

1 **5.2.4 Vegetation**

2 This section describes the environmental consequences of the NorthMet Project Proposed Action
3 to vegetation, which include direct effects on land cover types, native plant community types,
4 MBS Sites of Biodiversity Significance, and rare or sensitive plant species, as well as effects
5 from existing or introduced invasive non-native species.

6 **Summary**

7 The NorthMet Project Proposed Action would disturb 1,718.6 acres of the Mine Site and have
8 the greatest effect on upland conifer forest land cover types. Approximately 2,178 acres of the
9 Plant Site would be disturbed by the NorthMet Project Proposed Action, with most effects
10 occurring in already disturbed areas and tailings ponds. All land within the Transportation and
11 Utility Corridor would be affected (120.2 acres), the majority of which is already disturbed.

12 The NorthMet Project Proposed Action would affect 1,718.6 acres of MBS Sites of High
13 Biodiversity Significance, 698.2 acres of “imperiled-vulnerable” or “vulnerable” native plant
14 communities, 92.6 acres of “apparently secure” native plant communities, and 178.9 acres of
15 “widespread and secure” native plant communities.

16 Reclamation activities could introduce invasive non-native species to the high quality area
17 around the Mine Site, depending on which species are chosen, but preference would be given to
18 the establishment of native plant communities. The Plant Site itself is already heavily disturbed,
19 but the area around the Plant Site could be affected by the introduction of additional invasive
20 non-native species.

21 There are no federally listed plant species at the NorthMet Project area. There are 11 state-listed
22 plant species, all at the Mine Site; 9 species would be directly affected and 2 would be indirectly
23 affected by the NorthMet Project Proposed Action.

24 Indirect effects from the NorthMet Project Proposed Action could include dust deposition on
25 vegetation, hydrology changes, ore spillage along the Transportation and Utility Corridor, and
26 erosion on the tailings basin. Mitigation measures would be in place for each of these categories.

27 **5.2.4.1 Methodology and Evaluation Criteria**

28 This section compares the types of data presented in Section 4.2.4 for the NorthMet Project area.
29 Specifically, GIS data were obtained from the MDNR regarding GAP land cover types, native
30 plant communities, MBS Sites of Biodiversity Significance, and listed ETSC plant species within
31 the NHIS. Data were obtained from the USFS regarding MIH types, forest stand age classes,
32 RFSS, invasive non-native species, and landscape ecosystems. Separate NorthMet Project area-
33 specific listed species survey reports were also utilized to supplement MDNR NHIS data and
34 estimate effects on populations.

35 GIS analysis was used to calculate effects on the data layers mentioned above. The effects were
36 calculated for habitat types, classifications, and species where they overlap the NorthMet Project
37 area footprints.

38 Direct effects on natural features (e.g., vegetative cover types, plant communities, sites of
39 biodiversity significance, and rare species) occur through clearing, filling, and other construction
40 activities. A direct effect on an ETSC plant species occurs when the action results in the removal

41 or loss (i.e., taking) of an individual plant or entire plant population. Direct effects are those that
 42 are a result of the NorthMet Project Proposed Action, that are immediate, and that often last for
 43 years.

44 An indirect effect occurs when a cover type, plant community, Site of Biodiversity Significance,
 45 or rare species experiences a change in vegetative composition. Indirect effects can occur over
 46 time or after the action is completed and can occur on- or off-site. Indirect effects on vegetation
 47 may include changes in hydrology, deposition of particulate matter (dust), changes in
 48 successional stage, alteration of microclimate (e.g., tree removal resulting in drier soil
 49 conditions), loss of pollinators or loss of fungal associates in the rooting zone, erosion and
 50 sedimentation, and invasion of non-native species. Indirect effects were estimated by comparing
 51 the proximity of the NorthMet Project area infrastructure footprints to existing natural features
 52 (e.g., habitat types, plant species present).

53 **5.2.4.2 NorthMet Project Proposed Action**

54 This section describes the effects of NorthMet Project Proposed Action construction, operation,
 55 and closure on vegetation cover types and plant species. Potential effects from invasive non-
 56 native species are discussed separately.

