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1.0 INTRODUCTION

1.1. Study Overview

PolyMet Mining Company, Inc. (PolyMet) proposes to construct an open pit low grade polymetallic mineral mine in northern Minnesota. This project, called the NorthMet Mine and Ore Processing Facilities Project (mine project), is located in St. Louis County on the eastern end of the Mesabi Iron Range, about 60 miles north of Duluth, and 6 miles south of Babbit, Minnesota (Mine Site). PolyMet plans to mine and process polymetallic ore from the northwest portion of the Duluth Complex. The ore contains copper, nickel, gold, platinum, palladium, and cobalt. PolyMet plans to operate a processing facility at the Cliffs Erie (former LTV) mill near Hoyt Lakes, Minnesota, that will produce copper cathode, and separate platinum/palladium group metals sulfide and nickel/cobalt hydroxide concentrates, for off-site shipment and treatment.

This project would impact over 3,000 acres of habitat used by wildlife, including species of concern to federal and state agencies. Habitats that would be affected by the project include conifer forest (comprised primarily of black spruce[1], jack pine, tamarack, and balsam fir), deciduous forest (comprised primarily of trembling aspen and paper birch), mixed conifer/deciduous forest, riparian (dominated by speckled alder, red osier dogwood, and willow), and wetland (dominated by sedges, cat-tail, Labrador-tea, leatherleaf, and sphagnum moss).

Wildlife species of concern (and federal/state status) that could be impacted include bald eagle (federal threatened), gray wolf (federal threatened and state special concern), Canada lynx (federal threatened), mountain lion (state special concern), least weasel (state special concern), northern goshawk (U.S. Department of Agriculture [USDA] U.S. Forest Service [USFS] Region 9 sensitive species), and boreal owl (USFS Region 9 sensitive species). Loss of habitat for these species was identified as an important issue by state (Berg 2000) and federal (Vora 2000a) agencies during meetings regarding the proposed project.

Several wildlife studies have been conducted in the area. Terrestrial and aquatic ecosystems in the vicinity of the NorthMet Mine Site were studied as part of the Minnesota Environmental Quality Board Regional Copper-Nickel Study (Johnson and Lieberman 1979, Sather et al. 1979) in the late 1970s; this study included the NorthMet Mine Site. In July and August of 1999, Foth and Van Dyke (1999) conducted general surveys for plant and animal species of concern that may be found on the NorthMet Mine Site. The USFS prepared an Environmental Assessment (EA) for the Reservoir Analysis Area in 1999 (USFS 1999). The analysis area included portions of the proposed NorthMet Mine Site, primarily near Dunka Road. ENSR (2000) conducted studies of wildlife and their habitats on the Mine Site during winter 2000. ENSR also conducted surveys of wildlife and their habitats on lands immediately to the east of the NorthMet Mine Site, as part of the Mesaba Mine Project site evaluation for TeckCominco, Inc., during fall and winter of 2002 and 2003.

To supplement information gathered during these surveys, ENSR conducted surveys of fish and wildlife and their habitats during late June 2004. This report describes the results of these recent surveys. The objectives of the study were to:

- Determine general wildlife use of the study area;
- Determine the presence of wildlife species of concern; and
- Identify important habitats used by fish and wildlife.

This information will be used to support project environmental review and permitting efforts and to identify additional data collection requirements.

[1] Common and scientific names for plants and animals given in this report are in Appendix A.

1.2. Acknowledgements

ENSR appreciates the assistance of Jim Scott (PolyMet) in setting up the project and coordinating activities with other PolyMet personnel. Sherry Phillips, Dan Ryan, and Robin Vora (USFS) provided wildlife and habitat information for the site. Mindy Breva Steere (Minnesota Department of Natural Resources; DNR) provided information on rare plant and animal species that could be found in the area. John Borovsky (Barr Engineering) managed the project and provided logistical and technical support. Tim Anderson (Barr Engineering) prepared maps and provided Geographic Information System (GIS) analysis.

2.0 STUDY AREA

The Mine Site is 6 miles south of the village of Babbit, Minnesota. It is 1.5 to 2 miles south of the active Northshore Mining Company open-pit taconite mine and 8.3 miles east of Cliffs Erie's open-pit taconite mine and processing operations (Figure 2-1). The privately run Duluth Mesabi and Iron Range Railroad crosses the property. The Mine Site encompasses approximately 3,015 acres in Township 59 North, Range 13 West, Sections 1, 2, 3, 9, 10, 11, and 12 in St. Louis County, Minnesota. The property is zoned for mining, and PolyMet has a 100 percent leasehold interest in the property. The mineral rights are owned by U.S. Steel, and the surface is managed by the Forest Service. The Mine Site, which is in a previously logged forest area, is located in the Partridge River drainage, about 3 miles south of Iron Lake and the Laurentian Divide. The Partridge River is in the watershed of the East St. Louis River, which discharges into Lake Superior.

The study primarily focused on portions of the Mine Site located north of the Dunka Road. Most effort was spent surveying within the proposed mine pit footprint. Calling surveys for owls, northern goshawks, and wolves were conducted using pre-recorded calls and a megaphone, and had the potential to elicit responses from wolves and owls found to the south and west of the mine property, including Sections 8, 13, 14, 15, 16, and 17 in Township 59 North, Range 13 West.

In addition to conducting surveys of the Mine Site, ENSR also evaluated a waste rock storage area and rail route approximately 2½ miles west of the Mine Site, in Sections 13 and 14, Township 59 North, Range 14 West, and adjacent to the Dunka Road. This area is being considered by PolyMet as a potential site for storage of waste rock from the Mine Site and rail route between the Mine Site and Cliffs Erie mill.

Figure 2-1

3.0 METHODS

The evaluation of wildlife and their habitat use during early summer on the Mine Site was based on a review of the literature, personal communications with biologists familiar with wildlife and habitats in the area, natural resource database queries, and from field studies.

3.1. Literature Review and Personal Communications

ENSR reviewed the *Supplemental Site Specific Resource Information, August 1999,* report prepared by Foth and Van Dyke (1999). This report provided information on sensitive plants, cultural resources, and wetlands likely to be found in the study area, and on gray wolf and Canada lynx. ENSR reviewed the USFS *Biological Evaluation (BE) for the Reservoir Analysis Area, Laurentian Ranger District, Superior National Forest* and *Environmental Assessment for the Reservoir Analysis Area, Superior National Forest, Laurentian Ranger District* (USFS 1999). This evaluation was attached to the District Ranger's initial review of PolyMet's June 2, 1999, Plan of Operation. ENSR also reviewed the *Winter 2000 Wildlife Survey for the Proposed NorthMet Mine Site, St. Louis County, Minnesota* (ENSR 2000).

ENSR conducted telephone and in-person interviews with biologists and other agency staff with the DNR, U.S. Fish and Wildlife Service [USFWS], USFS Superior National Forest, and International Wolf Center, in conjunction with this survey, winter wildlife surveys conducted in 2000 on the site, and for surveys conducted during fall 2001 and winter 2002 on the Mesaba Mine Project site. A list of contacts, which includes telephone numbers and addresses, is provided in Appendix B.

3.2. Database Queries

The Minnesota DNR conducted an informal database query for ENSR during January 2000 and fall 2001 for wildlife species of interest and priority habitats likely to be found on or near the Mine Site. The survey did not identify any priority habitats, but determined that the Mine Site is likely to be used by gray wolves. ENSR requested a formal database search from the Minnesota Natural Heritage Program in June 2004. The results of that search showed that three rare plant species (least moonwort, neat spike-rush, and Torrey's manna-grass) are found in the area. In addition, one plant species (matricary grapefern) and one wildlife species (northern goshawk) were identified that are found in the area and are tracked by the Program, but are not given special status by the State of Minnesota.

ENSR contacted the USFWS for a list of federally-listed plant and animal species of concern for the study area, and obtained a copy of the Superior National Forest Regional Forester Sensitive Species Conservation Assessments list of species of concern for the Superior National Forest (Appendix C). ENSR reviewed the Superior National Forest Land and Resource Management Plan (LRMP; USDA Forest Service 1986, 2004) for Viability Indicator Species and Management Indicator Species. ENSR also reviewed the State of Minnesota DNR species of concern list on the DNR Website (http://www.dnr.state.mn.us/fish_and_wildlife/endangered_species/) and the *Birds of Fisherman's Point and Hoyt Lakes Area* (City of Hoyt Lakes 2000).

Based on the above discussions, database queries, and document reviews, the following were identified as species of interest for the summer 2004 survey on the NorthMet Mine Site (wildlife with a * are identified as Management Indicator Species in the 2004 LRMP for the Superior National Forest [USDA Forest Service 2004]):

Federally-listed Threatened and Endangered Species

- Bald eagle (threatened)*
- Canada lynx (threatened)
- Gray wolf (threatened)*

State-listed Threatened and Endangered Species

- Trumpeter swan
- Horned grebe
- Wilson's phalarope
- Common tern

State Species of Concern

- American white pelican
- Marbled godwit
- Least weasel
- Mountain lion

Federal Species of Concern

- Black tern
- Northern goshawk*
- Boreal owl
- Great gray owl
- Olive-sided flycatcher
- Black-throated blue warbler
- Bay-breasted warbler
- Connecticut warbler

Other Species of Concern (identified as Viability and Management Indicator Species in 1986 Superior National Forest LRMP)

- Northern leopard frog
- Common loon
- Hooded merganser
- Osprey
- Red-tailed hawk
- Ruffed grouse
- Spruce grouse
- American woodcock
- Killdeer
- Belted kingfisher
- Pileated woodpecker
- Black-backed woodpecker
- Brown creeper
- Golden-crowned kinglet
- Swainson's thrush

- Magnolia warbler
- Pine warbler
- Savannah sparrow
- Beaver
- Porcupine
- White-tailed deer
- Moose

3.3. Field Surveys

Field surveys were conducted to identify wildlife species and their habitat use during early summer. General observations of both of these components were conducted by vehicle and on foot.

3.3.1. General Survey Methodology

ENSR conducted surveys at the proposed Mine Site during June 22 to 26, 2004. A two-person team consisting of a senior wildlife biologist and a mid-level botanist conducted the surveys.

During the field surveys, information on wildlife and wildlife sign observed in the study area was recorded. Wildlife sign included calls, tracks, scat, and evidence of habitat use, such as foraging sign, nests, dens, and bedding sites. Binoculars were used to locate and identify wildlife and their habitats. The locations of wildlife, their sign, and their habitats used were recorded on aerial photographs and topographic maps. Time of day and weather conditions were also recorded during surveys.

3.3.2. Transect Surveys

Surveys were conducted during the day from a four-wheel drive vehicle along established roads, and on foot in the remaining areas. For walking surveys, the survey area was divided into four areas, nearly equal in size. The survey team generally followed a somewhat circular route that allowed them to survey a variety of wildlife habitats within each area, and to conduct calling surveys that would ensure good survey coverage over the entire survey area.

Observations of wildlife and their sign that were recorded during the surveys included information about the species and number of animals making the sign, habitat associated with wildlife and their sign, and general activity of the animal (where possible).

The survey team attempted to identify all tracks observed during transect surveys, and used this information to determine habitat use, as described in Becker et al. (1998). Tracks of interest included those of gray wolf, deer, moose, fisher, pine marten, and grouse. Techniques used for identifying tracks are given in Rezendes (1992), Halfpenny et al. (1995), and Foresman and Pearson (1998).

The track surveys focused on locating fresh tracks in soft soil and mud, which were new enough that they were clearly identifiable. Generally, these tracks were less than 4 days old. The direction of travel, species and number of animals making the tracks, and habitat use was noted

3.3.3. Northern Goshawk, Owl, and Gray Wolf Calling Surveys

Calling surveys for northern goshawk were conducted during the day, and during the night for owls and wolves, at pre-determined calling stations along each transect (Figure 3-1). A 10-watt amplifier, with a range of up to 2 miles, was used to broadcast the calls. Professionally recorded goshawk, owl, and wolf calls were played into the

amplifier. Visual and auditory observations of all wildlife that responded to calls during these surveys were recorded.

3.3.3.1. Northern Goshawk

Adult goshawk warning calls were broadcasted at calling stations during the day. Facing in a pre-determined direction, a series of calls were broadcasted for 30 seconds, followed by rotating 120 degrees and playing another 30-second series of calls. The final 30-second series were played after rotating an additional 120 degrees. Before initiating another round of calls, the survey team waited several minutes, looking and listening for responses to the broadcasted calls. This procedure was repeated at each calling station.

If a hawk responded to the calls, the species was determined based on visual and auditory observations. Since several species of hawks are found in the area that are likely to respond to northern goshawk warning calls if they have a nest nearby, the survey team also tried to locate the nests of hawks that responded to broadcasted calls.

3.3.3.2. Owls

Recordings of owls that could be found in the area, including boreal owl, great gray owl, barred owl, short-eared owl, saw-whet owl, long-eared owl, screech owl, and great horned owl were broadcasted at night at calling stations (see Figure 3-1; owl calls were not done at Stations C-5, C-9, and C-14).

Two call replications were conducted at each calling location, with each replication lasting approximately 1 minute. The male owl territorial calls were broadcasted in three directions during each replication. To start, the recording was played while facing a pre-determined direction, followed by a rotation of 120 degrees 20 seconds after the call began. The recording was then played for another 20 seconds in the new direction. This method was repeated once more, for the final 20 seconds of the call. Audible responses and visual observations of owls made during each broadcast were recorded.

3.3.3.3. Gray Wolf

Calling surveys for gray wolves were conducted in the evenings during both survey periods. Wolf calls are believed to play a role in maintaining wolf territories, and howling surveys in the past have achieved a 60 percent success rate in detecting wolves (Route 2000). Human vocalizations that imitate wolf howls, and recorded wolf calls, were broadcasted from calling stations. At each calling station, calls of a lone wolf and of several wolves in a pack were broadcasted for approximately 3 minutes. These were followed by human-made calls that lasted for approximately 1 minute (Harrington and Meche 1979). If wolves responded, the number of animals involved was estimated and recorded.

3.3.4. Habitat Assessment

Wildlife habitat features on the site, including plant species composition and structure and special features (snags, downed woody debris, rock outcrops, wetlands, and deer snow-intercept thermal [SIT] cover) were recorded during field surveys. In particular, we noted the species composition, density, and size (diameter at breast height [dbh]) of trees and shrubs seen near survey areas, and the use of snags and other special habitat features by wildlife. This information was recorded on aerial photographs, and, in conjunction with information on shrubs and herbaceous vegetation collected during surveys, was used to prepare a habitat map of the Mine Site (see back pocket of report).

Infrared aerial photographs were reviewed to identify areas on the Mine Site having similar vegetative cover (cover types; habitat types) based on the vegetative classification discussed below. All cover types were mapped to a 1-acre minimum polygon size. Photographs were then used in the field to verify cover types.

Wildlife habitats were primarily characterized based on whether the area was wetland or upland (based on guidance provided in Cowardin et al. 1979), and plant types (forbs/grassland, shrubland, forestland) and percent aerial coverage. If an area had >30 percent tree cover, it was coded as forested. If it had <30 percent tree cover, but >30 percent shrub cover, it was coded as shrubland. If an area had <30 percent forest cover and <30 percent tree cover, it was coded as emergent/bog (for wetlands), or disturbed or grassland/forb (for uplands). Forest stands were further characterized based on the percent cover of deciduous and conifer trees within the stand. Stands with >70 percent cover of deciduous or conifer trees were coded as forest deciduous or forest conifer, respectively. Stands with a mixture of conifer and deciduous trees (30 to 70 percent cover of each tree type) were classified as mixed.

