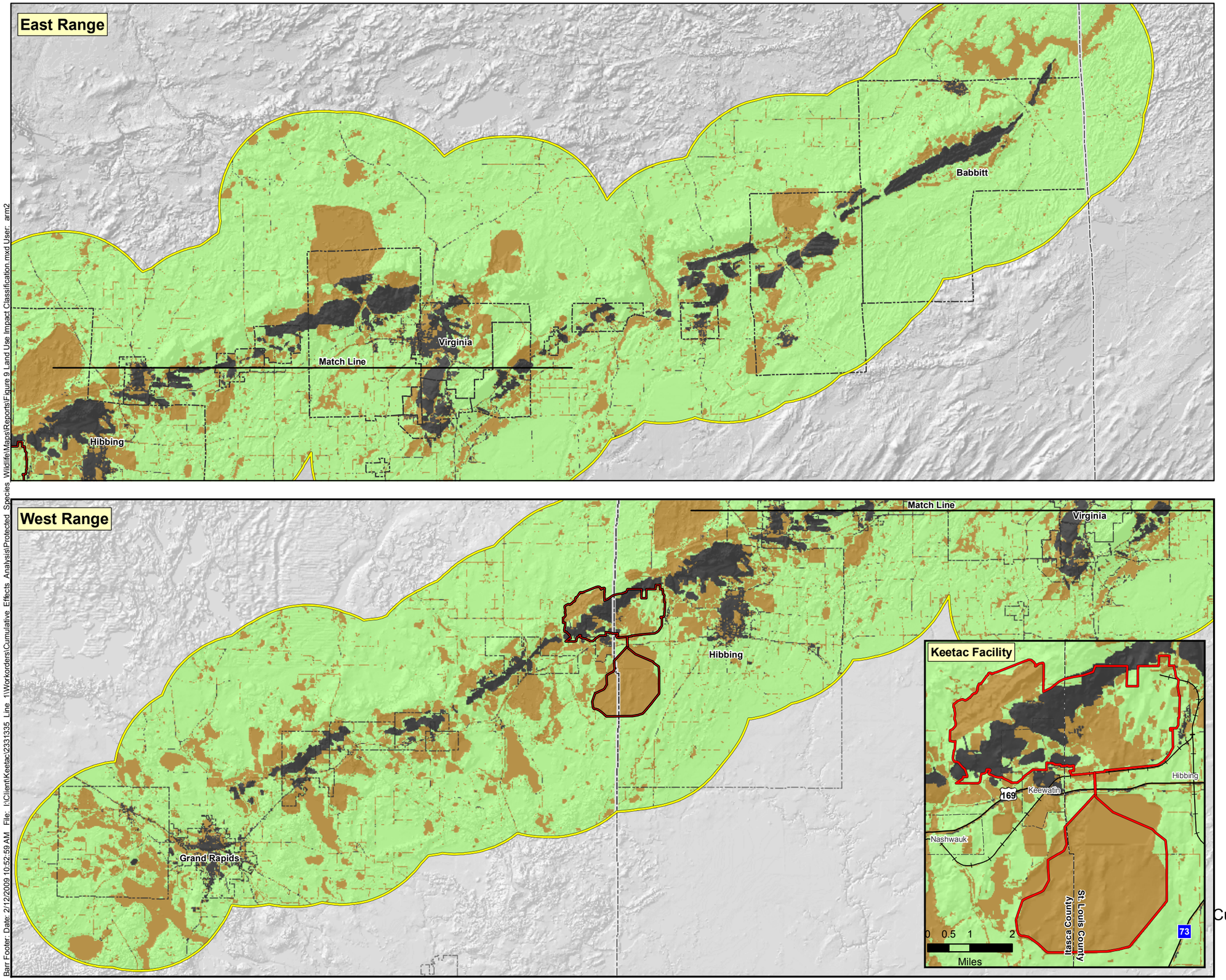


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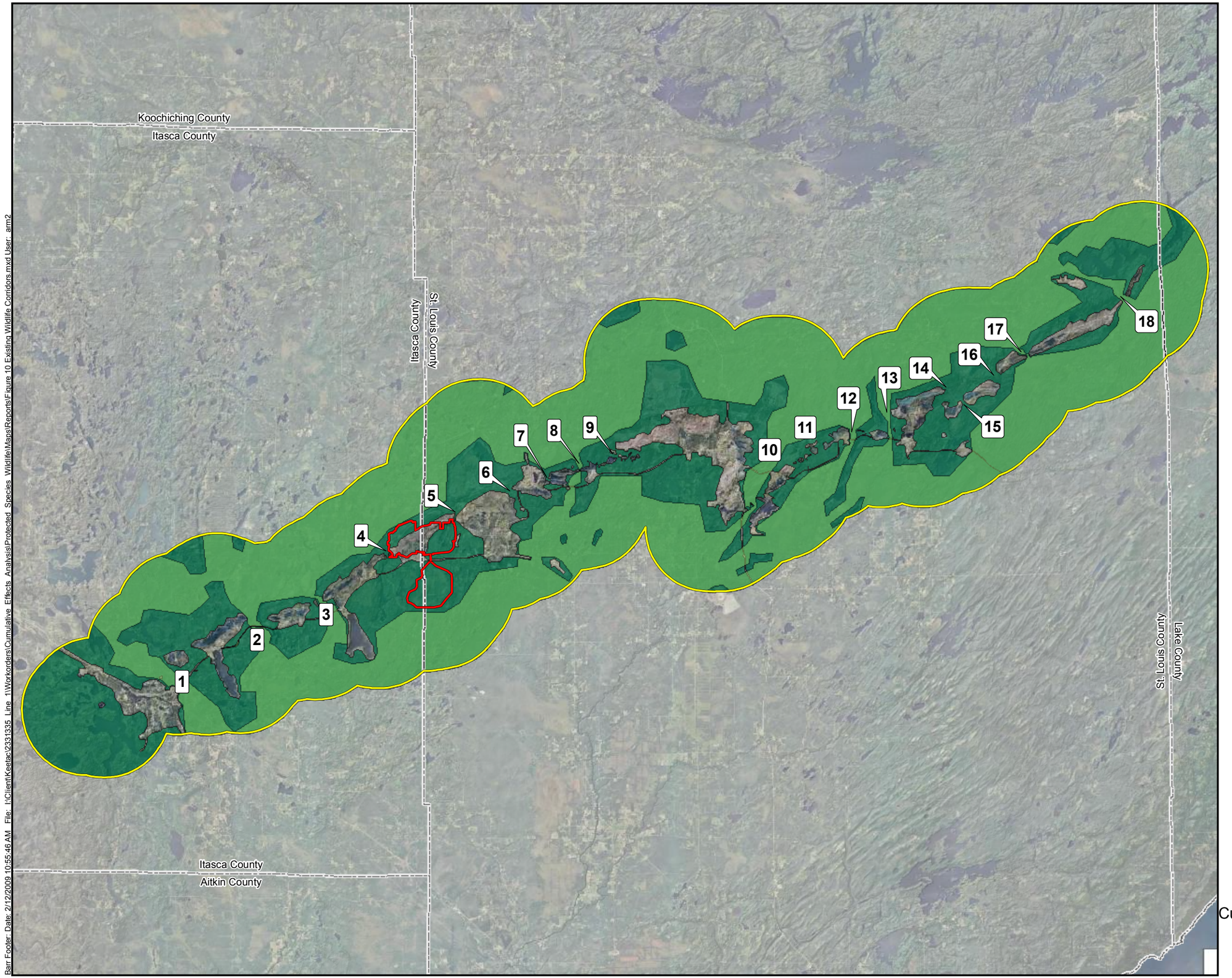
Figure 9
LAND USE IMPACT CLASSIFICATION
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN



Keetac Facility Boundary
Iron Range Study Area
High Quality Corridors
Moderate Quality Corridors

10 5 0 10
Miles

Barr Footer: Date: 2/12/2009 10:55:46 AM File: I:\Client\Keetac\2331335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species\Wildlife\Maps\Reports\Figure 10 Existing Wildlife Corridors.mxd User: am2

Figure 10
EXISTING WILDLIFE CORRIDORS
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

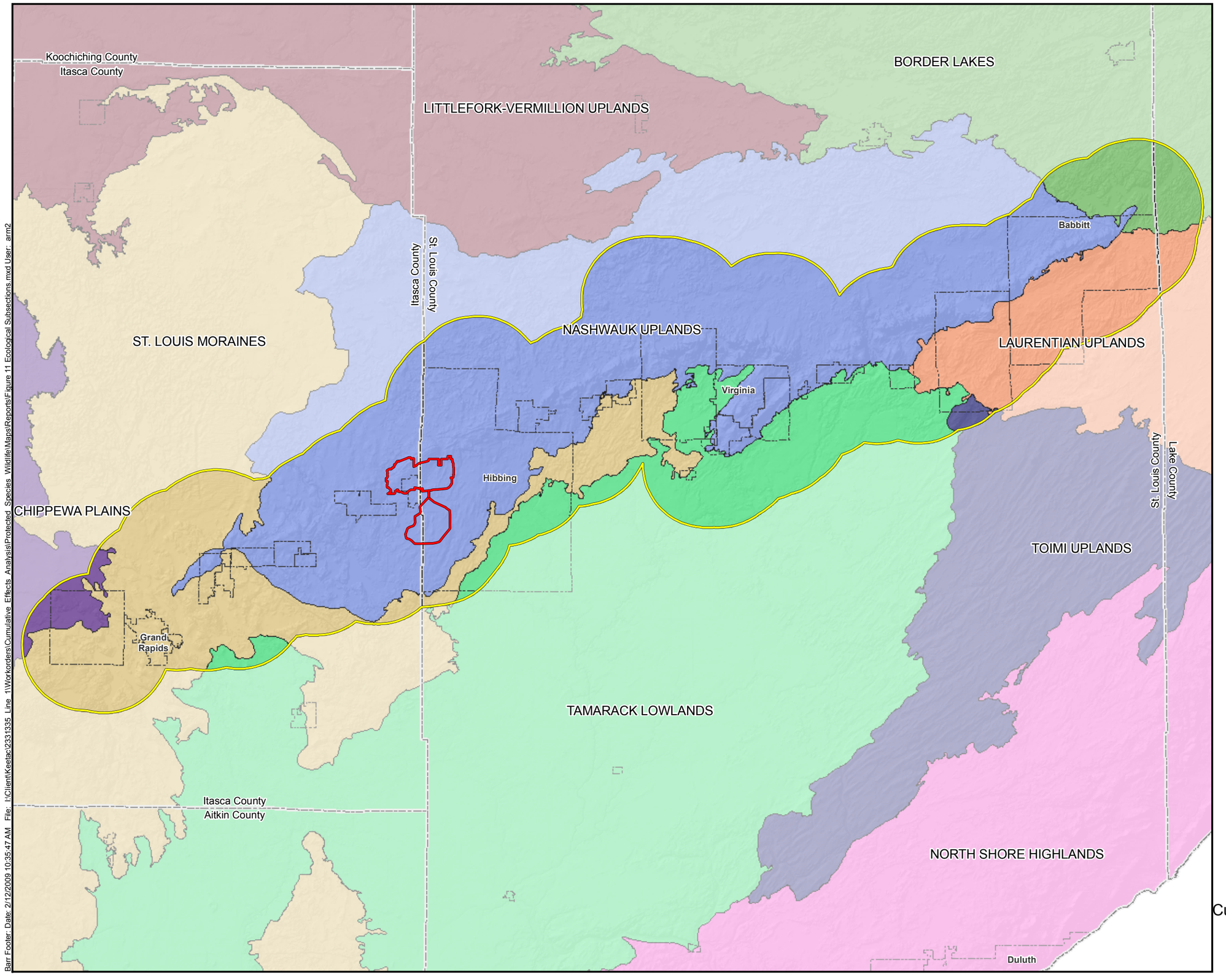


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Figure 11
ECOLOGICAL SUBSECTIONS
Cumulative Wildlife and T&E Impacts Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