57 **5.2.4.2.1 Mine Site**

58 ***Effects on Cover Types***

59 ***Habitat Types***

60 Construction and operation of the NorthMet Project Proposed Action at the Mine Site would
 61 directly affect 1,718.6 acres (57 percent of the Mine Site) of land with various MDNR GAP land
 62 cover designations as a result of excavating the mine pits and creating overburden and waste
 63 rock stockpiles and associated internal haul roads and drainage ditches. As shown in Table 5.2.4-
 64 1, these effects would include 62 percent (741.9 acres) of the upland conifer forest at the Mine
 65 Site. Other high-acreage directly-affected cover types include lowland coniferous forest (437.2
 66 acres) and upland deciduous forest (354.7 acres). Approximately 1,295.9 acres, or about 43
 67 percent of the Mine Site, would not be disturbed. The wetland field assessment indicated a high
 68 level of wetland quality. Section 5.2.3 provides a more detailed discussion of wetland effects.

69 Table 5.2.4-1 Direct Effects on Cover Types at the Mine Site

Cover Types	Affected Acres	Non-affected Acres ¹	Total Cover Type Acres	Percent of Cover Type Affected
Upland coniferous forest	741.9	453.6	1,195.5	62
Lowland coniferous forest	437.2	344.0	781.2	56
Upland deciduous forest	354.7	293.3	648.0	55
Shrubland	133.0	108.7	241.7	55
Disturbed	44.0	84.0	128.0	34
Aquatic environments	6.0	6.7	12.7	47
Upland conifer-deciduous mixed forest	1.5	0.9	2.4	63
Cropland/grassland	0.2	4.7	4.9	4
Lowland deciduous forest	0.0	0.1	0.1	0
Total ²	1,718.6	1,295.9	3,014.5	57

70 Source: MDNR 2006b.

71 ¹ Areas of cover types not directly affected by mine pits, stockpiles, roads, or other infrastructure.

72 ² Total acres may be more or less than presented due to rounding.

73 ***Minnesota Biological Survey***

74 Approximately 353.6 acres of the One Hundred Mile Swamp MBS Site of High Biodiversity
75 Significance and 1,364.9 acres of the Upper Partridge River MBS Site of High Biodiversity
76 Significance would be affected by the NorthMet Project Proposed Action. The portions of these
77 two MBS sites that are within the Mine Site area represent a small portion of the mapped Sites of
78 High Biodiversity Significance in St. Louis County (2 percent) and the State of Minnesota (less
79 than 1 percent). Habitat effects associated with the NorthMet Project Proposed Action would not
80 result in a large percentage decline in statewide areas ranked as high by the MBS (MDNR
81 2008a).

82 Approximately 698.2 acres of the “imperiled-vulnerable” or “vulnerable” native plant
83 communities—the black spruce-Jack pine woodlands (FDn32c; 495.5 acres; 20 percent of
84 community within Laurentian Uplands subsection) and rich black spruce swamp (FPn62a; 202.7
85 acres; 1 percent of community within Laurentian Uplands subsection), respectively—would also
86 be affected. Approximately 92.6 acres of the “apparently secure” native plant communities (i.e.,
87 black spruce bog: treed subtype [APn80a1; 77.7 acres; 4 percent of community within
88 Laurentian Uplands subsection] and poor tamarack-black spruce swamp [APn81b; 14.9 acres;
89 less than 1 percent of community within Laurentian Uplands subsection]) would be affected.
90 Approximately 178.9 acres of “widespread and secure” native plant communities would also be
91 affected, including alder (maple-loosestrife) swamp (FPn73a; 42.5 acres; 3 percent of
92 community within Laurentian Uplands subsection), aspen-birch forest: balsam fir subtype
93 (FDn43b1; 101.1 acres; less than 1 percent of community within Laurentian Uplands
94 subsection), and poor black spruce swamp (APn81a; 35.3 acres; less than 1 percent of
95 community within Laurentian Uplands subsection).