In addition, stands were characterized by predominant tree size. If most trees were <4 inches dbh, the stand was classified as sapling. Sapling trees are generally less than 10 years old (Table 3-1; USDA Forest Service 2004). If trees were mostly 5-12 inches dbh, the stand was classified as pole/young mature forest. Pole/young mature stands are usually from 10 to 60 years in age. Stands dominated by trees >12 inches dbh were classified as mature. These stands are generally 60 years or older. This wildlife habitat classification system is similar to that developed by the Minnesota DNR (1993) Natural Heritage Program, in that it separates vegetation communities into upland and wetland habitat types based on vegetation characteristics, but differs in that it further divides forest communities based on tree size, and evaluates grassland/forb and shrub successional stages associated with recently-logged or disturbed forests. Table 3-2 summarizes the habitat classification criteria used to identify habitat cover types found on the mine property and provides corresponding habitat types based on the key to natural communities developed by the Minnesota DNR (1993) Natural Heritage Program. The table also provided the corresponding Management Indicator Habitats that were developed for the 2004 Superior National Forest LRMP (USDA Forest Service 2004).

As noted above, information was gathered during field surveys to determine habitat quality and presence/absence of special habitat features used by wildlife. The Minnesota DNR Natural Heritage Program developed *Element Occurrence Ranking Guidelines* based on several natural community habitat features (Minnesota Department of Natural Resources 1994). These guidelines primarily consider the presence or absence of human-induced disturbances such as logging and development, but also consider the presence or absence of special habitat features, such as a multi-layered forest structure and presence of large downed woody debris. Table 3-2 includes Element Occurrence Rankings for habitat types recorded during this study.

Habitat types were recorded on infrared aerial photographs and then overlaid on maps developed using GIS (see back pocket of report). These maps and associated GIS database were used to determine approximate acreages of each habitat type and to determine habitat types that would be impacted by the proposed mine project.

3.3.5. Data Recording

Observations made during the study were recorded on tape recorders, aerial photographs, and data sheets. Observations of wildlife, their sign, and habitats were recorded on aerial photographs and topographic maps. Photographic records (still and video camera) were taken as necessary to record wildlife, their sign, and habitats.

Table 3-1

Ages of Forest Stand Types

Forest Type	Young (seedling)	Sapling/Pole	Mature/Old	Old/Old Growth	Old Growth Multi-ages
Jack Pine	0-9	10-39	40-59	60-79	80+
Red Pine	0-9	10-49	50-119	120-149	150+
White Pine	0-9	10-40	50-119	120-149	150+
Lowland Spruce/Tamarack	0-19	20-59	60-119	120-149	150+
Spruce/Fir	0-9	10-49	50-89	90-149	150+
Aspen-Birch/Aspen-Birch-Conifer	0-9	10-49	50-79	80+	80+

Source: USDA Forest Service (2004).

Table 3-2

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Wetland					
P-0	Open water	14	Lake bed	Not applicable	>70 percent of area dominated by open water with no standing vegetation. Open water areas usually created where streams or culverts blocked by beaver dams.
P-1	Bog/palustrine	14	Black spruce bog; open sphagnum bog; mixed emergent marsh	AB, B, C	Bogs are dominated by leatherleaf, young speckled alder, and in some areas, scattered cattail and sedges. Sphagnum moss often covers 80 to 90 percent of the bog. In the tree layer, there are scattered (<5 percent) black spruce (some dead) and smallish tamarack. Labrador-tea, blueberry, small-fruited bog cranberry, and small willows are also common. Other species encountered include marsh cinquefoil, cottongrass, round sundew, starflower, bunchberry, and three-leaved Solomon's seal. Emergent wetlands are often dominated by sedges and cattails (80 to 90 percent cover) and water depths are several feet in deeper areas. Willows, tamarack, and speckled alder are often found along the border of these wetlands. Wild iris is common in some sedge wetlands. Bog wetlands provide habitat for several amphibians and birds, while sedge wetlands are used by moose.
P-2	Palustrine scrub shrub	14	Alder swamp; willow swamp	B, C	Wetlands dominated by speckled alder, pussy willow, red-osier dogwood, and other shrubs; < 30 percent tree cover. Scrub-shrub wetlands usually consist of a dense (80 to 90 percent) cover of speckled alder, with alder often 6 feet or taller in height. These wetlands may also have scattered sapling balsam fir, black spruce, willow, and the occasional black ash. Dominant low shrubs are Labrador-tea, velvet leaf blueberry, low bush blueberry, honeysuckle, prickly wild rose, raspberry, and red osier dogwood. Mountain maple saplings are also present. Herbaceous layer species include club and sphagnum mosses, horsetail, wood fern, bunchberry, blue bead lily, star flower, and creeping snowberry. Provides forage for deer and moose.

Table 3-2 (Cont.)

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Wetland (Cont.)					
P-3	Palustrine forest dead trees	Not applicable	Black spruce bog; black spruce swamp	C	Portions of flooded wetlands/bogs with a large number of dead black spruce (wetlands flooded by beavers or man-made structures). Some dead trees are used by cavity-nesting birds as nesting and foraging sites.
P-4	Palustrine forest deciduous sapling (0-4 in dbh)	14	Mixed hardwood swamp	C	Wetlands dominated by sapling deciduous trees. Comprised of sapling birches, aspens, and maples. Specked alder dominates the dense shrub layer, while interrupted fern, sedge, and mosses are close to the ground.
P-5	Palustrine forest deciduous pole/young mature (5-12 in dbh)	14	Mixed hardwood swamp	B	Wetlands dominated by pole- and young mature-size deciduous trees. Comprised of birches, aspens, and maples. Specked alder dominates the shrub layer, but is generally less dense than when found in sapling stands.
P-6	Palustrine forest deciduous mature (12+ in dbh)	14	Mixed hardwood swamp	AB	Wetlands dominated by mature deciduous trees; habitat not recorded on study area.
P-7	Palustrine forest mixed sapling (0-4 in dbh)	14	Mixed hardwood swamp; black spruce swamp	C	Wetlands dominated by mixed stand of sapling deciduous and conifer trees. In addition to species listed for palustrine deciduous forest, also includes sapling black spruce and tamarack and a dense shrub cover dominated by speckled alder. Provides important forage for moose and deer, yet limited cover, especially during winter.

Table 3-2 (Cont.)

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Wetland (Cont.)					
P-8	Palustrine forest mixed pole/young mature (5-12 in dbh)	14	Mixed hardwood swamp; black spruce swamp	B	Wetlands dominated by mixed stand of pole- and young mature-size deciduous and conifer trees, including black spruce, tamarack, aspen, and paper birch. Labrador-tea and blueberry are prevalent, as is spruce regeneration. The herbaceous layer varies in vegetative cover. In some areas with dense stands of spruce, few shrubs are seen, but sphagnum and club mosses could cover nearly 100 percent of the ground. Common species include blue bead lily, starry Solomon's seal, horsetail, star flower, and creeping snowberry. Some areas also have cottongrass and bog laurel.
P-9	Palustrine forest mixed mature (12+ in dbh)	14	Mixed hardwood swamp; black spruce swamp	AB	Wetlands dominated by mixed stand of mature deciduous and conifer trees with well-developed midstory of pole-size trees. Wetlands forests are dominated by black spruce, with scattered other conifer species (e.g., tamarack) or deciduous trees. Labrador-tea and blueberry are prevalent, as is spruce regeneration.
P-10	Palustrine forest conifer sapling (0-4 in dbh)	9, 14	Black spruce swamp	C	Wetlands dominated by sapling conifer trees, primarily black spruce and tamarack. Wetlands forests dominated by black spruce and lesser amounts of tamarack and fir. Sapling spruce forest is rare on the site and provides limited wildlife habitat due to the small trees, lack of down woody material and snags, and wet soil conditions.
P-11	Palustrine forest conifer pole/young mature (5-12 in dbh)	9, 14	Black spruce swamp	B	Wetlands dominated by pole- and young mature-size conifer trees, primarily black spruce and tamarack. Wetlands forests dominated by black spruce. Labrador-tea and blueberry are prevalent, as is spruce regeneration. Some tamarack could also be present. The herbaceous layer varies in vegetative cover. In some areas with dense stands of pole-sized spruce, few shrubs are seen, but sphagnum and club mosses could cover nearly 100 percent of the ground. Common species include blue bead lily, starry Solomon's seal, horsetail, star flower, and creeping snowberry. Some areas also cottongrass and bog laurel. These stands provide good hiding cover for wildlife.

Table 3-2 (Cont.)

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Wetland (Cont.)					
P-12	Palustrine forest conifer mature (12+ in dbh)	9, 14	Black spruce swamp	AB	Wetlands dominated by mature conifer trees, primarily black spruce and tamarack. Wetlands forests dominated by black spruce; forested wetlands dominated by other conifer species (tamarack) or deciduous trees are rare. Labrador-tea and blueberry are prevalent, as is spruce regeneration. Some tamarack could also be present. Mature forests often contain numerous snags and down woody debris.
Upland					
U-1	Disturbed	Not applicable	Not applicable	Not applicable	Recently-disturbed sites or cleared for roads, landings, etc. These areas have little or no vegetation. Vegetation consists of scattered forbs and grasses, including field hawkweed, yellow sweetclover, and bladder campion. Sandy areas and rock piles provide habitat for burrowing species.
U-2	Grassland/ Forbs	Not applicable	Not applicable	Not applicable	Areas dominated by grasses and forbs; <30 percent cover of trees and shrubs. Occur in areas recently logged.
U-3	Shrubland	Not applicable	Not applicable	Not applicable	Area dominated by shrubs; >30 percent cover of shrubs and <30 percent cover of trees. Occur in areas where natural succession of logged/disturbed sites has led to replacement of grassland/forb habitats with habitats dominated by shrubs. Scattered pole and sapling trees (trembling aspen, paper birch, jack pine, and black spruce) are occasionally found in these areas, but shrubs, including speckled alder, beaked hazel, blueberry, and raspberry could cover up to 80 percent or more of the landscape. Provides forage for deer and moose, and nesting and foraging habitats for a variety of birds, but have few special habitat features and provides little cover, especially during winter.

Table 3-2 (Cont.)

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Upland (Cont.)					
U-4	Forest deciduous sapling (0-4 in dbh)	2	Aspen forest; aspen-birch forest	C	Forests dominated by sapling deciduous trees, primarily trembling aspen, with lesser amounts of paper birch. Beaked hazel, lowbush blueberry, Labrador-tea, low-bush honeysuckle, and wild rose are important shrubs. The ground cover includes wild sarsaparilla, blue bead lily, bunchberry, large-leaved aster, swamp dewberry, bracken fern, interrupted fern, goldthread, twinflower, sweet coltsfoot, wild strawberry, and pink ladyslipper. Provides foraging habitat for deer and moose, but little cover for wildlife.
U-5	Forest deciduous pole/young mature (5-12 in dbh)	2	Aspen forest; aspen-birch forest	BC	Forests dominated by pole- and young mature-size deciduous trees. Deciduous forests usually dominated by trembling aspen. Percent cover in pole forests ranges from 60 to 80 percent, and usually has a dense (60 to 80 percent cover) midstory of sapling balsam fir and paper birch, beaked hazel, lowbush blueberry, Labrador-tea, low-bush honeysuckle, and wild rose. The ground cover includes wild sarsaparilla, blue bead lily, bunchberry, large-leaved aster, swamp dewberry, bracken fern, interrupted fern, goldthread, twinflower, sweet coltsfoot, strawberry, and pink ladyslipper. Provides foraging and nesting habitat for a variety of birds and small mammals, and shade cover during summer for larger mammals.
U-6	Forest deciduous mature (12+ in dbh)	2	Aspen forest; aspen-birch forest	B	Forest dominated by mature deciduous trees, with well-developed midstory of pole- and young mature-size trees. Deciduous forests usually dominated by trembling aspen, although some forests contain an important paper birch component. Well-developed midstory of sapling to pole-size balsam fir and paper birch, beaked hazel, lowbush blueberry, Labrador-tea, low-bush honeysuckle, and wild rose. The ground cover includes wild sarsaparilla, blue bead lily, bunchberry, large-leaved aster, swamp dewberry, bracken fern, interrupted fern, goldthread, twinflower, sweet coltsfoot, strawberry, and pink ladyslipper. Dead trees and stumps used by cavity nesting birds and small mammals, and downed woody material provides habitat.

Table 3-2 (Cont.)
Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Upland (Cont.)					
U-7	Forest mixed sapling (0-4 in dbh)	4	Mixed pine-hardwood forest; boreal hardwood-conifer forest	C	Forests dominated by a mixed stand of sapling conifer and deciduous trees. Mixed forests contain varying amounts of jack pine, spruce, aspen, paper birch, and balsam fir saplings. Wild sarsaparilla, blue bead lily, low bush honeysuckle, sweet coltsfoot, rosy twisted-stalk, large-leaved aster, and wood fern are common herbs. Provides good foraging habitat, but limited cover for wildlife.
U-8	Forest mixed pole/young mature (5-12 in dbh)	4	Mixed pine-hardwood forest; boreal hardwood-conifer forest	BC	Forests dominated by a mixed stand of pole- and young mature-size conifer and deciduous trees. Mixed forests contain varying amounts of jack pine, spruce, aspen, paper birch, and balsam fir. Beaked hazel and sapling deciduous and conifer trees are common in the midstory. Common herbs are wild sarsaparilla, blue bead lily, low bush honeysuckle, sweet coltsfoot, rose twisted-stalk, and large-leaved aster.
U-9	Forest mixed mature (12+ dbh)	4	Mixed pine-hardwood forest; boreal hardwood-conifer forest	B	Forests dominated by a mixed stand of mature conifer and deciduous trees, with well-developed midstory of pole- and young mature-size trees. Mixed forests contain varying amounts of jack pine, spruce, aspen, paper birch, balsam fir, and red maple. Pole- and young mature-size deciduous and conifer trees are found in the midstory, including black spruce and fir. Mature forests usually have a moderate shrub layer, but the ground is nearly covered with vegetation, including wild sarsaparilla, bunchberry, Canada mayflower, blue bead lily, round-branched ground pine, starflower, bedstraw, large-leaved aster, and rose twisted stalk. Large deciduous trees used by raptors, including northern goshawk and broad-winged hawk, for nests. Dead trees and stumps, especially those of conifers, used by cavity nesting birds and small mammals, and downed woody material provides habitat for small mammals, snakes, and amphibians.
U-10	Forest conifer sapling (0-4 in dbh)	5, 8	Jack pine forest; black spruce-feathermoss forest	C	Forests dominated by sapling conifer trees, primarily jack pine and balsam fir, and occasionally black spruce. The shrub layer is usually dense. The herb layer includes interrupted fern, round-branched ground pine, shining clubmoss, bunchberry, wood ferns, and starry Solomon's seal. Provides limited foraging habitat and cover.

Table 3-2 (Cont.)

Habitat Classification

Code	Habitat Type	USFS Management Indicator Habitat Number	Minnesota Natural Heritage Program Natural Community Key[1]	Minnesota Natural Heritage Program Element Occurrence Ranking[2]	Habitat Characteristics
Upland (Cont.)					
U-11	Forest conifer pole/young mature (5-12 in dbh)	5, 8	Jack pine forest; black spruce-feathermoss forest	BC	Forests dominated by pole- and young mature-size conifer trees, primarily jack pine, with scattered balsam fir and black spruce. The shrub layer is often sparse in dense forests, but well-developed in pole forests with openings in the canopy. The herb layer includes interrupted fern, round-branched ground pine, shining clubmoss, bunchberry, wood ferns, and starry Solomon's seal. Pole conifer forests provided forage for conifer-dependent species (red squirrel, spruce grouse) and hiding cover, but poor snow-intercept thermal cover for deer and moose. These forests have few snags or dead woody material.
U-12	Forest mature conifer (12+ in dbh)	5, 8	Jack pine forest; black spruce-feathermoss forest	B	Forests dominated by mature conifer trees, primarily jack pine and balsam fir, with scattered black spruce. Stands usually consist of trees of nearly uniform age. The shrub layer is usually dense and includes beaked hazel, willow, and paper birch, aspen, and fir saplings. The herb layer includes interrupted fern, round-branched ground pine, shining clubmoss, bunchberry, wood ferns, and starry Solomon's seal. Jack pine forests with interspersed wet areas often have black spruce and tamarack in the overstory, and a shrub layer comprised of willow, wild rose, gooseberry, blueberry, and Labrador-tea. Large-leaved aster, blue-bead lily, and starflower are common herbs. These forests provide good foraging habitat for conifer-dependent species, and good snow-intercept thermal cover for deer and moose. Snags and down woody material are common, but not abundant as in mixed mature forests, in these forests and provide habitat for owls and woodpeckers.