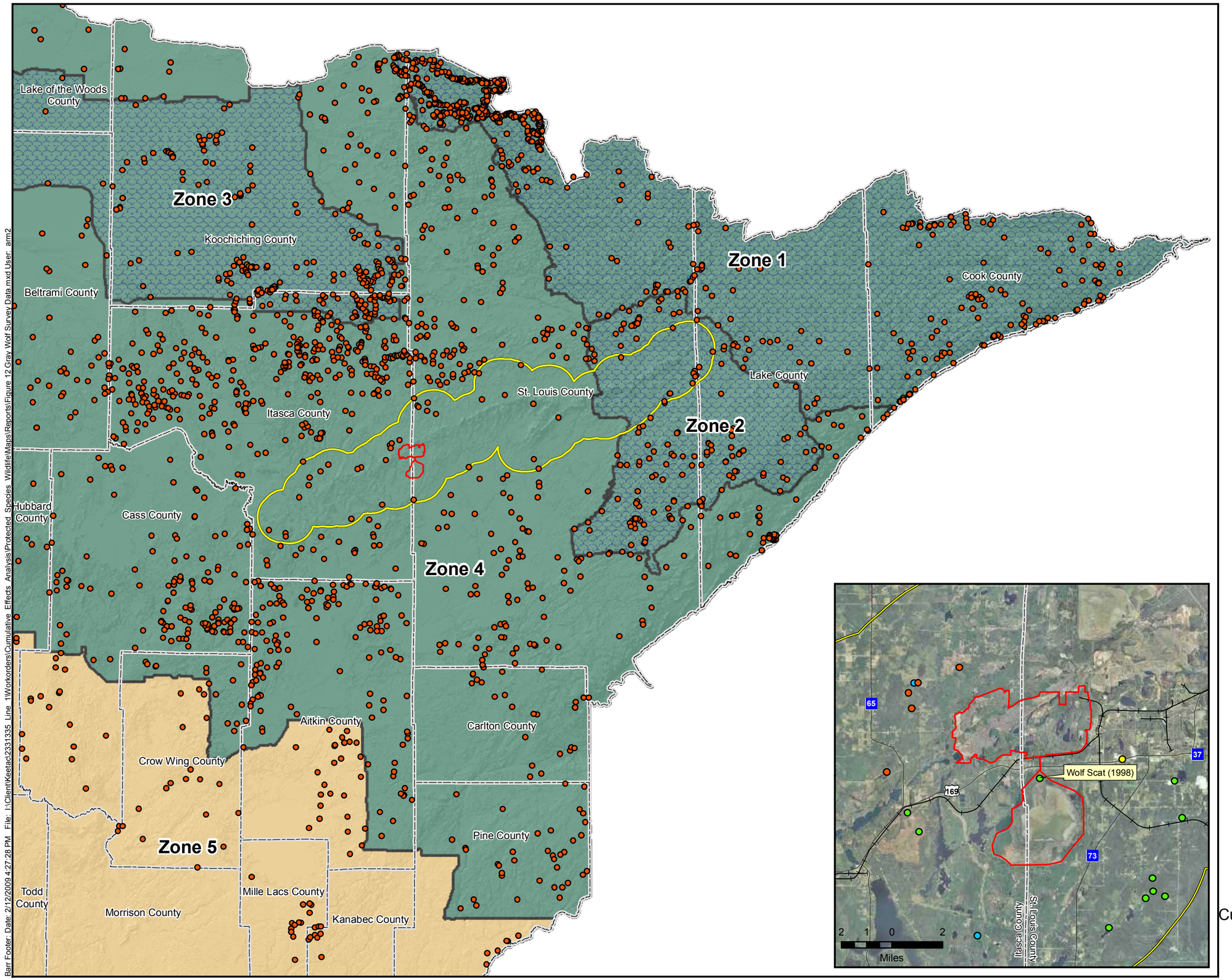

Figure 12
GRAY WOLF SURVEY DATA
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

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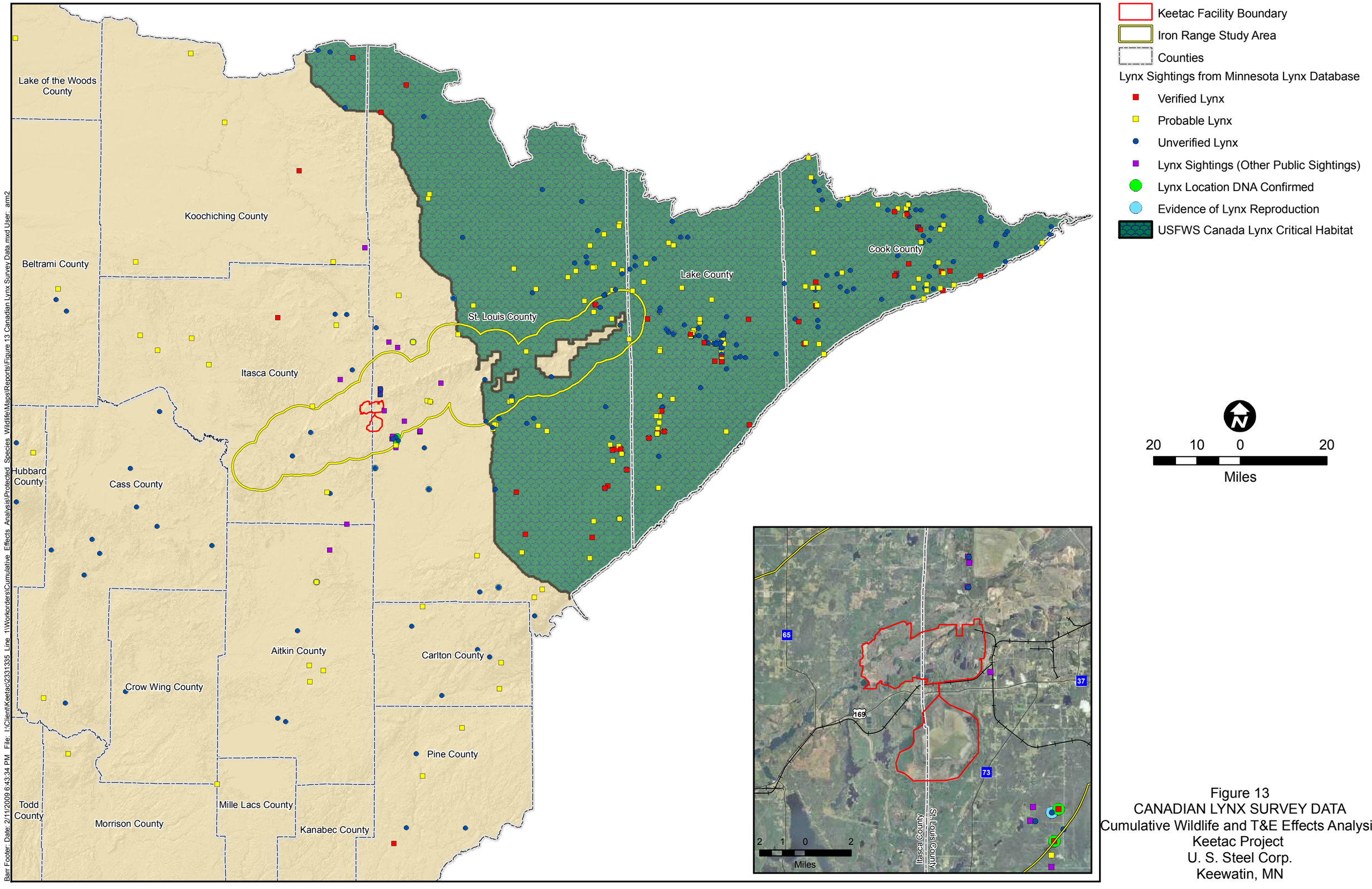

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Figure 13
CANADIAN LYNX SURVEY DATA
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Lake of the Woods County
Koochiching County
Beltrami County
Itasca County
St. Louis County
Lake County
Cook County
Hubbard County
Cass County
Aitkin County
Carlton County
Crow Wing County
Pine County
Todd County
Morrison County
Mille Lacs County
Kanabec County

Keetac Facility Boundary
Iron Range Study Area
Counties
NHIS 2005 Data
Active Nests Within 15 Mile Buffer
Inactive/Undetermined Nests Within 15 Mile Buffer
Distant Active/Inactive Nests
Active Nest Occurs Within 1 Mile Buffer
Inactive/Undetermined Nest Occurs Within 1 Mile Buffer

N
20 10 0 20
Miles

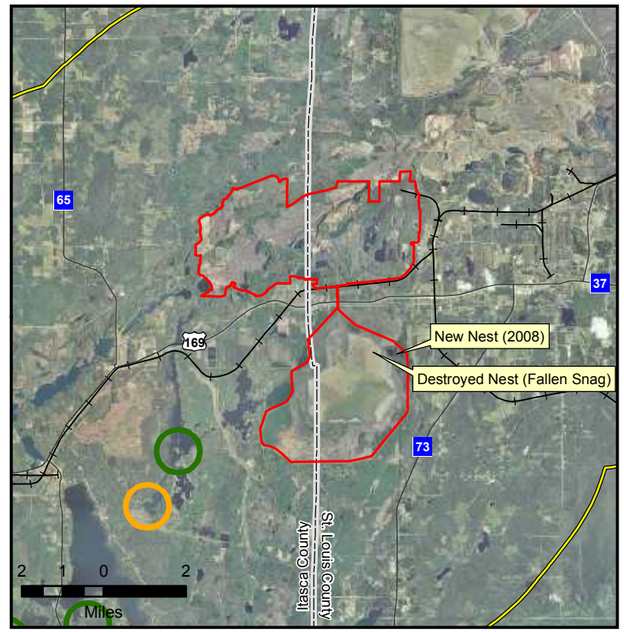
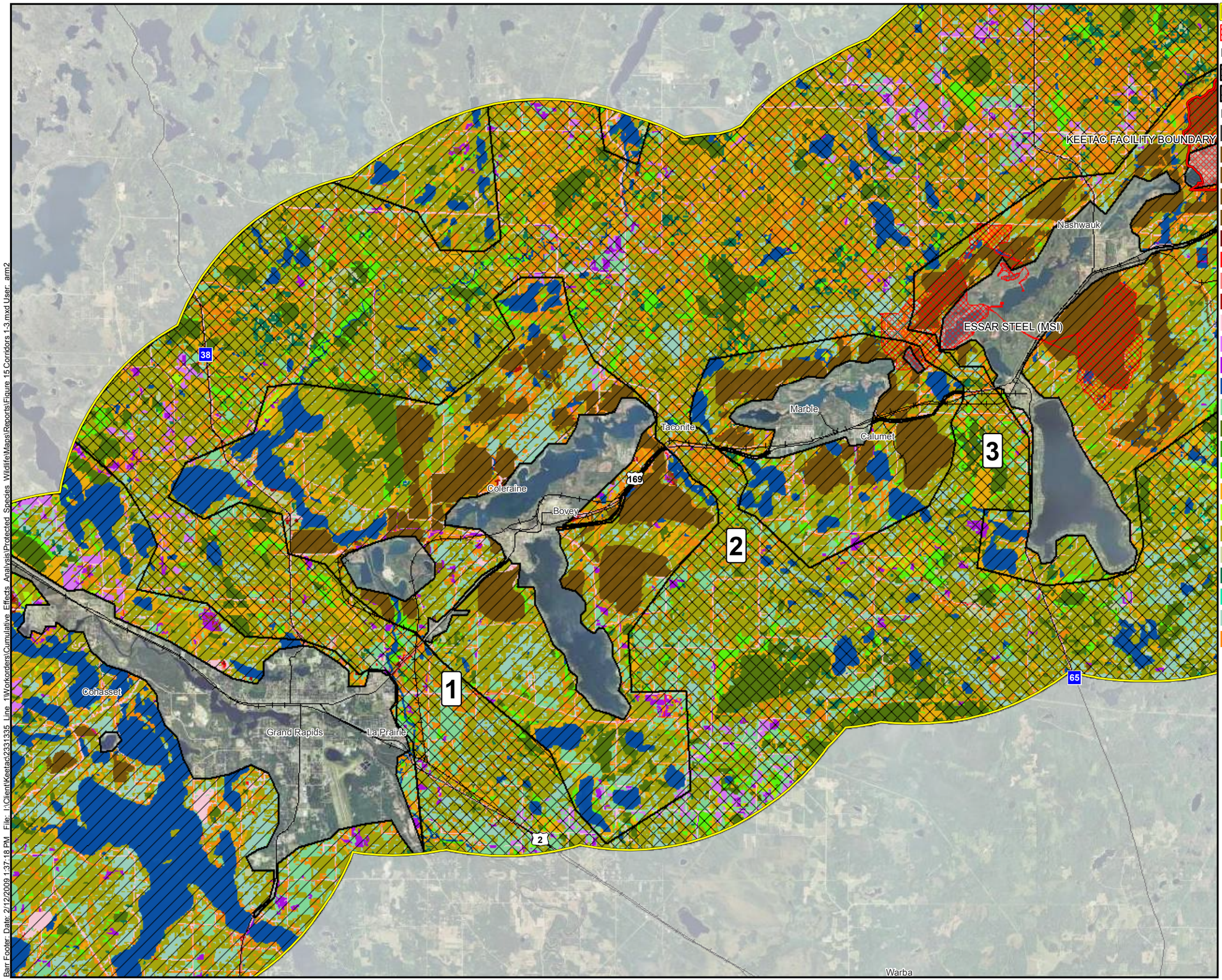