Figure 3-1

4.0 SURVEY RESULTS

4.1. Introduction

The weather was generally favorable during the study period. Temperatures ranged from 40° F at night to 70° F during the day. Light rain fell on and off during June 23 to June 25. The survey team traversed the site mostly on foot, although the Dunka Road and site exploration roads were used to access portions of the site. Generally, a circular route was taken on foot each day, with the intent of surveying a variety of habitat types each day.

4.2. Wildlife Species Survey

Amphibians, reptiles, birds, and mammals were surveyed. Green and chorus frogs were observed in several wetlands on the study area. Tadpoles were also seen in several wet areas, but could not be identified to species. Garter snakes were observed in clearcuts. Thirty-two species of birds were identified. Great blue heron, common snipe, belted kingfisher, and swamp sparrow were observed near wetlands and ponds. Mourning dove, eastern kingbird, water pipit, chipping sparrow, song sparrow, and white-throated sparrow were associated with disturbed areas and grassland/shrublands. The remaining species were primarily associated with forests, including three species of woodpeckers (hairy woodpecker, northern flicker, and pileated woodpecker). Woodpecker cavities and foraging sign were common on larger snags (>6 in dbh) and on stumps. Other cavity-nesting species seen in forests included black-capped chickadee and red-breasted nuthatch. Broad-winged hawk, least flycatcher, eastern phoebe, blue jay, common raven, American crow, winter wren, hermit thrush, American robin, gray catbird, red-eyed vireo, Nashville warbler, pine warbler, black-and-white warbler, common yellowthroat, and dark-eyed junco were found in forests. Ruffed grouse were heard drumming, especially on the western and central portions of the property.

Common mammals seen or identified based on sign included bats, beaver, pine marten, red squirrel, white-tailed deer, moose, gray wolf, and coyote. Marten dens and sign were common in jack pine and spruce forests associated with wetlands. Red squirrel sign were abundant in jack pine forests. Deer and moose were associated with clearings near forests, although moose droppings were also common in sedge and alder wetlands near upland forests. Moose were most common on the western portion of the Mine Site. There was evidence of snowshoe hare browsing on grasses, forbs, shrubs, and the lower branches of trees. Black bear scat was seen in the north central portion of the property, and a bear and cub were seen near the western boundary of the Mine Site. Red fox scat was found in the study area. Coyote tracks were seen along roadways, and wolves were heard during night call surveys. Bats were seen flying over wetlands in the evening.

Most species observed during the summer 2004 survey were also observed during the winter 2000 survey. However, several species observed during winter 2000 were not observed during this study: spruce grouse, black-backed and northern three-toed woodpeckers, eastern wood pewee, gray jay, common redpoll, snow bunting, least weasel, bobcat, and river otter. These bird species are either uncommon in the area during summer or were migrating north during the 2000 study. The tracks of the mammal species were easily observed in the snow during winter.

Grouse, deer, moose, and snowshoe hare were observed on the Mine Site during winter and summer, but when compared to their abundance in other areas of Minnesota, were uncommon on the site. Drumming counts indicate that ruffed grouse are least common in northeastern Minnesota than other parts of the state (Huempfner 1978a, Minnesota Department of Natural Resources 1999a); approximately half of the spruce grouse in Minnesota are found in the northeastern portion of the state. Ruffed grouse favor young aspen/birch forests less than 25 years in age; most forest stands on the NorthMet Mine Site are more than 25 years old.

An estimated 8 to 10 deer are found per square mile in the study area (Huempfner 1978a, Berg 2000). Based on population surveys and hunter kill rates, deer population densities in Minnesota are lower in northeastern Minnesota than in more southerly areas of the state (Berg 2000, Minnesota Department of Natural Resources 2004b). Deer and deer sign were primarily observed on the western and southern portions of the Mine Site and in areas containing both scrub-shrub and conifer forest habitat.

Moose sightings were also common in logged areas with abundant shrubs, in wetland areas, and near young mature forest habitat. Moose populations in the Superior National Forest have fluctuated considerably since the early 1900s and have shown their greatest increases during periods of intense timber harvest (Huempfner 1978a). Based on ground and helicopter surveys, 5 to perhaps as many as 10 moose used the study area. Aerial surveys conducted in 1978 found about 0.8 moose per square mile in an area that included the NorthMet Mine Site. Moose primarily used the western half of the Mine Site.

4.3. Northern Goshawk, Owl, and Gray Wolf Calling Surveys

4.3.1. Northern Goshawk

Calling surveys, using recorded calls, were conducted at 14 calling stations (Figure 3-1). Surveys were done for northern goshawk during the day.

No responses were obtained during the day that could be positively identified as a goshawk call. However, one call response was heard at site C-14 that sounded similar to a goshawk; this site was near an area where a potential goshawk call was heard, on one occasion, during surveys in 2000. The survey site was within 100 yards of a stand of mature mixed forest, which was carefully surveyed for a hawk nest; no nests, or hawks, were observed.

During March 2000, goshawk vocalizations were heard on several occasions in response to the goshawk call in the west-central portion of Section 2 and western portion of Section 4, Township 59 North, Range 13 West. The hawk was observed in Section 2 on several occasions in 2000, and its nest was found (GOS; see Figure 3-1). Later during the spring of 2000, the DNR attached a radio transmitter to one of the goshawks, however, the birds later abandoned the nest that year. During the 2004 survey, the survey team visited the goshawk nest site. The nest was still intact, but there was no indication that the nest was still being used. Goshawks were called for in the vicinity of the nest, but no response was received.

Northern goshawks are widely distributed across the northern half of eastern North America and in many parts of western North America (Squires and Reynolds 1997), but are generally rare over most portions of their range. Population productivity and nesting densities are related to snowshoe hare and grouse populations. Goshawks in Minnesota favor forest stands with large canopy trees and a brushy understory (Phillips 1999). Territory sizes can range up to 6,000 acres, and logging and other human-related activities can discourage goshawks from using an area.

Until the 2000 survey, no goshawks were known to be nesting in the Superior National Forest and few active nests were reported in the Superior National Forest, historically (Phillips 1999, Vora 2000b). Since 2000, several goshawk nests have been found in the Superior National Forest.

Goshawk breeding habitat in the Superior Forest is typically older forest with sufficient open space between the bottom live tree branches and the understory for the birds to easily fly (Phillips 1999). Aspen are favored as nest trees. The goshawk pair observed on the Mine Site used a large, 14-inch dbh aspen tree as a nest, and the midstory canopy was mostly open in the vicinity of the nest. The surrounding forest stand was a mixture of deciduous and

conifer trees, and was near a recent clear-cut stand and scrub-shrub wetland. Similar habitat was observed at several areas on the Mine Site, and could provide alternative sites for nesting and foraging goshawks.

4.3.2. Other Hawks

A broad-winged hawk responded to the goshawk calls on June 25th. The hawk was nesting near the road leading into the exploration area (BWH; see Figure 3-1). At least one chick was in the nest.

4.3.3. Owls

During evening surveys on June 24th, a saw-whet owl responded to calls from calling station C-12. The saw-whet owl was heard north of the Mine Site.

The saw-whet owl, a common species in Minnesota, was also heard during surveys in March 2000. The saw-whet owl was heard in the mature bog spruce forest associated with One Hundred Mile Swamp. It did not approach the source of the vocalizations.

A barred owl was heard in sections 1, 3, and 12 of Township 59 North, Range 13 West, during surveys in winter 2000. No barred owls were heard during summer 2004 surveys.

4.3.4. Wolf

Several wolves responded to calls from calling station C-12. The wolves were located to the south of the calling station, and likely south of the property boundary based on call intensity and direction.

Approximately 2,600 wolves reside in northern Minnesota. Wolf packs are generally comprised of four to eight wolves (Aylsworth 2000). Several wolf packs have been identified, and individuals within the pack radio-collared, near the study area by the U.S. Geological Survey/International Wolf Center. Territory size for wolves in northern Minnesota ranges from 20 to 150 square miles, and wolf packs tend to avoid areas used by other wolf packs.

The number of wolves in Minnesota has increased nearly five-fold since the early 1970s (Berg and Benson 1999, Aylsworth 2000). Wolves typically prey on ungulates (hoofed animals), such as deer, elk, and moose in Minnesota (Minnesota Department of Natural Resources 1999b). Until recently, wolves have been primarily confined to areas with little human disturbance, but during the past 20 years have been observed using areas with higher levels of human activity (Mech 1995; Thiel et al. 1998). Wolves also appear to avoid areas with a high density of roads, especially those accessible to two-wheeled (versus four-wheeled and ATV) vehicles, although more wolves have moved into areas with higher road densities in recent years (Mech 1998, Minnesota Department of Natural Resources 1999b)

Wolves used the Mine Site during 2000, and wolf calls were heard to the south of the Mine Site during the 2004 survey. Wolf packs with radio-collared individuals have been observed several miles to the north and northeast of the Mine Site. It is likely that the study area includes much of the territory of a wolf pack comprised of three or more individuals. During 2000 and 2004, wolf tracks were seen along Dunka Road. Interestingly, wolf tracks were not observed on the study area during January 2000, when the drill rig was operating, but only during March 2000 and June 2004, when the rig was not in operation. Thus, noise and activity associated with drilling activities may have discouraged wolves from using the area in the immediate vicinity of the exploration area.

4.3.5. Species of Concern

Several species of concern may be found in the NorthMet Mine Site, although most species listed below are rare visitors to the area or migrate through the area during spring or fall. Information on species of concern were obtained from the following sources for reptiles and amphibians (Behler and King 1995); birds (Terres 1982, Robbins et al. 1983; Benyus 1989; City of Hoyt Lakes 2000); and mammals (Burt and Grossenheider 1965, Chapman and Feldhamer 1982)

4.3.5.1. Federally-listed Threatened and Endangered Species

Bald eagle (threatened; Superior National Forest Management Indicator Species). No bald eagles were observed during the surveys. Bald eagles tend to be associated with larger lakes surrounded by mature forest, where eagles can perch while searching for fish, birds, and other prey items, and where large trees provide suitable structure for nests. No large lakes, or large nesting trees, are on the Mine Site and it is unlikely that bald eagles would use the site. The nearest bald eagle nest is located 7.5 miles to the north on Birch Lake.

Canada lynx (threatened). Canada lynx are rare in northern Minnesota, except during "invasions," which tend to occur about every 10 years, perhaps due to population pressures and shortages of its principal prey, the snowshoe hare (Heinselman 1996). Surveys for lynx were conducted using bait traps and track surveys on the NorthMet Mine Site during winter 2000. No lynx or their sign were observed during 2004 surveys.

The Canada lynx originally ranged throughout the boreal forest of North America and the mixed coniferous-deciduous forests of the northeastern and Great Lakes states (Hazard 1982). Snowshoe hare and red squirrels are the primary prey item of lynx in northern Minnesota, but they also eat carrion, grouse, and small mammals (Aubry et al. 2000). Canada lynx numbers declined sharply in the U.S. and Canada in the mid-1900s due to overtrapping and ecological changes caused by settlement, logging, and agriculture (DeVos and Matel 1952, Todd 1985). Individuals move great distances when prey items are scarce, and lynx were seen in many areas of Minnesota during 1962-1963 and 1972-1973, presumably years when snowshoe hares were scarce in Canada (Phillips 1999).

Approximately 50 lynx have been seen in St. Louis County since 2000 (Minnesota Department of Natural Resources 2004a) and four of these lynx had young. The nearest sightings were approximately 6 miles from the Mine Site. A lynx was captured and radio-collared approximately 12 miles north of the Mine Site in August 2003; the animal subsequently moved west to near Pelican Lake in the northwestern portion of St. Louis County. The nearest sightings of a lynx with young were approximately 16 miles north of the Mine Site in 2002 and 16 miles south of the Mine Site in 2004. Observations of lynx based on trapping records and visual observations show that lynx are more likely to be found in northeastern Minnesota than other portions of the state. Given that lynx have been observed within 6 miles of the Mine Site, it is possible that lynx travel through the Mine Site area. Snowshoe hare were observed in the eastern portion of the site during 2000 and 2004 surveys.

Gray wolf (threatened; Superior National Forest Management Indicator Species). Gray wolf was recorded on the site during surveys in 2000 and 2004. The results of these surveys and status of the wolf in Minnesota are discussed in Section 4.3.4, above.

4.3.5.2. State-listed Threatened and Endangered Species

Trumpeter swan. The trumpeter swan is found on lakes and ponds in the Rocky Mountains during the breeding season, and on the West Coast during winter. The swan is rarely seen outside of its breeding range, although it was observed in Minnesota during a severe winter (Terres 1982). According to a guide to birds near Hoyt Lakes, the

trumpeter swan is an occasional visitor to the area during migration. No trumpeter swans were seen in the study area during 2000 or 2004.

Horned grebe. The horned grebe nests on freshwater ponds and lakes throughout central and western Canada and into the Dakotas and Minnesota, and winters on salt water and the Great Lakes. The horned grebe is a common migrant in the Hoyt Lakes area and could use ponds in the study area during migration. No horned grebes were seen in the study area during 2000 or 2004.

Wilson's phalarope. The Wilson's phalarope nests on prairie sloughs and ponds found in the interior grasslands of western and central Canada and northern U.S. and the Pacific Northwest (Terres 1982). The bird winters in southern South America and has been reported as a rare migrant in the vicinity of the Mine Site. No Wilson's phalaropes were seen in the study area during 2000 or 2004.

Common tern. The common tern is found over large inland lakes in Canada and the northern U.S. The bird nests in large colonies on beach sandspits and islands of sand and oyster shells, and winters along the Atlantic and Gulf coasts. The common tern is a rare migrant in the Mine Site area. No common terns were seen in the study area during 2000 or 2004.

4.3.5.3. State Species of Concern

American white pelican. The American white pelican nests on isolated islands in lakes of inland North America, primarily in the Prairie Provinces. The pelican winters along the Pacific and Gulf coasts. Northeastern Minnesota is on the eastern range of the pelican's migratory route, and the bird is an occasional visitor to the area during migration.

Marbled godwit. The marbled godwit is common in the western U.S. and Canada, nesting on prairies, meadows, and pastures. Godwits winter along the Pacific, Gulf, and Atlantic coasts. Godwits migrating between breeding areas and the Gulf and Atlantic coasts are occasionally seen near the study area.

Least weasel. The least weasel is found in Alaska, throughout Canada, and into the northern U.S. They prefer meadows, fields, and brushy areas. Weasel tracks were observed in the study area during 2000, but were not identified to species (shorttail and longtail weasels could also be found in the study area). The least weasel has a sporadic distribution in northern Minnesota.

Mountain lion. The mountain lion is a habitat generalist that preys primarily on deer and prefers areas with little human disturbance. Although increased sightings of mountain lion in Minnesota suggest an increasing population, no mountain lions have been reported in the study area (Phillips 1999). Track and bait surveys were done for mountain lions during winter 2000 on the Mine Site, but no confirmed sign of mountain lion were observed during the study.

4.3.5.4. Federal Species of Concern

Black tern. The black tern is a locally common breeder on prairie sloughs and marshes of the upper Midwest and Canadian Prairie. The black tern breeds in northern Minnesota and has been seen in the Hoyt Lakes area during summer and fall. Breeding habitats favored by black terns are uncommon on the Mine Site and it is unlikely that black terns would nest or spend much time on the site. No black terns were seen in the study area during 2000 or 2004 surveys.