Figure 14
BALD EAGLE SURVEY DATA
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

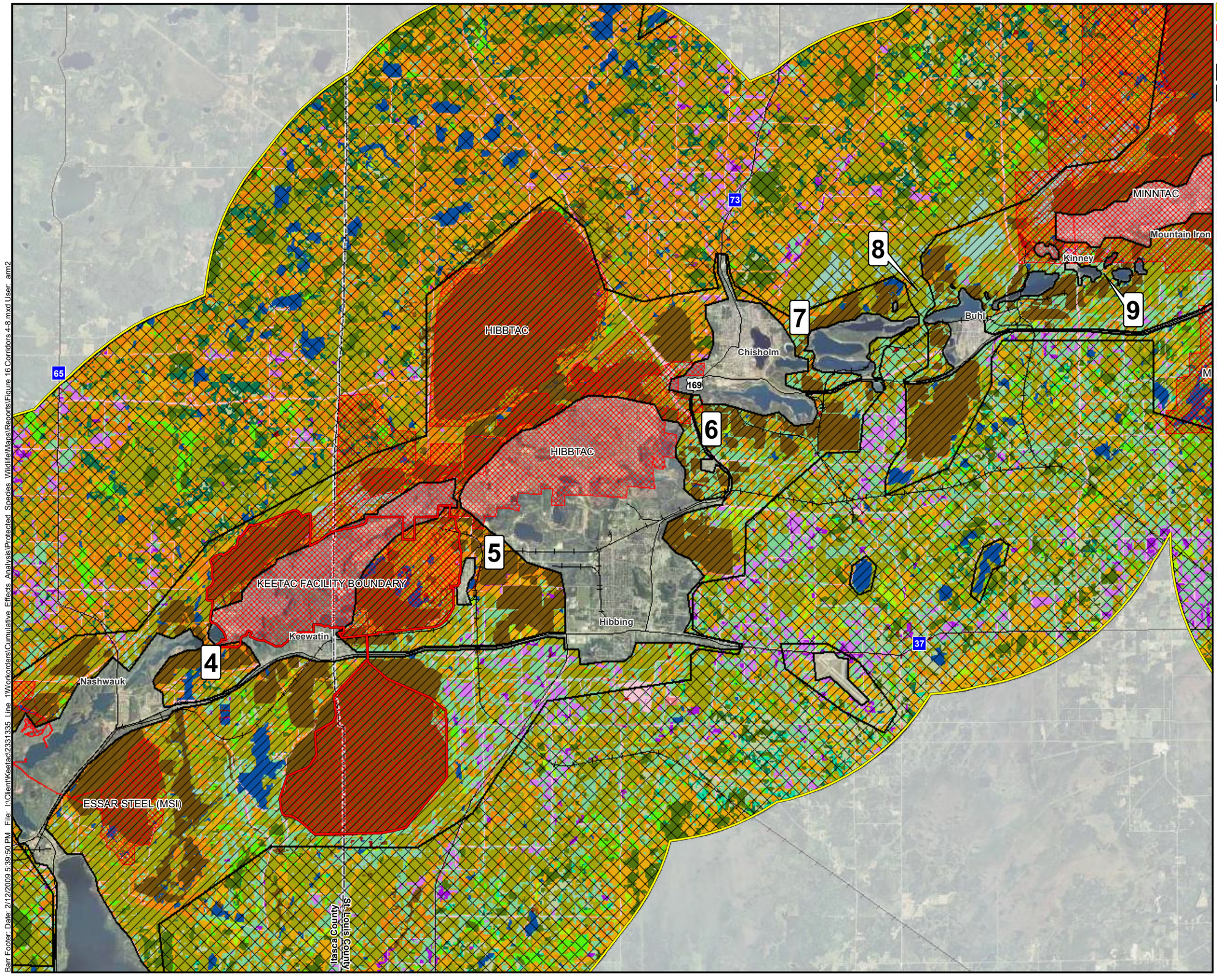


Iron Range Study Area
Future Mine Features
Existing Wildlife Corridors
High Quality
Moderate Quality
Existing Land Cover
2007 DNR Mine Feature Shapefile - High Impact
2007 DNR Mine Feature Shapefile - Moderate Impact
20' Buffer of MnDOT Railroads - Moderate Impact
USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
GAP-Barren Land
USGS NLCD 2001 - Developed High Intensity
USGS NLCD 2001 - Developed Medium Intensity
USGS NLCD 2001 - Developed Low Intensity
GAP- Mixed Development
USGS NLCD 2001 - Developed Open Space
GAP-Cropland
USGS NLCD 2001 - Cultivated Crops
Aquatic (Open Water)
Grassland
Lowland Conifer Forest
Lowland Conifer-Deciduous mix
Lowland Deciduous Forest
Lowland Shrub
Marsh
Aspen/White Birch
Pine
Upland Conifer Forest
Upland Conifer-Deciduous mix
Upland Deciduous Forest
Upland Shrub

2 1 0 2
Miles

Figure 15
CORRIDORS 1 - 3
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/12/2009 1:37:18 PM File: I:\Client\Keetac\23311335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species WildlifeMaps\Reports\Figure 15 Corridors 1-3.mxd User: arm2

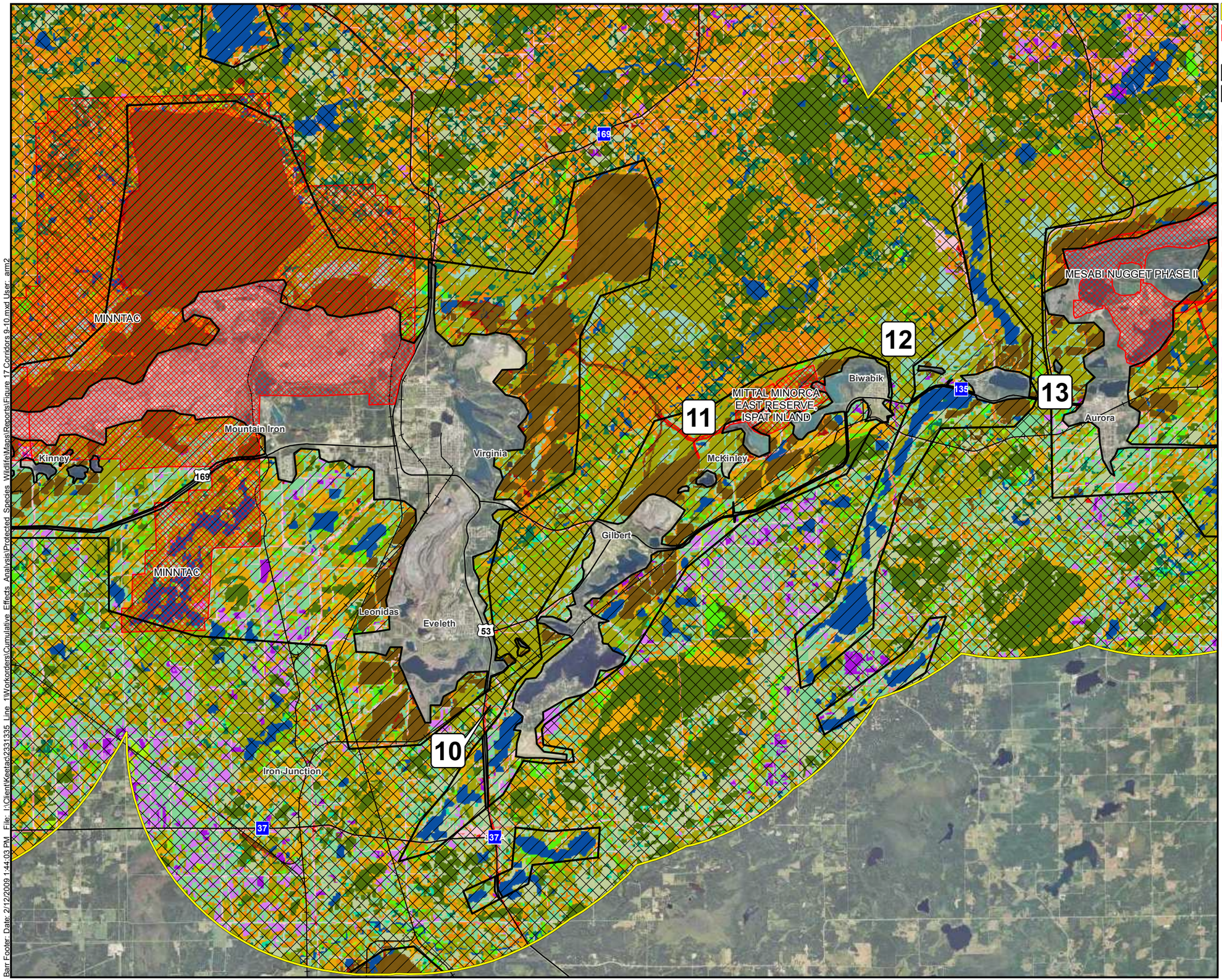


Iron Range Study Area
Future Mine Features
Existing Wildlife Corridors
High Quality
Moderate Quality
Existing Land Cover
2007 DNR Mine Feature Shapefile - High Impact
2007 DNR Mine Feature Shapefile - Moderate Impact
20' Buffer of MnDOT Railroads - Moderate Impact
USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
GAP-Barren Land
USGS NLCD 2001 - Developed High Intensity
USGS NLCD 2001 - Developed Medium Intensity
USGS NLCD 2001 - Developed Low Intensity
GAP- Mixed Development
USGS NLCD 2001 - Developed Open Space
GAP-Cropland
USGS NLCD 2001 - Cultivated Crops
Aquatic (Open Water)
Grassland
Lowland Conifer Forest
Lowland Conifer-Deciduous mix
Lowland Deciduous Forest
Lowland Shrub
Marsh
Aspen/White Birch
Pine
Upland Conifer Forest
Upland Conifer-Deciduous mix
Upland Deciduous Forest
Upland Shrub