Northern goshawk (Superior National Forest Management Indicator Species). The northern goshawk was observed nesting on the Mine Site during early spring surveys in 2000, but the nest was abandoned during 2004 surveys. In 2005, a goshawk was again seen using the nest site (Ryan 2005a). A goshawk may also have been heard in the western portion of the Mine Site during 2000 and 2004 surveys. The status of the northern goshawk in Minnesota is discussed in Section 4.3.1, above.

Boreal owl. Surveys for boreal owl were conducted in the study area during winter and early spring 2000 and summer 2004; no boreal owls were heard. Boreal owl nest in mature conifer and mixed deciduous/conifer forests in northern Canada, and are irregular visitors to the northern U.S., including northern Minnesota, during winter. Although a boreal owl was heard on the Dunka Road during surveys in 1988-1989, few boreal owls are expected to occur in or near the study area (USDA Forest Service 1999).

Great gray owl. The great gray owl primarily nests at high elevations in the Sierra Nevada and Northern Rocky Mountains, and in pine and spruce forests of western and north central Canada. Great gray owls use stick nests built in tamarack and spruce trees. Surveys were conducted in the study area during 2000 and 2004, but no great gray owls were heard.

Olive-sided flycatcher. The olive-sided flycatcher is common in coniferous woods of the western U.S. and western and central portions of northern Canada. Flycatchers nest in tamarack and other conifer trees. They were not seen or heard during 2000 and 2004 surveys, and are listed as rare visitors to the area during migration.

Black-throated blue warbler. The black-throated blue warbler is common in conifer and mixed forests, primarily east of Minnesota. These warblers nest as far west as central Minnesota, but are listed as rare migrants in the study area. No black-throated blue warblers were seen or heard during surveys in 2000 or 2004.

Bay-breasted warbler. The bay-breasted warbler is fairly common in the northern coniferous forests of Canada, and has been reported nesting in northeastern Minnesota. It constructs nests in spruce, hemlock, and birch trees, or in shrubs. The bay-breasted warbler is an occasional migrant through the area on its way to and from Central and South America. Bay-breasted warblers were not seen or heard on the study area during 2000 or 2004.

Connecticut warbler. The Connecticut warbler is an occasional migrant and breeding bird in the vicinity of the study area. This species prefers to nest in spruce-tamarack bogs and in poplar and aspen woods. These warblers winter in Central and South America. The Connecticut warbler was not seen or heard on the study area during 2000 or 2004.

4.3.5.5. Other Species of Concern

Several animal species were identified in the 1986 Land and Resource Management Plan (LRMP) for the Superior Forest as Superior National Forest Viability and Management Indicator Species (USDA Forest Service 1986). In 2004, the plan was updated to include only three Viability/Management Indicator Species bald eagle, gray wolf, and northern goshawk (USDA Forest Service 2004). These three species are discussed above. In addition, this report includes information on those species listed in the 1986 LRMP.

Northern leopard frog. The northern leopard frog is found in the Rocky Mountains, upper Midwest U.S., and southern Canada. It breeds in freshwater and brackish marshes. In the Superior National Forest, it selects grass, forb, and low wet meadows near streams, ponds, and open water. The species was not recorded during surveys in 2004, likely because it is primarily nocturnal, and the breeding season was nearly completed by the time of 2004 surveys.

Common loon. The common loon is a common breeder along lakes and rivers in northern Minnesota, west through the northern U.S, and throughout Canada. Loons winter along the Pacific, Atlantic, and Gulf coasts. Loons forage on small fish and crustaceans. Loons tend to use deep water bodies where they can dive to escape predation. Although loons are common near the study area, there are only a few small areas with deep water that could be attractive to breeding or migrating loons on the study area. No loons were seen during surveys in 2000 or 2004.

Hooded merganser. Hooded mergansers are found on wooded lakes and streams, primarily in the western U.S., and northern Minnesota and most of the eastern U.S. Mergansers nest in tree cavities that are large enough to allow for entrance by the female. Mergansers were not seen during 2000 or 2004 surveys, but are commonly seen in the vicinity of the proposed Mine Site and could use ponds and streams on the study area.

Osprey. The osprey is an uncommon raptor that is found along the seacoast, lakes, and rivers. It ranges from Alaska, through western and southern Canada, into the northern U.S., and along U.S. and Canadian coastlines. Ospreys are common in the Hoyt Lakes region, primarily on large lakes and rivers where mature white and red pine is found within ¼ mile of fish-bearing streams and lakes. Ospreys were not seen on the study area during 2000 and 2004 surveys. Given the limited number of lakes and rivers on the Mine Site, it is unlikely that osprey would be found on the site.

Red-tailed hawk. Red-tailed hawks are found throughout North America. They nest in woodlands and feed in open country, feeding on rabbits, rodents, and snakes. They are occasionally seen nesting in the Hoyt Lakes region, but would be unlikely to use the Mine Site for long periods given the general lack of open habitat.

Ruffed grouse. Ruffed grouse are common on the Mine Site and were seen and heard during surveys in 2000 and 2004. During winter 2000, ruffed grouse were often seen buried in the snow or perched in deciduous and mixed forests dominated by aspen. During 2004, ruffed grouse were seen in mixed forests and heard drumming. Drumming counts indicate that ruffed grouse are less common in northeastern Minnesota than in other parts of the state (Huempfner 1978a, Minnesota Department of Natural Resources 1999a). Ruffed grouse favor young aspen/birch forests less than 25 years in age; most forest stands on the Mine Site are more than 25 years old.

Spruce grouse. Approximately half of the spruce grouse in Minnesota are found in the northeastern portion of the state. Spruce grouse primarily use mature jack pine and spruce forests, which comprise over half of the Mine Site. Spruce grouse were seen or heard occasionally during surveys in 2000; none were observed during 2004.

American woodcock. The American woodcock is a common migrant and occasional breeder in the vicinity of the Mine Site. Woodcock are mostly found in the eastern and southern U.S. Woodcock were not seen during surveys in 2000 or 2004, but were seen on the adjacent Mesaba Mine Project site during fall 2001. American woodcock live in moist woods and thickets, and were associated with speckled alder shrublands on the Mesaba Mine Project site.

Killdeer. Killdeer are very common in meadows, pastures, fields, and dry uplands throughout North America. They are common in the Hoyt Lakes area but likely would not use the study area to any great extent due to the lack of meadows, pastures, and fields favored by killdeer for nesting and foraging.

Belted kingfisher. The belted kingfisher is the most common kingfisher in North America. It is seen singly or in pairs along streams and ponds, often perching at the edge of the pond and then diving into the water for fish. The belted kingfisher is a common breeder in the Hoyt Lakes area, and was seen on the study area during 2004 surveys.

Pileated woodpecker. Pileated woodpeckers are found in the Pacific Northwest, throughout much of Canada, into Minnesota, and throughout much of the eastern U.S. Pileated woodpeckers favor large expanses of deciduous or mixed forests with mature trees and down woody material, snags, and large stumps. Pileated woodpecker and their sign were observed on the Mine Site, although the species is uncommon on the Mine Site. Observations of pileated woodpeckers and their sign were primarily confined to mature mixed forests with snags and stumps.

Black-backed woodpecker. Black-backed woodpeckers were observed using upland and wetland spruce/fir mixed forests and conifer stands with scattered snags in the central section of the northern half of the Mine Site during winter and early spring 2000; no black-backed woodpeckers were observed during 2004.

Brown creeper. The brown creeper is a common woodland bird found throughout North American. Creepers favor both deciduous and conifer mature forest, and in the vicinity of the study area, mature red and white pine stands. Brown creepers were not seen in the study area during 2000 and 2004 surveys, but area listed as occasional migrants, and rare breeders, in the Hoyt Lakes area. There is little pine on the study area.

Golden-crowned kinglet. Golden-crowned kinglets are found throughout North America, primarily in mature lowland conifer forests. Golden-crowned kinglets are listed as occasional migrants and nesters in the Hoyt Lakes area, and were not seen on the study area during 2000 or 2004.

Swainson's thrush. Swainson's thrush summer in the spruce, cedar, and fir forests of Alaska, Canada, and the northern U.S. They are common migrants in the Hoyt Lakes area, and are occasionally reported to breed in the area. Swainson's thrushes were heard in mixed forest and spruce forest associations on the study area.

Magnolia warbler. Magnolia warblers breed in spruce, balsam fir, and hemlock forests of southern Canada and the northern U.S., and winter in Central America. Magnolia warblers are common residents in the Hoyt Lakes area and are likely found on the study area. They select sparsely stocked spruce and fir sampling stands, and mature and immature pine stands, on the Superior National Forest.

Pine warbler. The pine warbler nests in open groves of mature pine and is found nesting primarily to the east of Minnesota in the northeastern and eastern U.S. and southern Canada. Pine warblers also select mature aspen trees near lowland conifer foraging habitat. The pine warbler is listed as an occasional migrant and breeder in the Hoyt Lakes area, and was heard in the study area during 2004.

Savannah sparrow. The savannah sparrow is common throughout North America and prefers large fields with short or sparse grass or weeds, although savannah sparrows also use sedge marshes and wet meadows. The savannah sparrow is listed as common in the Hoyt Lakes area. It was not seen or heard on the study area, and would be unlikely to use the study area extensively due to the lack of large fields with suitable habitat.

Beaver. Beaver are common residents on the Mine Site. Many large open water and emergent wetlands on the Mine Site are the result of beavers damming streams on the site. Beavers also block culverts under road and railroad grades to create lake habitat. Beaver lodges and tree cuttings are common in areas used by beavers.

Porcupine. Porcupines are most often found in woody areas, but have adapted to a wide range of habitats, ranging from tundra to desert chaparral and rangelands. They are found throughout Alaska, Canada, and the western U.S. In the Superior National Forest, porcupines are most closely identified with mature pine forests. No porcupines were observed during surveys in 2000 and 2004, and are considered scarce in the Boundary Waters area north of the study area.

White-tailed deer. White-tailed deer are common on the site. An estimated 8 to 10 deer are found per square mile in the study area (Huempfner 1978b, Berg 2000). Based on population surveys and hunter kill rates, deer population densities in Minnesota are lower in northeastern Minnesota than in more southerly areas of the state (Berg 2000, Minnesota Department of Natural Resources 2004b). Deer tracks were primarily observed in the western and southern portions of the Mine Site during 2000 and 2004, especially in recently logged areas and shrublands near mixed and conifer pole/young mature and mature forest habitats.

Moose. Moose sightings were common in logged areas with abundant shrubs and near mature forest habitat, and in sedge and willow wetlands. Moose populations in the Superior National Forest have fluctuated considerably since the early 1900s and have shown their greatest increases during periods of intense timber harvest (Huempfner 1978c). Based on ground and helicopter surveys in 2000 and 2004, 5 to perhaps as many as 10 moose may be found on the study area. Aerial surveys conducted in 1978 found about 0.8 moose per square mile in an area that included the Mine Site. Moose primarily used the western half of the study area.

4.4. Wildlife Habitat Assessment

Habitat observed on the study area was typical of habitats associated with much of the Iron Range. The Mine Site has little relief. The site consists of a mosaic of slightly elevated upland areas surrounded by wetlands, and slopes toward the east-northeast, in the direction of the Partridge River. Elevations range from 1,620 feet mean sea level along the western boundary to 1,550 feet mean sea level near the southeastern boundary of the Mine Site. More upland habitat was associated with the central portion of the Mine Site. The One Hundred Mile Swamp is the dominant feature on the landscape, located northeast of the Mine Site. The Partridge River drains this swamp and flows along the northeastern and eastern boundary of the Mine Site, before entering and leaving the southeastern portion of the Mine Site.

Forest vegetation dominates the study area (Figure 4-1). Most forest stands contained trees that were 12-inch dbh or less, and thus unable to provide much snow-intercept-thermal cover for deer and moose. The site can be divided into four general quadrants. The northwest quadrant is dominated by lowland black spruce, with scattered stands of aspen and balsam fir/aspen; tamarack is also scattered throughout these stands. Most trees are estimated to be 60 years or older (USDA Forest Service 2000). Interspersed within forest stands are brush/sapling tree stands that were recently logged and provide habitat for deer and moose. Several wetlands are found in this quadrant, with One Hundred Mile Swamp comprising most of the western and northern portions of the quadrant (see Figure 3-1).

The northeast quadrant is dominated by nearly equal amounts of jack pine and spruce, with scattered aspen stands and alder swamps. Although there are scattered black spruce stands containing trees greater than 60 years in age, most trees, especially jack pine, are 20 to 60 years in age (USDA Forest Service 2000). There are a few recently logged areas within this quadrant. The Partridge River and several large associated wetlands are found in this area. Most shrub/sapling tree habitat is associated with these wetlands and drainages.

The southeast quadrant contains a nearly equal mix of lowland and upland spruce, jack pine, and aspen, with some balsam fir and paper birch. Most tree stands are from 40 to 80+ years of age, although jack pine tree stands along Dunka Road are from 20 to 40 years of age. The Partridge River and a tributary to the river, Stubble Creek, are found in this quadrant and are dominated by sedge and cattail meadows and shrubs, including speckled alder and willow. The powerline and Duluth Mesabi and Iron Range Railroad are also important features in this quadrant.

Aspen, black spruce, and speckled alder wetlands dominate the southeast quadrant. There is more balsam fir in this quadrant than in the other quadrants, while jack pine is rare and found only in scattered stands. Most tree stands are 60 years of age or older, with the oldest stands found near the southern boundary of the quadrant; most jack pine stands have been harvested within the past 40 years (USDA Forest Service 2000). Clearings comprised of

grasses, forbs, and shrubs were associated with the powerline right-of-way, and several recently logged areas. The Partridge River is the dominant aquatic feature in this quadrant, but several wetlands were also found along the powerline route.
The recently logged areas consist of grasses and ferns with aspen saplings and speckled alder. The areas of more mature upland forests consist of jack pine, balsam fir, and aspen, with lesser amounts of paper birch, red pine, and white pine. The mature lowland areas consist mainly of black spruce and tamarack growing on a bed of sphagnum moss and clubmoss with speckled alder, Labrador-tea, and leatherleaf. The open wetland areas consist of grasses, sedges, cattails, speckled alder, and pussy willow.

Upland areas appeared to be used more by wildlife than wetlands, especially by large mammals such as deer and moose, probably because uplands provided greater cover and more browse and other food items during winter than did wetlands. Deer favor aspen and birch forests in northern Minnesota for foraging, while conifer-dominated stands are important in late winter (Mooty 1971, Wetzel 1972). Huempfner (1978b, c) suggested that mixed conifer-deciduous forest stands near recently disturbed areas containing large amounts of browse should be considered prime wintering areas for deer and moose. This appeared to be true on the Mine Site, as evidence of deer and moose use was greatest in recently logged areas, near right-of-ways, and near wetlands/streams. Peak (1971) and Wetzel (1972) found that winter deer and moose beds were associated with conifer stands, primarily balsam fir, that provided areas with shallower snow depths and helped to decrease body heat loss.

4.4.1. Wetlands

Wetlands consist predominantly of emergent wetland and open bog, scrub-shrub bog, and forest bog. Wetlands are best classified as precipitation-driven wetlands on low permeability soils (Hollands 1999). Several wetlands were enlarged due to damming of streams by beaver dams. The largest wetland associated with the study area is One Hundred Mile Swamp, portions of which are adjacent to the northeastern portion of the Mine Site. The swamp is drained by Yelp Creek, which flows into the Partridge River. The Partridge River flows to the north of the Mine Site, near the eastern boundary, and then through the southeastern portion of the study area. Another small, unnamed creek drains a wetland in Section 10 that has been dammed by beavers. This creek flows to the southwest.