2 1 0 2
Miles

Figure 16
CORRIDORS 4 - 9
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/12/2009 5:39:50 PM File: I:\Client\Keetac\2331335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species\Wildlife\Maps\Reports\Figure 16 Corridors 4-8.mxd User: arm2

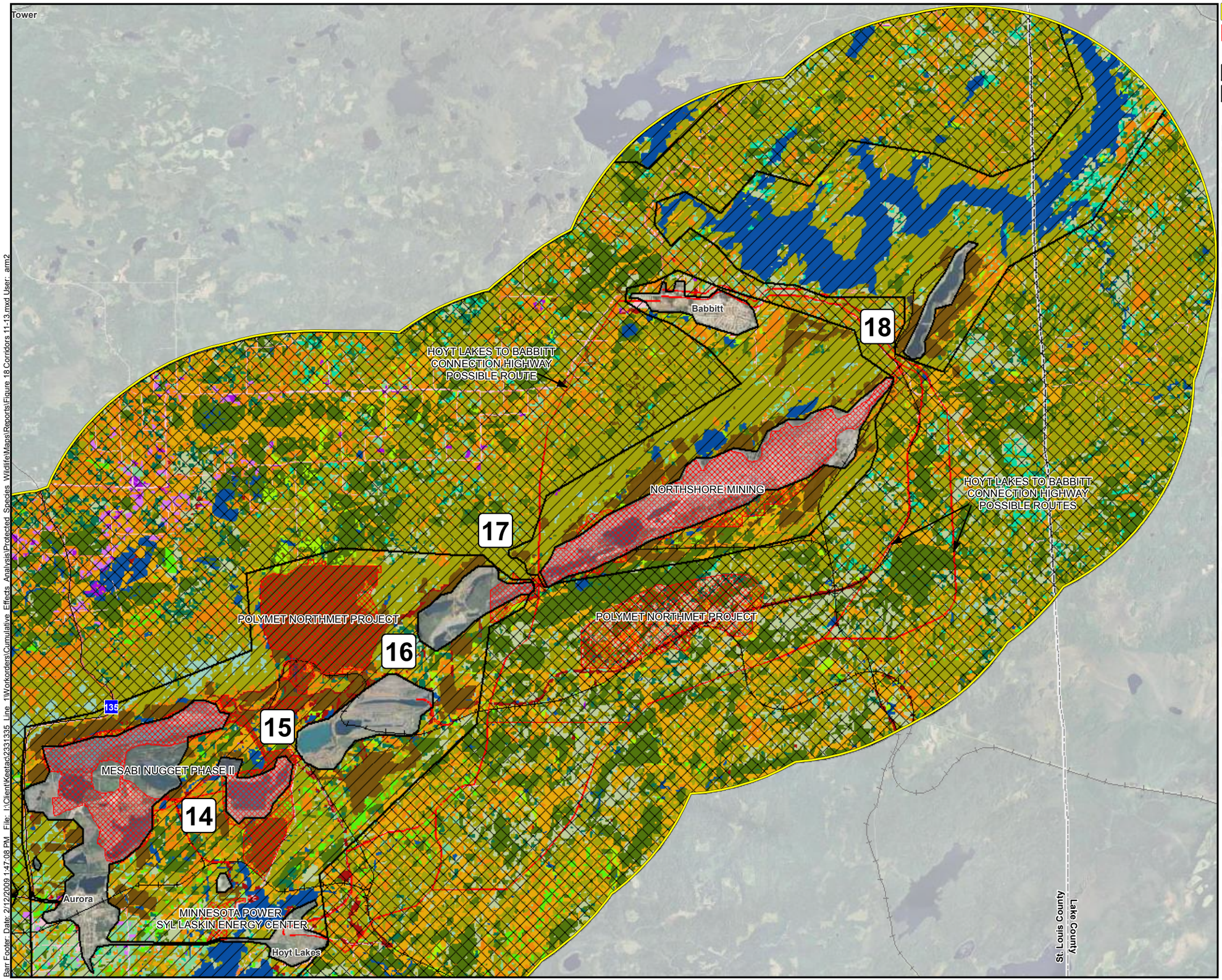


Iron Range Study Area
Future Mine Features
Existing Wildlife Corridors
High Quality
Moderate Quality
Existing Land Cover
2007 DNR Mine Feature Shapefile - High Impact
2007 DNR Mine Feature Shapefile - Moderate Impact
20' Buffer of MnDOT Railroads - Moderate Impact
USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
GAP-Barren Land
USGS NLCD 2001 - Developed High Intensity
USGS NLCD 2001 - Developed Medium Intensity
USGS NLCD 2001 - Developed Low Intensity
GAP- Mixed Development
USGS NLCD 2001 - Developed Open Space
GAP-Cropland
USGS NLCD 2001 - Cultivated Crops
Aquatic (Open Water)
Grassland
Lowland Conifer Forest
Lowland Conifer-Deciduous mix
Lowland Deciduous Forest
Lowland Shrub
Marsh
Aspen/White Birch
Pine
Upland Conifer Forest
Upland Conifer-Deciduous mix
Upland Deciduous Forest
Upland Shrub