Open sphagnum bogs are dominated by leatherleaf, young alder, and in some areas, cattail and sedges. Sphagnum moss often covers 80 to 90 percent of the bog. In the tree layer, there are scattered (<5 percent) black spruce (some dead) and smallish tamarack. Labrador-tea, blueberry, small-fruited bog cranberry, and small willows are also common. Other species encountered include marsh cinquefoil, cottongrass, round sundew, starflower, bunchberry, and three-leaved Solomon's seal.

There are several lakes/emergent wetlands on the property that were created by logging activities, road construction, or beaver dams. These wetlands are often dominated by sedges and cattails (80 to 90 percent cover) and water depths are several feet in deeper areas. Spruce and other trees associated with the wetland are often killed when flooded due to the rising water level. Willows, tamarack, and speckled alder are often found along the border of these wetlands. Wild iris is common in some sedge wetlands.

Scrub-shrub wetlands usually consist of a dense (80 to 90 percent) cover of speckled alder, with alder often 6 feet or taller in height. These wetlands may also have scattered sapling balsam fir, black spruce, willow, and the occasional American mountain-ash. Dominant low shrubs are Labrador-tea, velvet leaf blueberry, low bush blueberry, honeysuckle, prickly wild rose, raspberry, and red osier dogwood. Mountain maple saplings are also present. Herbaceous layer species include club and sphagnum mosses, horsetail, wood fern, bunchberry, blue bead lily, star flower, and creeping snowberry.

Wetlands forests were dominated by black spruce; forested wetlands dominated by other conifer species (tamarack) or deciduous trees were rare. Labrador-tea and blueberry are prevalent, as is spruce regeneration. In some areas with dense stands of spruce, few shrubs are seen, but sphagnum and club mosses can cover nearly 100 percent of the ground. Common species include blue bead lily, starry Solomon's seal, horsetail, star flower, and creeping snowberry. Some areas also have cottongrass and bog laurel.

Snags and woody debris were rarely encountered in wetlands. Most snags were the result of dead and dying spruce in wetlands that had been flooded by beavers or man-made activities. These snags, however, were little used by cavity-nesting bird species, but did provide perches for birds.

4.4.2. Uplands

Disturbed areas are associated with roads and landings on the Mine Site, and waste rock waste rock storage areas, roads, and rail route approximately 2½ miles west of the Mine Site. These areas had little vegetation, consisting of scattered forbs and grasses, including field hawkweed, yellow sweetclover, and bladder campion. Portions of the waste rock pile also had sapling paper birch.

Shrublands were associated with areas that had been recently logged. Scattered pole/young mature and sapling trees (trembling aspen, paper birch, jack pine, and black spruce) are occasionally found in these areas, but shrubs, including speckled alder, beaked hazel, blueberry, and raspberry may cover up to 80 percent or more of the landscape; percent cover is much less in more recently logged areas.

Conifer forests were dominated by jack pine. Forest cover was 40 to 60 percent in more mature forests, but up to 70 to 80 percent in pole/young mature forests. The shrub layer included beaked hazel, willow, and paper birch and aspen saplings. The herb layers included interrupted fern, round-branched ground pine, shining clubmoss, bunchberry, wood ferns, and starry Solomon's seal. Jack pine forests with interspersed wet areas often had black spruce and tamarack in the overstory, and a shrub layer comprised of willow, prickly wild rose, gooseberry, blueberry, and Labrador-tea. Large-leaved aster, blue-bead lily, and starflower were common herbs.

Mixed forests contained varying amounts of jack pine, spruce, aspen, paper birch, and balsam fir. Beaked hazel and sapling trees were common in the midstory. Wild sarsaparilla, blue bead lily, low bush honeysuckle, sweet coltsfoot, rosy twisted-stalk, large-leaved aster, and wood fern were common herbs. Mature forests usually had a sparse shrub layer, but the ground was nearly covered with vegetation, including wild sarsaparilla, bunchberry, Canada mayflower, blue bead lily, round-branched ground pine, starflower, bedstraw, large-leaved aster, and rose twisted stalk.

Deciduous forests were usually dominated by trembling aspen, although some forests contained an important paper birch component. Percent cover in pole/young mature forests ranged from 60 to 80 percent, and usually had a dense (60 to 80 percent cover) midstory of sapling balsam fir and paper birch, beaked hazel, lowbush blueberry, Labrador-tea, low-bush honeysuckle, and wild rose. The ground cover included wild sarsaparilla, blue bead lily, bunchberry, large-leaved aster, swamp dewberry, bracken fern, interrupted fern, goldthread, twinflower, sweet coltsfoot, strawberry, and pink ladyslipper.

Sapling forests were associated with areas that had been logged in the past decade. Tree cover ranged from 30 to 80 percent. Most forests consisted of pole/young mature-size trees, with tree cover near 80 percent in younger forests, and 40 to 50 percent in the older pole/young mature forests. Small patches of mature forest were found in the central and western portions of the Mine Site. As the amount of forest cover decreased, the amount of shrub and ground cover increased. For example, if the tree cover was near 70 to 80 percent, shrub cover was usually less than 30 percent. For more open mature tree stands, shrub and herbaceous cover could both be 60 to 80 percent.

Largest trees were up to approximately 16 inches dbh for both conifer and deciduous trees; most mature forest stands were dominated by deciduous trees. Balsam fir was common in the understory of larger pole/young mature and mature forests.

Snags and large woody debris were uncommon in disturbed areas, shrublands, and sapling and pole/young mature forests. Large snags (up to 16 inches dbh), stumps, and woody debris were common in more mature forest stands. Snags and stumps were used by pileated, hairy, black-backed, and other woodpeckers, chickadees, nuthatches, and other cavity-nesting birds. Several large holes were seen in snags, suggesting use by owls.

5.0 LIKELY IMPACTS TO WILDLIFE SPECIES AND HABITAT FROM THE PROPOSED NORTHMET MINE PROJECT

The proposed NorthMet Mine and Ore Processing Facilities Project would have both adverse and beneficial impacts to wildlife. Most impacts would be limited to wildlife found in the vicinity of the Mine Site, although some wide-ranging species, such as lynx, gray wolf, bear, and deer that reside mostly outside of the Mine Site could be impacted by mining activities during and after the mine project. Proposed mitigation measures would eventually restore some wildlife habitat to the site, but not to the same quantity or quality as the pre-disturbance condition.

This report focuses on impacts to wildlife from activities associated with the Mine Site. Potential issues from the Mine Site that involve wildlife include the following:

- Habitat loss and modification
- Land use and disturbance
- Toxic materials
- Threatened, endangered, and sensitive species

5.1. Habitat Loss and Modification and Wildlife Species Impacted

Habitat analysis is a standard approach used to assess the impacts of land management activities on wildlife. Habitat relates the presence of an organism to the physical (e.g., topography, microclimate) and biological (e.g., plant composition and cover) attributes of the environment (Block and Brennan 1993).

Most habitat assessment studies focus on the biological attributes, which are often delineated as cover types, or areas of land or water with similar habitat characteristics. Once the landscape is delineated into a group of cover types, the relationship between occurrence of cover types and presence of various wildlife species can be determined. This relationship can be used to assess whether a certain species is likely to occur in an area, and how loss of or a change in cover types could influence wildlife species occurrence.

The Mine Site would directly impact approximately 3,015 acres of wildlife habitat. Of this 3,015 acres, approximately 1,305 acres (43 percent) are wetland, and 1,710 acres (57 percent) are upland (Table 5-1; see Map 1 in back pocket). It is assumed that nearly all of this habitat would be lost to the Mine Site, although undeveloped portions, primarily on the perimeter of the Mine Site, could be retained as wildlife habitat and to buffer the Mine Site from adjacent, undisturbed habitats. However, noise disturbance and human presence would render these habitats unsuitable for most wildlife during mine operations.

Species that are fossorial, nest or roost in cavities, or are relatively immobile and could not avoid construction equipment would be killed during mine development. These include amphibians and reptiles, burrowing mammals, rodents and other slow-moving mammals, and cavity nesting/roosting birds and bats. More mobile species, such as deer, moose, coyote, and birds would leave the area during construction, but would have to compete with other wildlife for food and shelter in newly-occupied sites. As a result, health and survivorship of these individuals could be lessened. If construction occurred during winter when most birds and bats are on wintering grounds or migrating, the number of wildlife killed during construction would be reduced. Displacement of resident species due to winter construction, however, would force these animals to seek new food and shelter sources during the time of year when these sources are generally most limiting and wildlife tend to be under greatest physical stress.

5.1.1. Wetlands

Palustrine conifer pole/young mature forest is the dominant wetland vegetation, comprising 58 percent of wetland vegetation in the Mine Site. Scrub-shrub habitat was the second most dominant wetland vegetation and was found on approximately 30 percent of the Mine Site. Other important wetland habitat types were bog/palustrine emergent wetland (5 percent), and palustrine mixed pole/young mature forest (5 percent).

Table 5-1

Habitat Classification and Acres in Lease Area and Mine Site

Code	Habitat Type	Total Number of Acres in Mine Site[1]
NA	No data	0
P-0	Open water	3
P-1	Bog/palustrine emergent wetland	67
P-2	Palustrine scrub shrub	386
P-3	Palustrine forest dead trees	4
P-4	Palustrine forest deciduous sapling (0-4 in dbh)	7
P-5	Palustrine forest deciduous pole/young mature (5-12 in dbh)	4
P-6	Palustrine forest deciduous mature (12+ in dbh)	0
P-7	Palustrine forest mixed sapling (0-4 in dbh)	0
P-8	Palustrine forest mixed pole/young mature (5-12 in dbh)	59
P-9	Palustrine forest mixed mature (12+ in dbh)	10
P-10	Palustrine forest conifer sapling (0-4 in dbh)	3
P-11	Palustrine forest conifer pole/young mature (5-12 in dbh)	762
P-12	Palustrine forest conifer mature (12+ in dbh)	0
U-1	Disturbed	66
U-2	Grassland/Forbs	79
U-3	Shrubland	215
U-4	Forest deciduous sapling (0-4 in dbh)	37
U-5	Forest deciduous pole/young mature (5-12 in dbh)	127
U-6	Forest deciduous mature (12+ in dbh)	1
U-7	Forest mixed sapling (0-4 in dbh)	0
U-8	Forest mixed pole/young mature (5-12 in dbh)	713
U-9	Forest mixed mature (12+ dbh)	297
U-10	Forest conifer sapling (0-4 in dbh)	0
U-11	Forest conifer pole/young mature (5-12 in dbh)	175
U-12	Forest mature (12+ in dbh)	0
Total		3,015

Palustrine conifer forests are dominated by black spruce, with lesser amounts of tamarack and balsam fir. The canopy is often dense, limiting the number of understory plants that can grow in the shade. A limited number of

wildlife species are found in these forests. Species that were seen or could use palustrine conifer forests on the Mine Site, and would be impacted by the mine project, include black-backed woodpecker, spruce grouse, golden-crowned kinglet, snowshoe hare, and lynx. Efforts to site mine facilities on the drier portions, and to avoid palustrine forests, within the lease area would reduce impacts to these habitats, and the wildlife that use them.

Scrub-shrub habitat is dominated by speckled alder and pussy willow. Alders form a dense thicket in many areas on the Mine Site, and travel through these thickets is difficult, especially during summer. Scrub-shrub wetlands provide habitat for many species, although most also rely on upland or wetland forestlands for a portion of their life needs. Moose and deer will use these wetlands for shelter and browse, star-nosed moles and shrews use trails, and several species of birds build nests, forage, and seek cover in the alder branches. Moose sign was most common when alder stands were near emergent wetlands. Ruffed grouse and woodcock seek forage and shelter in alder stands; ruffed grouse and snowshoe hare also forage on willow buds and twigs. Alder flycatcher, common yellowthroat, and yellow warbler are other common species found in these habitats that would be affected by the mine project.

Bog/palustrine emergent wetlands provide important habitat for several species of amphibians, birds, and small mammals. Seeds, leaves, and twigs are used for food, while the dense, low cover provides breeding and hiding areas for these species. The general lack of shrubs and trees, however, limits the number of species that can use these areas due to fewer available strata compared to scrub-shrub and forest habitats. Common species that were seen or would likely occur on the Mine Site, and that could be impacted by the mine project include green, chorus, and leopard frogs, great blue heron, northern harrier, short eared owl, common snipe, belted kingfisher, sedge wren, swamp sparrow, and Le Conte's sparrow. Many emergent and open water wetlands were created by beaver dams, and otter sign was seen along the Partridge River. Bats were also seen flying over emergent wetlands and along streams in the evening.

Land clearing and excavation required for the new Mine Site could increase sediment loads into nearby aquatic bodies. This could result in temporarily degraded habitat conditions for aquatic organisms. The impacts would be most severe following heavy rainfall during the winter and spring. Increased sedimentation could result in degradation of fish and amphibian habitat.

Impacts from erosion and sedimentation would be minimized by use of best management practices. These would include the use of diversion channels to route stormwater runoff into detention ponds, where sediments would settle out. Before water was allowed to flow into natural drainages, silt fences, hay bales, or other diversion structures would be used to control overland sediment transport, and interim revegetation efforts would be used to stabilize disturbed soils during construction and operation.

After mine closure, the mine pit would be allowed to fill with water. The pit lake would provide some habitat for wildlife, primarily amphibians and aquatic birds, but the lake would have limited value to wildlife due to its steep slopes and limited shallow-water, vegetated habitat. Waste rock piles would eventually be covered with shrubs and trees, although some reclaimed lands could take 50 years or more to become productive given the poor underlying rock material.

5.1.2. Uplands

Forest mixed pole/young mature is the dominant upland vegetation habitat type, comprising 42 percent of the Mine Site, followed in importance by forest mixed mature (17 percent), shrubland (13 percent), and forest conifer pole/young mature (10 percent). Pole/young mature forest comprised 75 percent of upland forest in the Mine Site. When both wetland and upland habitats are combined, forestland comprised 73 percent of the Mine Site. Thus, species that would be most affected by construction and operation of the Mine Site would be forest-dwelling

species. Although no attempt was made to quantify wildlife abundance on the Mine Site, more wildlife appeared to use upland forests than wetland forests.

Mixed forests are ecologically the richest forests on the continent and provide an abundance of wildlife habitat (Benyus 1989). They are comprised of several tree types, each with its own types of forage and cover, in addition to shrubs and forbs/grasses. The presence of several layers of vegetation, along with numerous species of plants within each strata, allow many wildlife to find niches in these forests. Species that use both types of forest (i.e., conifers for nesting and shelter habitat, and deciduous forest for forage) do especially well. Where mixed forests abut shrublands, wetlands, or clearings, wildlife species, primarily birds, which favor forest edges, are found.

Bird species associated with these forests that would be impacted by the mine project included five species of woodpeckers (black-backed, northern-three toed, hairy, and pileated woodpeckers, and northern flicker). Although woodpecker foraging sign were seen in both pole/young mature and mature forests, pileated woodpecker foraging sign and nest cavities, and other woodpecker nest cavities, were more common on larger snags (>8 inches dbh) and on stumps in more mature mixed forests. Other cavity-nesting species seen in mixed forests included black-capped chickadee and red-breasted nuthatch. Broad-winged hawk and northern goshawk were also seen in mature forests where larger deciduous trees provided stout branches needed to support their nests. Other species found in mixed forests included ruffed grouse, least flycatcher, eastern phoebe, blue jay, common raven, American crow, winter wren, hermit thrush, American robin, gray catbird, red-eyed vireo, Nashville warbler, pine warbler, black-and-white warbler, common yellowthroat, and dark-eyed junco.

Common mammals seen, or likely to be found, in these forests and that could be impacted by mine development include moles and voles, least weasel, pine marten, red fox, coyote, black bear, and white-tailed deer. Marten dens and sign were common in jack pine and spruce forests associated with wetlands. Deer and moose sought shelter in mixed forests and foraged in nearby clearings. There was evidence of snowshoe hare browsing on grasses, forbs, shrubs and the lower branches of trees in mixed forests adjacent to alder wetlands. Coyote, fox, and wolf tracks were seen along roadways within mixed forests.

Conifer forests provide food and shelter for wildlife, especially during winter because trees retain their needles; the needles provide limited forage value, but provide important cover. During winter, ruffed grouse and ravens were seen huddling under conifer branches. Marten dens and sign were common in jack pine and spruce forests associated with wetlands. Seeds are sought out by black-capped chickadee, red-breasted nuthatch, pine warbler, voles, and mice. Red squirrel and their sign were abundant in jack pine forests; piles of seed husks were seen in piles in snow at the base of trees during winter, while squirrel trails led from one jack pine stand to another. Deer and moose use pole/young mature forests for cover during summer, but would likely seek shelter in larger pole/young mature and mature conifer forests during winter where older stands have developed a multi-layered forest canopy and stout branches that can capture snowfall.

Shrublands and sapling forests provided browse for deer and moose, but limited cover. Deer appeared to favor areas where shrublands were in close proximity to upland forests, while moose seemed to favor shrubland habitats in close proximity to upland and wetland forests.

5.1.3. U.S. Forest Service Management Indicator Habitats

Nearly all Superior National Forest Management Indicator Habitats (MIHs) would be impacted by the proposed mine project (USDA Forest Service 2004). The project would result in the loss of upland forest (MIH 1), upland deciduous forest (MIH 2), aspen-birch and mixed aspen-conifer forest (MIH 4), upland conifer forest ((MIH 5), upland spruce-fir forest (MIH 6), jack pine forest (MIH 8), lowland black spruce-tamarack forest (MIH 9), and riparian upland forest (MIH 10). Management Indicator Habitats 4, 8, and 9 would be most affected; these are

subhabitats of MIHs 1, 2, and 5. There would also be a loss of forest edge (MIH 11), upland interior forest habitat (MIH 12), and upland mature forest (MIH 13). During mine construction and operation, there would be a loss of lake and stream habitat (MIH 14), but once mine operations ceased and the pit filled with water, there would be an increase in lake habitat on the proposed project site.

5.1.4. Habitat Fragmentation and Travel Routes

The proposed mine project would increase the amount of habitat fragmentation in the area, changing shrubland, and pole/young mature and young mature forest to disturbed areas, and later to mostly open-water habitat and grassland/shrubland/young forest. Construction and development of iron mines to the north and west of the property has made much of this area of limited value to wildlife, especially in areas with pits and waste rock piles. Waste rock piles 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. The amount of fragmentation and new habitats created within the Mine Site, however, would be small in the context of available forestland in the region.

Timber harvesting in the area has already removed some of the mature timber in the area, and construction of the Mine Site would remove an additional 306 acres of mature forest. Mature forest provides habitat for species that favor older forests, and provides important cover for deer and moose during winter.

The travel routes of most non-flying wildlife in the study area typically followed existing or historic logging or drilling roads, powerline and railroad rights-of-way, streams, and forest edges. Trails were also common between two adjacent forest types, especially between forage and shelter areas. There was no evidence that the Mine Site is used by large concentrations of wildlife or that the site serves as a critical wildlife corridor. However, the site does serve as a movement corridor, as demonstrated by tracks and trails that suggested movement primarily in an east-west direction, and also to the south. Studies of radio-collared lynx, and observations of gray wolf, bobcat, and coyote showed that these animals are found on or near the Mine Site, and that the Mine Site is part of the movement corridor for these species (Moen et al. 2004). After construction, these species would likely avoid the site.

5.2. Land Use and Noise

Light and glare, roads, and noise associated with the mine project would impact wildlife. The mine will operate 24 hours a day, 365 days per year, for approximately 20 years. Light and glare would primarily be associated with mine buildings, active stockpiles, and the mine pit. Light and glare can benefit wildlife by attracting insects that are important to some species, such as bats. Light and glare, however, can affect the behaviors of wildlife and make some species more susceptible to predation at night. Most wildlife would avoid areas of the mine that are active and well-lit.

Wildlife injury and death are expected to occur from increased traffic volume on the roads. Information on the current number of wildlife killed annually on roads in the study area is not known, but is likely small since only a few cars travel on the portion of the Dunka Road through the Mine Site each day. During mine construction and operation, vehicle traffic would increase on the Dunka Road. Thus, wildlife fatalities would be expected to increase during mine construction and operation. Amphibians, reptiles, and small and large mammals would probably be most affected. Habitat suitability for some wildlife would also be reduced near the Mine Site and more heavily used mine access roads due to vehicular traffic and noise. Mine employees would be instructed to drive slowly on mine access roads and be alert for wildlife to minimize the loss of wildlife during mine operations. After mine closure, most access roads would be reclaimed.

The impacts of noise on wildlife are largely unknown and the assessment of impacts remains subjective. Wildlife are receptive to different sound frequency spectrums, many of which may be inaudible to humans. Wildlife also are known to habituate to noise, especially noises that are steady or continuous, such as noises that would occur at the mill and ventilation raises. Wildlife are less likely to habituate to sudden, infrequent impulse noises.

Noise has the potential to impact all life functions of wildlife, but may have greatest impacts during breeding, roosting, and hibernation. Loud, sudden noises would be expected to displace a variety of wildlife found on the Mine Site, including deer, game birds, and small mammals.

5.3. Acid Mine Drainage

Water flowing from reactive waste rock piles would be collected in ponds and treated prior to discharge to the Partridge River. Studies have shown that the waste rock has the potential to generate acid and leach metals. Drainage water would be collected in ponds that could be used by amphibians, birds, and small and large mammals as a potential foraging, loafing, and drinking site. The risk to wildlife health, and potential for wildlife mortality, would depend upon the acidity and concentration of metals in the water, and the types and duration of use by wildlife.

The risks to wildlife of a spill during the transport of materials used for maintenance and operation of the Mine Site, and during storage and use of the materials at the mine, would depend on the location of the spill and types and amounts of materials spilled. Potentially toxic compounds used in mine processes include lime, ammonium nitrate, gasoline, and diesel fuel.

5.4. Threatened, Endangered, and Sensitive Species

5.4.1. Federally-listed Threatened and Endangered Species

Bald eagle (threatened; Superior National Forest Management Indicator Species). No bald eagles were observed during surveys. Although 100-Mile Swamp could provide foraging habitat for eagles, no large perch or nesting trees were seen near the swamp, thus it is unlikely that bald eagles would use the Mine Site. The nearest bald eagle nest is located 7.5 miles to the north on Birch Lake. Thus, there would be minimal affects to bald eagles from the mine project.

Canada lynx (threatened). Canada lynx are rare in northern Minnesota, except during "invasions," which tend to occur about every 10 years, perhaps due to population pressures and shortages of its principal prey, the snowshoe hare (Heinselman 1996). Surveys for lynx were conducted using bait traps and track surveys on the Mine Site during winter 2000, but no lynx were found.

Approximately 50 lynx have been seen in St. Louis County since 2000 (Minnesota Department of Natural Resources 2004a) and 4 of these lynx had young. The nearest sightings were approximately 6 miles from the project site. A lynx was captured and radio-collared approximately 12 miles north of the site in August 2003; the animal subsequently moved west to near Pelican Lake in the northwestern portion of St. Louis County. The nearest sightings of a lynx with young were approximately 16 miles north of the project site in 2002 and 16 miles south of the project site in 2004. Recent studies of snowshoe hare and red squirrel pellet density suggest that hare and squirrel numbers are greatest in jack pine, red pine, black spruce, and mixed pole/young mature and mature forests; presumably, lynx would be more common in these habitats (Moen et al. 2004). Longer-term studies have shown that lynx favor mixed forests in Minnesota (McKelvey et al. 1999). Since lynx have been seen near the Mine Site, and habitats used by prey species are common on the site, the potential exists for lynx to use or travel through the proposed Mine Site area. Thus, the proposed mine project may affect lynx.

Gray wolf (threatened; Superior National Forest Management Indicator Species). Gray wolf was recorded on the site during surveys in 2000 and 2004. Wolves appeared to be traveling through the area and radio-collared wolves have been observed traveling within a few miles of the Mine Site. Territory size for wolves in northern Minnesota ranges from 20 to 150 square miles and wolf packs tend to avoid areas used by other wolf packs. During 2000 and 2004, wolf tracks were seen along Dunka Road. Interestingly, wolf tracks were not observed on the study area during January 2000, when a exploration drill rig was operating, but only during March 2000, and June 2004, when the rig was not in operation. Thus, noise and activity associated with exploratory drilling activities may have discouraged wolves from using the Mine Site. No active dens are known to occur in the Lease Area. Mine activities would displace wolves from the site and disturbances associated with mining could cause wolves to avoid the area; however, wolf tracks were seen on a service road along the boundary between the Northshore Mine and Mesaba and NorthMet Mine sites. Thus, wolves could be affected by the mine project.

5.4.2. State-listed Threatened and Endangered Species

Trumpeter swan. The trumpeter swan is an occasional visitor to the area during migration. No trumpeter swans were seen in the study area during 2000 or 2004. Although there are several ponds on the Mine Site that could be used by swans that would be lost due to mine development, these comprise less than 30 acres of habitat on the site, and ponds, lakes, and other aquatic bodies that could be used by swans are abundant in the region. Thus, the mine project would likely not affect the trumpeter swan.

Horned grebe. The horned grebe is a common migrant in the Hoyt Lakes area and could use ponds in the study area during migration. No horned grebes were seen in the study area during 2000 or 2004. Approximately 70 acres of bog, emergent wetland, and open water habitat that could be used by grebes would be lost due to mine development. However, these habitats are abundant in the region. Thus, the mine project may affect horned grebes.

Wilson's phalarope. The Wilson's phalarope nests on prairie sloughs and ponds found in the interior grasslands of western and central Canada and northern U.S. and the Pacific northwest (Terres 1982). The bird is a rare migrant in the vicinity of the Mine Site. No Wilson's phalaropes were seen in the study area during 2000 or 2004. Prairie sloughs and ponds are absent from the Mine Site and region, and other water bodies that could be used by Wilson's phalarope are abundant in the region. Thus, the mine project would likely not affect Wilson's phalaropes.

Common tern. The common tern nests in large colonies on beach sandspits and islands of sand and oyster shells. The common tern is a rare migrant in the study area. No common terns were seen in the study area during 2000 or 2004 and suitable nesting habitat is lacking on the Mine Site. The common tern could use larger ponds on the site during migration, but these habitats are abundant throughout the region. Thus, the mine project would likely not affect common terns.

5.4.3. State Species of Concern

American white pelican. Northeastern Minnesota is on the eastern range of the white pelican's migratory route, and the bird is an occasional visitor to the area during migration. Pelicans were not seen on the Mine Site during 2000 or 2004. Pelicans favor lakes that are several feet or more deep where they can swim and forage for fish. Most ponds on the Mine Site are shallow and small and would provide only limited habitat for pelicans. These types of habitats are more abundant regionally, however.

Marbled godwit. The marbled godwit is common in the western U.S. and Canada, nesting on prairies, meadows, and pastures. Godwits migrating between breeding areas and the Gulf and Atlantic coasts are occasionally seen in the Hoyt Lakes area, but prairie/grassland habitat is absent from the Mine Site. Thus, since it is unlikely that marbled godwits would use the Mine Site.

Least weasel. The least weasel is found in Alaska, throughout Canada, and into the northern U.S. They prefer marshes, meadows, fields, and brushy areas. Weasel tracks were observed in the study area during 2000, but were not identified to species (shorttail and longtail weasels could also be found in the study area and are more abundant in northeastern Minnesota than the least weasel). The least weasel has a sporadic distribution in northern Minnesota. The mine project may affect least weasels.

Mountain lion. The mountain lion is a habitat generalist that preys primarily on deer and prefers areas with little human disturbance. Although increased sightings of mountain lion in Minnesota suggest an increasing population, no mountain lion have been reported in the study area (Ryan 2005b). Track and bait surveys were done for mountain lion during winter 2000 on the Mine Site, but no confirmed sign of mountain lion were observed during the study. Mountain lion prey upon deer, and favor mixed forest, swamps, and water courses as habitats, all of which are found in the study area. These deer and habitats are also common in the region. Thus, although the mine project may affect mountain lion movements in the area, it would not adversely affect the mountain lion population.

5.4.4. Federal Species of Concern

Black tern. The black tern is a locally common breeder on prairie sloughs and marshes of the upper Midwest and Canadian Prairie. The black tern breeds in northern Minnesota and has been seen in the Hoyt Lakes area during summer and fall. Breeding habitats favored by black terns are uncommon on the Mine Site and it is unlikely that black terns would nest or spend much time on the site. No black terns were seen in the study area during 2000 or 2004 surveys.

Northern goshawk (Superior National Forest Management Indicator Species). A northern goshawk pair was observed nesting on the site during early spring surveys in 2000. The nest site was found in mature mixed forest habitat; goshawks also use deciduous forests in northern Minnesota (Huempfner and Pfannmeuller 1978). These birds were radio-collared later that spring, and shortly after abandoned the nest. The nest was unoccupied during surveys in late June 2004, and there was no evidence that the nest had been used by goshawks that spring. A call survey was conducted by the USFS in the vicinity of the nest in mid-April 2005. A goshawk responded to a call and landed on the nest (Ryan 2005a). A goshawk may also have been heard in the western portion of the site during 2004 surveys, but no nests were found in the area of the call. Several other goshawk nests have been found in the Superior National Forest in recent years as more goshawk surveys have been conducted on the Forest (Vora 2001). Approximately 10 percent of the Mine Site consists of mature mixed forest habitat that could provide future nesting habitat for goshawks; this habitat would be lost due to mine development. Thus, the mine project may affect northern goshawks.

Boreal owl. Surveys were conducted in the study area during winter and early spring 2000 and during summer 2004 for boreal owl. No boreal owls were heard. Boreal owl nest in mature conifer and mixed deciduous/conifer forests in northern Canada, and are irregular visitors to the northern U.S., including northern Minnesota, during winter. A boreal owl was heard on the Dunka Road during surveys in 1988-1989, although few boreal owls are expected to occur on or near the Mine Site (USDA Forest Service 1999).

Great gray owl. Great gray owls use stick nests built in tamarack and spruce trees. They favor spruce bogs for foraging and nesting habitat. Northern Minnesota is on the southern edge of the owl's range. Surveys were conducted in the study area during 2000 and 2004, but no great gray owls were heard. Great gray owls have been observed near Ely, Minnesota, and during November 2004 in the Duluth, Minnesota region. Great gray owls could use the Mine Site.

Olive-sided flycatcher. The olive-sided flycatcher is common in the western U.S. and western and central portions of northern Canada. Flycatchers nest in tamarack and other conifer trees. They were not seen or heard during 2000 or 2004 surveys, and are listed as rare visitors to the area during migration. Suitable habitats are found on the Mine Site, thus the mine project may affect olive-sided flycatchers.

Black-throated blue warbler. The black-throated blue warbler is common in conifer and mixed forests, primarily east of Minnesota. These warblers are listed as rare migrants in the study area. No black-throated blue warblers were seen or heard during surveys in 2000 and 2004, but suitable habitats are found on the Mine Site.

Bay-breasted warbler. The bay-breasted warbler is fairly common in the northern coniferous forests of Canada, and has been reported nesting in northeastern Minnesota. The bay-breasted warbler is an occasional migrant in the area. Bay-breasted warblers were not seen or heard in the study area during 2000 or 2004, but suitable habitats are found on the Mine Site. The mine project may affect bay-breasted warblers.

Connecticut warbler. The Connecticut warbler is an occasional migrant and breeding bird in the vicinity of the Mine Site. This species prefers to nest in spruce-tamarack bogs and in poplar and aspen woods. The Connecticut warbler was not seen or heard in the study area during 2000 or 2004, but suitable habitat is found on the Mine Site. Thus, the mine project may affect Connecticut warblers.