2 1 0 2
Miles

Figure 17
CORRIDORS 10 - 13
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/12/2009 1:44:03 PM File: I:\Client\Keetac\23313335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species_WildlifeMaps\Reports\Figure 17 Corridors 9-10.mxd User: am2



Iron Range Study Area
Future Project Boundaries

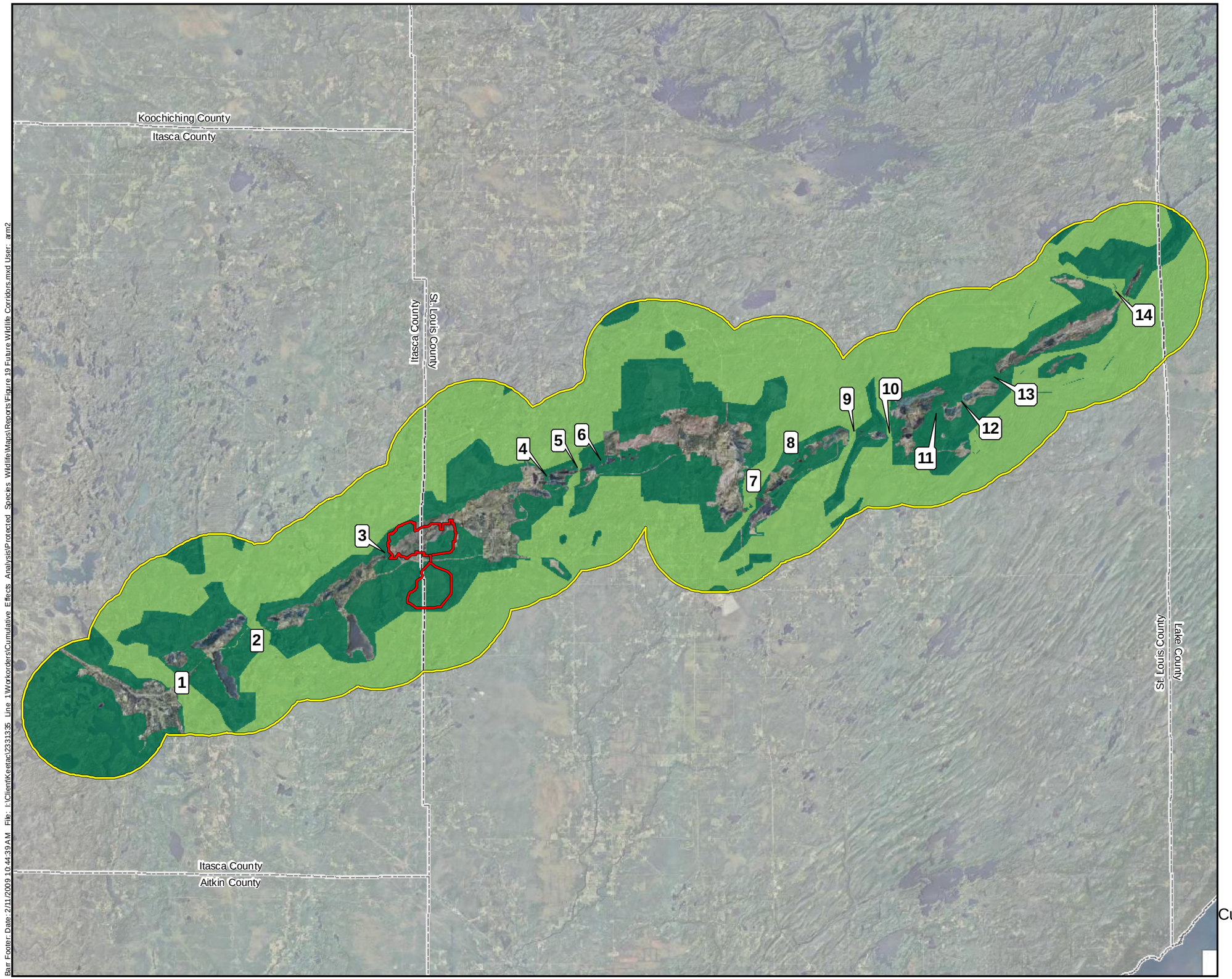
Existing Wildlife Corridors
- High Quality
- Moderate Quality

Existing Land Cover
- 2007 DNR Mine Feature Shapefile - High Impact
- 2007 DNR Mine Feature Shapefile - Moderate Impact
- 20' Buffer of MnDOT Railroads - Moderate Impact
- USGS NLCD 2001 - Barren Land (Rock/Sand/Clay)
- GAP-Barren Land
- USGS NLCD 2001 - Developed High Intensity
- USGS NLCD 2001 - Developed Medium Intensity
- USGS NLCD 2001 - Developed Low Intensity
- GAP- Mixed Development
- USGS NLCD 2001 - Developed Open Space
- GAP-Cropland
- USGS NLCD 2001 - Cultivated Crops
- Aquatic (Open Water)
- Grassland
- Lowland Conifer Forest
- Lowland Conifer-Deciduous mix
- Lowland Deciduous Forest
- Lowland Shrub
- Marsh
- Aspen/White Birch
- Pine
- Upland Conifer Forest
- Upland Conifer-Deciduous mix
- Upland Deciduous Forest
- Upland Shrub

2 1 0 2
Miles

Figure 18
CORRIDORS 14 - 18
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

Barr Footer: Date: 2/12/2009 1:47:08 PM File: I:\Client\Keetac\23313335 Line 1\Workorders\Cumulative Effects Analysis\Protected Species WildlifeMaps\Reports\Figure 18 Corridors 11-13.mxd User: arm2



Iron Range Study Area
Keetac Facility Boundary
High Quality Corridors
Moderate Quality Corridors

10 5 0 10
Miles

Figure 19
FUTURE WILDLIFE CORRIDORS
Cumulative Wildlife and T&E Effects Analysis
Keetac Project
U. S. Steel Corp.
Keewatin, MN

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