5.4.5. Other Species of Concern

Several animal species were identified in the 1986 LRMP for the Superior Forest (USDA Forest Service 1986) as Superior National Forest Viability and Management Indicator Species. In 2004, the plan was updated to include only three Viability/Management Indicator Species—bald eagle, gray wolf, and northern goshawk (USDA Forest Service 2004). These three species are discussed above. In addition, this report includes information on those species listed in the 1986 LRMP.

Northern leopard frog. The northern leopard frog is found in the Northern Rocky Mountains, upper Midwest U.S., and southern Canada. It breeds in freshwater and brackish marshes. In the Superior National Forest, it selects grass, forb, and low wet meadows near streams, ponds, and open water. The species was not recorded during surveys in 2004, likely because it is primarily nocturnal, and the breeding season is usually completed by mid-June (Gerholdt 1999). It is likely that leopard frogs are found on the Mine Site, as they breed in sedge meadows and these meadows are found over much of the Mine Site. The northern leopard frog is a common frog in Minnesota and impacts to leopard frogs from the mine project would not jeopardize the leopard frog population in the region.

Common loon. The common loon is a common breeder along lakes and rivers in northern Minnesota, west through the northern U.S. and throughout Canada. Loons tend to use deep-water bodies where they can dive to escape predation. Although loons are common near the study area, there are only a few small areas with deep water that could be attractive to breeding or migrating loons in the study area. No loons were seen during surveys in 2000 or 2004.

Hooded merganser. Hooded mergansers are found on wooded lakes and streams in northern Minnesota. Mergansers were not seen during 2000 or 2004 surveys, but are commonly seen in the vicinity of the proposed Mine Site and could use ponds and streams in the study area. Thus, the mine project may affect hooded mergansers.

Osprey. The osprey is an uncommon raptor that is found along the seacoast, lakes, and rivers. Ospreys are common in the Hoyt Lakes region, primarily found using the large lakes and rivers where mature white and red pine are found within ¼ mile of fish-bearing streams and lakes. Osprey were not seen in the study area during 2000

and 2004 surveys. Given the limited number of large lakes and rivers on the NorthMet site, it is unlikely that osprey would be found on the Mine Site for extended periods of time.

Red-tailed hawk. Red-tailed hawks are found throughout North America. They nest in woodlands and feed in open country, feeding on rabbits, rodents, and snakes. They are occasionally seen nesting in the Hoyt Lakes region, and a red-tailed hawk was seen flying over the Mine Site, but would be unlikely to use the study area for long periods due to the general lack of open habitat.

Ruffed grouse. Ruffed grouse were common on the site and were seen and heard during surveys in 2000 and 2004. During winter 2000, ruffed grouse were often seen buried in the snow or perched in deciduous and mixed forests dominated by aspen. During 2004, ruffed grouse were seen in mixed forests and heard drumming. Drumming counts indicate that ruffed grouse are least common in northeastern Minnesota than other parts of the state (Huempfner 1978a, Minnesota Department of Natural Resources 1999a). Ruffed grouse favor young aspen/birch forests less than 25 years in age; most forest stands on the Mine Site are more than 25 years old. Ruffed grouse would be displaced during mine construction into nearby habitats. Forest habitats favored by ruffed grouse are abundant in the region, but displaced grouse would still have to compete with other grouse and wildlife for limited resources when occupying new areas. The mine project would affect ruffed grouse populations in the region.

Spruce grouse. Approximately half of the spruce grouse in Minnesota are found in the northeastern portion of the state. Spruce grouse primarily use mature jack pine and spruce forests, which comprise over half of the NorthMet Mine Project site. Spruce grouse were seen or heard occasionally during surveys in 2000; none were observed during 2004. Spruce grouse are uncommon in the study area. Like ruffed grouse, spruce grouse would be displaced during mine construction into nearby habitats. Forest habitats favored by spruce grouse are common in the region, although less abundant than forest habitats favored by ruffed grouse. Spruce grouse would have to compete with other grouse and wildlife for limited resources when occupying new areas. The mine project would affect spruce grouse populations in the region.

American woodcock. American woodcock are common migrants and occasional breeders in the area. Woodcock were not seen during surveys in 2000 or 2004, but were seen on the adjacent Mesaba Mine Project site during fall 2001. American woodcock live in moist woods and thickets. They were associated with speckled alder stands on the Mesaba Mine Project site and are likely to use similar habitats in the study area. Alder stands comprise approximately 12 percent of the site. The mine project may affect woodcock populations in the region.

Killdeer. Killdeer are very common in meadows, pastures, fields, and dry uplands throughout North America. They are common in the Hoyt Lakes area but likely would not use the Mine Site to any great extent due to the lack of meadows, pastures, and fields favored by killdeer for nesting and foraging.

Belted kingfisher. The belted kingfisher is the most common kingfisher in North America. It is seen singly or in pairs along streams and ponds, often perching at the edge of the pond and then diving into the water for fish. The belted kingfisher is a common breeder in the Hoyt Lakes area, and was seen in the study area during 2004 surveys. The mine project would result in the destruction of approximately 70 acres of habitat that could be used by kingfishers; however, bog/emergent wetland and open water habitats are common in the region and displaced kingfishers would move to these habitats. Thus, the mine project would affect belted kingfisher in the region.

Pileated woodpecker. Pileated woodpeckers favor large expanses of deciduous or mixed forests with mature trees and down woody material, snags, and large stumps. Pileated woodpeckers and their sign were observed in the study area, although the species is uncommon on the site. Observations of pileated woodpeckers and their sign were primarily confined to mature mixed forests with snags and stumps. The long-term forest management goal for

the Superior National Forest is to maintain or slightly increase the amount of mature and old-growth forest and abundance of snag and down woody material (USDA Forest Service 2004). Of the over 1 million acres of forestland in the Superior National Forest, over half will be managed for young mature to old growth characteristics that would benefit pileated woodpeckers. The mine project would result in the loss of about 310 acres of mature forest and 1,840 acres of pole/young mature forest. Pileated woodpeckers would be displaced off the site by mine development, but should find adequate habitat off-site.

Black-backed woodpecker. Black-backed woodpeckers were observed using upland and wetland spruce/fir mixed forests and conifer stands with scattered snags in the central section of the northern half of the study area during winter and early spring 2000. These birds may have been migrants, as no black-backed woodpeckers were observed during 2004 and black-backed woodpeckers are rare in the region. Over 800 acres of spruce forest would be lost to mine development, but the mine footprint would avoid important spruce forests to the north and west of the Mine Site. Thus, the mine project would affect black-backed woodpeckers.

Brown creeper. The brown creeper is a common woodland bird found throughout North American. Creepers favor both deciduous and conifer mature forest, and mature red and white pine stands. Brown creepers were not seen in the study area during 2000 and 2004 surveys, and are listed occasional migrants, and rare breeders, in the Hoyt Lakes area. There are only scattered clumps of pines in the study area. The proposed mine project may affect brown creepers.

Golden-crowned kinglet. Golden-crowned kinglets are common and found throughout North America, primarily in mature lowland conifer forests. Golden-crowned kinglets are listed as occasional migrants and nesters in the Hoyt Lakes area, but were not seen in the study site during 2000 or 2004. Mature lowland conifer forest is most common in the northwestern portion of the Lease Area, but much of this area would not be impacted by the mine footprint. The proposed mine project may affect golden-crowned kinglets.

Swainson's thrush. Swainson's thrush summer in the spruce, cedar, and fir forests. They are common migrants in the Hoyt Lakes area, and occasionally are reported to breed in the area. Swainson's thrush were heard in mixed forest and spruce forest associations in the study area. A third of forests on the proposed Mine Site is comprised of mixed forest, but this forest type is common in the region and displaced thrush would be able to find habitat elsewhere.

Magnolia warbler. Magnolia warblers breed in spruce, balsam fir, and hemlock forests, are common residents in the Hoyt Lakes area, and are likely found in the study area. They select sparsely stocked spruce and fir sampling stands, and mature and immature pine stands, in the Superior National Forest. Spruce and balsam forests comprise much of the conifer forest habitat on the proposed Mine Site, and on lands surrounding the site. The proposed mine project could affect magnolia warblers.

Pine warbler. The pine warbler nests in open groves of mature pine and is found nesting primarily to the east of Minnesota in the northeastern and eastern U.S. and southern Canada. Pine warblers also select mature aspen trees near lowland conifer foraging habitat. The pine warbler is listed as an occasional migrant and breeder in the Hoyt Lakes area, and was heard in the study area during 2004. As noted for the brown creeper, there is little pine habitat on the proposed Mine Site. The proposed mine project could affect the pine warbler.

Savannah sparrow. The savannah sparrow is common throughout North America and prefers large fields with short or sparse grass or weeds; savannah sparrows also use sedge marshes and wet meadows. The savannah sparrow is listed as common in the Hoyt Lakes area. It was not seen or heard in the study area, and would be unlikely to use the Mine Site due to the lack of large fields with suitable habitat. The savannah sparrow could use the existing waste rock storage piles approximately 2½ miles west of the mine property, in Sections 13 and 14,

Township 59 North, Range 14 West, that may be used to store waste rock from the proposed mine project; these sites are covered by forbs, grasses, and sapling deciduous trees. Development of the Mine Site would likely not affect savannah sparrows, but use of the waste rock piles for storage of additional waste rock material could affect the savannah sparrow.

Beaver. Beaver are common residents on the study area and in nearby wetlands. Most large open water and emergent wetlands on the site developed as a result of beavers damming streams on the study area. Beavers also block culverts under road and railroad grades to create lake habitat. Beaver lodges and tree cuttings are common in areas used by beavers. It is likely that some beavers would be killed or harm during proposed mine construction activities, although some beaver could be trapped and safely relocated to protected areas. Beaver are common in the region, thus they would be affected by the mine project.

Porcupine. Porcupines are most often found in woody areas, but have adapted to a wide range of habitats, ranging from tundra to desert chaparral and rangelands. In the Superior National Forest, porcupines are most closely identified with mature pine forests. No porcupines were observed during studies in 2000 and 2004 and are considered rare in the Boundary Waters area north of the study area. Only scattered mature pine trees were seen on the Mine Site, thus porcupines are likely uncommon on the site. If found on the site, it is likely that some porcupine would be killed or harm during proposed mine construction activities, although some animals could be trapped and safely relocated to protected areas Thus, the proposed mine project may affect porcupines.

White-tailed deer. White-tailed deer are common on the site. An estimated 8 to 10 deer are found per square mile in the study area (Huempfner 1978b, Berg 2000). Based on population surveys and hunter kill rates, deer population densities in Minnesota are lower in northeastern Minnesota than in more southerly areas of the state (Berg 2000, Minnesota Department of Natural Resources 2004b). Deer tracks were primarily observed in the western and southern portions of the site during 2000 and 2004, especially in recently logged areas and shrublands near mixed and conifer forest pole/young mature and mature forest habitats. Deer would be able to leave the area during mine construction, and many already likely move on and off the Mine Site to meet seasonal habitat needs. Deer are habitat generalists, and would be able to find suitable habitat off-site, although deer could be more susceptible to stress if displaced during mid- to late winter when animals would be in poorer condition than during other times of the year. The proposed mine project would affect deer on the Mine Site, but would not adversely affect deer populations.

Moose. Moose sightings were common in logged areas with abundant shrubs and near mature forest habitat, and in sedge and willow wetlands. Moose populations in the Superior National Forest have fluctuated considerably since the early 1900s and have shown their greatest increases during periods of intense timber harvest (Huempfner 1978c). Based on ground and helicopter surveys in 2000 and 2004, 5 to perhaps as many as 10 moose used the study area. Aerial surveys conducted in 1978 found about 0.8 moose per square mile in an area that included the Mine Site. Moose and their sign were most common in the western half of the study area; willow/alder and sedge wetlands were also more common on the western than eastern portion of the Mine Site. Moose would be displaced to nearby habitats, most likely to the west and south of the Mine Site. The proposed mine project would affect moose.

Cumulative Effects and Irreversible and Irretrievable Commitments of Resources

Wildlife species and their habitat on the Iron Range are in a constant state of flux due to mining activities and other development, timber harvest and management, recreation and other human-disturbance activities, and natural succession of plant communities. The 3-million acre Superior National Forest is comprised of approximately 450,000 acres of aquatic habitat, while much of the remaining land is forested (USDA Forest Service 2004).

Portions of the study area are privately held and comprised of forest, shrub, and aquatic habitats. These habitats dominate regionally, as well.

Iron ore mining has disturbed or destroyed much wildlife habitat to the north and west of the Mine Site. These areas once were comprised of habitats similar to those on the proposed Mine Site, but now consist of disturbed areas, pit lakes, and sparsely vegetated waste rock and mine spoil piles. Some of the oldest waste rock piles now support dense stands of sapling and pole/young mature deciduous trees, but their value to wildlife is much less than what occurred on the site prior to mine development. Noise and other disturbances associated with mine operations have also displaced wildlife, although, as evidenced by wildlife sightings and sign, many species, including wolf, moose, deer, bobcat, and a variety of birds and other wildlife, have become habituated to mine disturbance.

Wildlife habitat has been lost due to commercial and residential development on the Iron Range. Much of this development has been in support of mining and recreational activities that occur on the Iron Range and Boundary Waters Canoe Area and Wilderness. Except for mining, there is very little commercial or residential development within several miles of the NorthMet Mine Site, and only limited vehicle activity and recreation (primarily hunting and use of snowmobiles) occurs in the area.

Much of the remaining area is in commercial forest production, as evidenced by stands of different ages and recent clearcuts on the Mine Site. Upland forests have experienced the most recent logging activity, and most upland forests on the Mine Site are less than 45 years old. Most spruce lowland forests on the eastern portion of the Lease Area are over 60 years in age, while those in the western portion of the Lease Area are 80 years or older (USFS 2000). Although a forest management objective for the Superior National Forest is to promote more mature and old-growth forest, a portion of forestlands in the Superior National Forest and Iron Range will be harvested each year. Thus, wildlife species that are most adapted to more mature forests will need to seek new habitats, while habitat generalists and those that use shrublands and younger forestlands will benefit from timber harvests.

Historic data suggest that the Minnesota “north woods” have always been in a state of flux, and that only a quarter of the forest in northeast Minnesota consisted of mature forest at the time of European settlement (Heinselman 1996). Fire played an important role in the forest dynamics and plant species, such as jack pine whose seeds are not released until the cones are exposed to high temperatures, evolved life history adaptations to cope with fire. In turn, wildlife also adapted to change in forest community structure. Since European settlement, fire intervals have lengthened and forest stands have change due to fire has become less prevalent.

Development of Mine Site would cause the loss of over 3,000 acres of wetland and upland habitat, increase the level of noise and disturbance in the area, and lead to increased vehicle activity and recreational activity in the area. After mine operations cease, a pit lake would develop and portions of the site would be reclaimed to shrubland and forestland habitat. However, wildlife habitat values would be lost, and would be cumulative to the loss of wildlife habitat that has occurred in the Iron Range since early settlement. Forest management activities on nearby lands and within the region, including logging and use of prescribed fire, should improve wildlife habitat for species that favor early successional forests and may replace some of the habitat values lost due to the proposed mine project.

There would be an irretrievable loss of high-quality wetland and upland habitat, and timber resources, as a result of the construction of the Mine Site. The site would revert to mostly open water and upland shrubland/forestland habitat after completion of mining activities, but it would take decades for suitable wildlife habitat to develop on the site, and the quality of habitat would not exceed that which currently exists on the site. Timber harvest activities, and agricultural, residential, and recreational development, have occurred in the past and will occur in

the future on lands or near the Mine Site. Over the long-term, there would be a net loss of wildlife habitat in the region as lands are cleared and developed.

5.5. Best Management Practices and Reclamation

A number of best management practices and reclamation measures would be taken to reduce or avoid impacts to wildlife. The size of the footprint would be kept as small as possible to reduce the amount of habitat disturbance. Where feasible, trees and other large vegetation would be left as a buffer around the perimeter of the Mine Site to reduce glare, noise, and other disturbances to wildlife.

The mine would be constructed in phases to minimize the amount of area disturbed at any one time, and to allow sequential reclamation as mining activities permanently cease in each disturbance area. Small trees, scrub vegetation, and forest detritus would be mulched and removed with the topsoil and stockpiled for future use in reclamation. As sections of waste rock stockpiles or other mine facilities are closed, the sites would be graded for precipitation runoff and/or to better match the local topography, covered with soil, and revegetated. A stormwater management plan would be developed that identifies practices to ensure that stormwater runoff does not adversely impact off-site water quality.

Reactive (acid-generating) waste rock would be stockpiled on top of a seepage barrier and drainage collected in lined storage ponds. The water in ponds would be treated prior to discharge to the Partridge River or other aquatic bodies. Pit water would also be collected, sediments would be allowed to settle out, and then treated, if necessary, before discharge. Fuel and other hazardous materials would be stored within a roofed structure. Bulk oil storage tanks would be enclosed with a berm sized to contain all oil within the storage tanks.

Speed limits would be enforced along the Dunka Road to reduce the risk of wildlife-vehicle collisions. Mine workers would be given training to make them aware of the importance of the area to wildlife, to request that employees report sick or dying wildlife along roads or at facilities, to ensure that employees to not dump wastes or other harmful materials off the site, and to make employees aware of other actions that could be harmful to wildlife or their habitats.

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APPENDIX A

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Plants	
American Fly Honeysuckle	*Lonicera canadenis*
American Mountain Ash	*Sorbus americana*
Balsam Fir	*Abies balsamea*
Beaked Hazel	*Corylus cornuta*
Bedstraw	*Galium* sp.
Black Ash	*Fraxinus nigra*
Black Spruce	*Picea mariana*
Bladder Campion	*Lychnis alba*
Blue Bead Lily	*Clintonia borealis*
Blueberry	*Vaccinium angustifolium*
Bog Laurel	*Kalmia polifolia*
Bracken Fern	*Pteridium aquilinum*
Bunchberry	*Cornus canadensis*
Canada Mayflower	*Maianthemum canadensis*
Cat-tail	*Typha* spp.
Clubmoss	*Lycopodium* spp.
Cottongrass	*Eriophorum* sp.
Creeping Snowberry	*Gaultheria hispidula*
Field Hawkweed	*Hieracium pretense*
Goldthread	*Coptis trifolia*
Gooseberry	*Ribes* spp.
Hemlock	*Tsuga* spp.
Honeysuckle	*Lonicera* sp.
Horsetail	*Equisetum* spp.
Interrupted Fern	*Osmunda claytoniana*
Jack pine	*Pinus banksiana*
Labrador-tea	*Ledum groenlandicum*
Large-leaved Aster	*Aster macrophyllus*
Least Moonwort	*Botrychium simplex*
Leatherleaf	*Chamaedaphne calyculata*
Lowbush Blueberry	*Vaccinium augustifolium*
Lowbush Honeysuckle	*Diervilla lonicera*
Marsh Cinquefoil	*Potentilla palustris*

APPENDIX A (Cont.)

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Plants (Cont.)	
Matricary Grapefern	*Bortychium matricariifolium*
Mountain Maple	*Acer spicatum*
Neat Spikerush	*Eleocharis nitida*
Paper Birch	*Betula papyrifera*
Pink Ladyslipper	*Cypripedium acaule*
Prickly Wild Rose	*Rosa acicularis*
Pussy Willow	*Salix discolor*
Raspberry	*Rubus* spp.
Red Maple	*Acer rubrum*
Red-osier Dogwood	*Cornus stolinifera*
Red Pine	*Pinus resinosa*
Round-branched Ground Pine	*Lycopodium dendroideum*
Round Sundew	*Drosera rotundifolia*
Rose Twisted Stalk	*Streptopus roseus*
Sedge	*Carex* spp.
Shining Clubmoss	*Lycopodium lucidulum*
Small-fruited Bog Cranberry	*Vaccinium oxycoccus*
Smartweed	*Polygonum* sp.
Solomon's Seal	*Polygonatum* sp.
Sphagnum Moss	*Sphagnum* spp.
Speckled Alder	*Alnus rugosa*
Spikerush	*Eleocharis* spp.
Starflower	*Trientalis borealis*
Starry Solomon's Seal	*Smilacina stellata*
Swamp Dewberry	*Rubus hispidus*
Sweet Coltsfoot	*Petasites palmatus*
Tamarack	*Larix laricina*
Torrey's Manna-grass	*Torreyochloa pallida*
Trembling Aspen	*Populus tremuloides*
Twinflower	*Linnaea borealis*
Velvet-leaf Blueberry	*Vaccinium myrtilloides*
Wild Iris	*Iris versicolor*
White Pine	*Pinus strobus*
Wild Sarsaparilla	*Aralia nudicaulis*

APPENDIX A (Cont.)

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Plants (Cont.)	
Wild Strawberry	*Fragaria virginiana*
Willow	*Salix* spp.
Wood Fern	*Dryopteris spp.*
Yellow Sweetclover	*Melilotus officinalis*
Animals	
Alder Flycatcher	*Epidonax Alnorum*
American Crow	*Corvus brachyrhyncos*
American Robin	*Turdus migratorius*
American White Pelican	*Pelecanus erythrorhynchos*
American Woodcock	*Scolopax minor*
Bald Eagle	*Haliaeetus leucocephalus*
Barred Owl	*Strix varia*
Bay-breasted Warbler	*Dendroica castanea*
Beaver	*Castor canadensis*
Belted Kingfisher	*Ceryle alcyon*
Black-and-white Warbler	*Mniotilta varia*
Black-backed Woodpecker	*Picoides arcticus*
Black Bear	*Ursus americanus*
Black-capped Chickadee	*Parus atricapillus*
Blacknose Dace	*Rhinichthys atratulus*
Black Tern	*Chlidonias niger*
Black-throated Blue Warbler	*Dendroica caerulescens*
Blue Jay	*Cyanocitta cristata*
Bobcat	*Lynx rufus*
Boreal Owl	*Aegolius funereus*
Broad-winged Hawk	*Bueto platypterus*
Brook Stickleback	*Culaea inconstans*
Brook Trout	*Salvelinus fontinalis*
Brown Creeper	*Certhia americana*
Canada Lynx	*Lynx canadensis*
Chipping Sparrow	*Spizella passerina*
Central Mudminnow	*Umbra limi*
Chorus Frog	*Pseudacris triseriata*
Common Crow	*Corvus brachyrhynchos*

APPENDIX A (Cont.)

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Animals (Cont.)	
Common Garter Snake	*Thamnophis sirtalis*
Common Loon	*Gavia immer*
Common Raven	*Corvus corax*
Common Snipe	*Capella gallinago*
Common Redpoll	*Acanthis flammea linaria*
Common Yellowthroat	*Geothylpis trichas*
Connecticut Warbler	*Oporornis agilis*
Coyote	*Canis latrans*
Dark-eyed Junco	*Junco hyemalis*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Phoebe	*Sayornis phoeba*
Eastern Wood Pewee	*Contopus virens*
Elk	*Cervus elaphus*
Finescale Dace	*Chrosomus neogaeus*
Fisher	*Martes pennanti*
Golden-crowned Kinglet	*Regulus satrapa*
Gray Catbird	*Dumetella carolinensis*
Gray Jay	*Perisoreus canadensis*
Gray Wolf	*Canis lupus*
Great Gray Owl	*Strix nebulosa*
Great Blue Heron	*Ardea herodias*
Great Horned Owl	*Bubo virginianus*
Green Frog	*Rana clamitans*
Hairy Woodpecker	*Dendrocopus villosus*
Hermit Thrush	*Hylocichla guttata*
Hooded Merganser	*Lophodytes cuculllatus*
Horned Grebe	*Podiceps auritus*
Killdeer	*Charadrius vociferus*
Least Flycatcher	*Epidonax minimus*
Least Weasel	*Mustela nivalis*
Le Conte's Sparrow	*Ammodramus leconteii*
Long-eared Owl	*Asio otus*
Magnolia Warbler	*Dendroica magnolia*
Marbled Godwit	*Limosa fedoa*

APPENDIX A (Cont.)

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Animals (Cont.)	
Moose	*Alces alces*
Mountain Lion	*Felis concolor*
Mourning Dove	*Zenaidura macroura*
Nashville Warbler	*Vermivora ruficapilla*
Northern Flicker	*Colaptes auratus*
Northern Goshawk	*Accipiter gentilis*
Northern Harrier	*Circus cyaneus*
Northern Leopard Frog	*Rana pipiens*
Northern Pike	*Esox lucius*
Northern Three-toed Woodpecker	*Picoides tridactylus*
Olive-sided Flycatcher	*Contopus borealis*
Osprey	*Pandion haliaetus*
Pileated Woodpecker	*Hylatomus pileatus*
Pine Marten	*Martes americana*
Pine Warbler	*Dendroica pinus*
Porcupine	*Erethizon dorsatum*
Red-breasted Nuthatch	*Sitta canadensis*
Red-eyed Vireo	*Vireo olivaceus*
Red Fox	*Vulpes fulva*
Red-tailed Hawk	*Buteo jamaicensis*
Red Squirrel	*Tamiasciurus hudsonicus*
River Otter	*Lutra canadensis*
Ruffed Grouse	*Bonasa umbellus*
Savannah Sparrow	*Passerculus sandwichensis*
Saw-whet Owl	*Aegolius acadicus*
Screech Owl	*Otus asio*
Sedge Wren	*Cistothorus platensis*
Short-eared Owl	*Asio flammeus flammeus*
Snow Bunting	*Plectrophenax nivalis nivalis*
Snowshoe Hare	*Lepus canadensis*
Song Sparrow	*Melospiza melodia*
Spruce Grouse	*Canachites canadensis*
Starnose Mole	*Condylura cristata*
Swainson's Thrush	*Catharus ustulatus*

APPENDIX A (Cont.)

Common and Scientific Names of Plants and Animals Given in the Report

Common Name	Scientific Name
Swamp Sparrow	*Melospiza georgiana*
Trumpeter Swan	*Cygnus buccinator*
Walleye	*Stizostedion vitreum*
Water Pipit	*Anthus spinoletta*
White Suckers	*Catastomus commersoni*
White-tailed Deer	*Odocoileus virginianus*
White-throated Sparrow	*Zonotrichia albicollis*
Wilson's Phalarope	*Phalaropus tricolor*
Winter Wren	*Troglodytes troglodytes*
Yellow Perch	*Perca flavescens*
Yellow Warbler	*Dendroica petechia*

APPENDIX B

Agency and Organization Contacts (2000 and 2004 Surveys)

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APPENDIX C
Superior National Forest
Regional Forester Sensitive Species

Tuesday, October 28, 2003

Scientific Name	Common Name
MAMMALS	
Phenacomys intermedius	Heather Vole
BIRDS	
Accipiter gentilis	Northern Goshawk
Aegolius funereus	Boreal Owl
Ammodramus leconteii	Le Conte's Sparrow
Chlidonias niger	Black Tern
Contopus cooperi	Olive-sided Flycatcher
Coturnicops noveboracensis	Yellow Rail
Dendroica caerulescens	Black-throated Blue Warbler
Dendroica castanea	Bay-breasted Warbler
Falco peregrinus anatum	American Peregrine Falcon
Oporornis agilis	Connecticut Warbler
Phalaropus tricolor	Wilson's Phalarope
Picoides tridactylus	Three-toed Woodpecker
Strix nebulosa	Great Gray Owl
Tympanuchus phasianellus	Sharp-tailed Grouse
REPTILES	
Clemmys insculpta (Glyptemys)	Wood Turtle
FISH	
Acipenser fulvescens	Lake Sturgeon
Coregonus zenithicus	Shortjaw Cisco
Ichthyomyzon fossor	Northern Brook Lamprey
MOLLUSKS	Creek Heelsplitter
Lasmigona compressa	
Ligumia recta	Black Sandshell

APPENDIX C
Superior National Forest
Regional Forester Sensitive Species (Cont.)

Scientific Name	Common Name
INSECTS	
Cicindela denikei	Tiger Beetle Spp
Erebia disa mancinus	Mancinus Alpine
Erebia discoidalis discoidalis	Red-disked Alpine
Lycaeides idas nabokovi	Nabokov's (or Northern) Blue
Oeneis jutta ascerta	Jutta Arctic
Pyrgus centaureae freija	Freija's Grizzled Skipper
PLANTS	
Adoxa moschatellina	Moschatel
Arnica lonchophylla	Northern Arnica
Asplenium trichomanes	Maidenhair Spleenwort
Astragalus alpinus	Alpine Milkvetch
Bidens discoidea	Swamp Beggar-ticks
Botrychium acuminatum	Moonwort
Botrychium lanceolatum	Triangle Grape-fern
Botrychium lanceolatum var angustisegmentum	Lance-leaf Grape-fern
Botrychium lunaria	Moonwort Grape-fern
Botrychium michiganense (hesperium)	A Moonwort
Botrychium mormo	Goblin Fern
Botrychium pallidum	Pale Moonwort
Botrychium rugulosum (=ternatum)	Ternate Grape Fern
Botrychium simplex	Least Grape-fern
Caltha natans	Floating Marsh-marigold
Calypso bulbosa	Fairy Slipper
Carex katahdinensis	Katahdin Sedge
Carex novae-angliae	New England Sedge

APPENDIX C
Superior National Forest
Regional Forester Sensitive Species (Cont.)

Scientific Name	Common Name
Carex rossii	Short Sedge
Crataegus douglasii	Douglas's Hawthorn
Cypripedium arietinum	Ram's-head Lady's Slipper
Disporum trachycarpum	Rough-fruited Mandarin
Eleocharis nitida	Neat Spike-rush
Juncus stygius	Moor Rush
Juncus subtilis	Creeping Rush
Juncus vaseyi	Vasey Rush
Listera auriculata	Auricled Twayblade
Littorella uniflora	American Shore-grass
Moehringia macrophylla	Large-leaved Sandwort
Muhlenbergia uniflora	Fall Dropseed Muhly Or One flowered Muhly
Nymphaea leibergii	Dwarf Water-lily
Osmorhiza berteroi	Chilean Sweet Cicely
Oxytropis borealis var viscida (=oxytropis viscida var viscida)	Sticky Locoweed
Platanthera clavellata	Small Green Woodland Orchid
Polemonium occidentale ssp lacustre	Western Jacob's Ladder
Polystichum braunii	Braun's Holly-fern
Pyrola minor	Lesser Wintergreen Or Small Shinleaf
Rubus chamaemorus	Cloudberry
Saxifraga cernua	Nodding Saxifrage
Saxifraga paniculata (=aizoon) spp. Neogaea	Livelong Saxifrage
Sparganium glomeratum	Northern Bur-reed

APPENDIX C
Superior National Forest
Regional Forester Sensitive Species (Cont.)

Scientific Name	Common Name
Subularia aquatica	Awlwort
Taxus canadensis	Canada Yew
Tofieldia pusilla	False-asphodel
Viola lanceolata	Lance-leaved Violet
Waldsteinia fragarioides	Barren Strawberry
Woodsia glabella	Smooth Woodsia
NONVASCULAR PLANTS	
A subcentrifuga	
Arctoparmelia centrifuga	Lichen
Caloplaca parvula	
Cetraria (=ahtiana) aurescens	Yellow ribbon lichen
Cladonia wainoi	A Lichen Species
Menegazzia terebrata	Port-hole Lichen
Peltigera venosa	A Dog Lichen
Pseudocyphellaria crocata	Yellow specklebelly lichen
Ramalina thrausta	A Lichen
Sticta fuliginosa	A Lichen
Usnea longissima	