96 ***Culturally Important Plants***

97 Effects on wild rice as a result of the NorthMet Project Proposed Action are expected to be
98 minimal. The 10-mg/L sulfate standard for wild rice would be met for the Embarrass River, since
99 the containment and seepage collection system would capture seepage presently going to the
100 Embarrass River tributaries. The Partridge River will, at certain times of the year, exceed the 10-
101 mg/L sulfate standard, mostly during winter low-flow conditions. During the remainder of the
102 year, in high-flow conditions, the NorthMet Project Proposed Action has a low probability of
103 increasing sulfate contributions. Effects, as well as water quality standards, are discussed more
104 thoroughly in Section 5.2.2.

105 While a distinct list of plant species important to the Bands is not available, Sections 4.2.9 and
106 5.2.9 discuss more broadly the effects on the ecological subsections, large landscapes, and
107 connected ecosystems.

108 ***Indirect Effects***

109 In addition to the direct effects mentioned above, potential indirect effects on remaining
110 vegetative cover types at the Mine Site could be associated with dust from road traffic and
111 mining operations and with changes in hydrology. Dust on leaves can affect the rates of

112 photosynthesis and respiration, which both influence plant growth. If sulfide-containing dust is
113 deposited on leaves, it could react with oxygen in the air and water from precipitation to create
114 sulfates over a period of weeks to months. This residual build-up in the soil could inhibit growth
115 by slowly acidifying the soil conditions. Such effects of fugitive dust, if any, could potentially
116 occur south of the East Pit and West Pit where haul roads are concentrated and the Rail Transfer
117 Hopper and other facilities are located. The distance dust travels depends on wind speed,
118 antecedent weather conditions, dust particle size, and vegetation density near the source.
119 PolyMet proposes to implement various dust-control measures such as stabilizing disturbed soils
120 by temporarily establishing vegetation and water spraying during dry periods (consistent with
121 *Minnesota Rules*, part 6132.2800). As Section 5.2.7 further describes, fugitive dust control
122 measures would result in 90 percent control at the Mine Site. These measures, which are
123 standard practice for existing taconite mines on the Mesabi Iron Range, should be adequate to
124 minimize potential indirect effects from fugitive dust. As Section 5.2.3 explains, vegetation
125 located within high likelihood of hydrology effect zones would be more likely to have
126 community changes than those with no or low likelihood of effect.

127 ***Reclamation***

128 Reclamation activities help to offset a portion of the effects of a project. Reclamation and
129 revegetation at the Mine Site would promote cover development and initiate vegetative
130 succession on stockpiles, the combined East Central Pit, and Mine Site infrastructure footprints.
131 Fertilizer would be applied at rates recommended for each group of species planted, and would
132 be worked into the soil to a depth of 8 inches on the level and 4 inches on all slopes (PolyMet
133 2012n). On areas to be mulched after seeding, no more seed would be sown than could be
134 mulched the same day. Seed would be sown via mechanical Truax native seed drills or
135 hydrospreading at specified rates of application, unless inaccessible or wet areas dictate the use
136 of hand-operated spreaders. Seedbeds would be firmed using cultipackers, or seeds would be
137 hand-raked into the soil, before mulching. Six different types of mulch could be applied,
138 depending on the situation. As nutrients and organic matter are returned to the soil, the
139 conditions on the reclaimed areas would become more suitable for migration of nearby native
140 herbaceous and woody species.

141 The Category 1 Stockpile would be incrementally and progressively reclaimed throughout the
142 life of the mine, starting in year 14, to minimize erosion of the outer slopes, promote post-closure
143 land use, and minimize the need for active site care and maintenance during the post-closure
144 period. Prior to construction of the cover system, the stockpile surfaces would be graded for
145 long-term stability, to promote vegetation growth and erosion control, and to develop a surface
146 drainage network over the stockpile (PolyMet 2012s). After grading, an engineered
147 geomembrane system would be constructed. The geomembrane system would consist of, from
148 top to bottom: 18 inches of rooting zone soil consisting of on-site unsaturated overburden mixed
149 with peat, as needed, to provide organic matter; 12 inches of granular drainage material with
150 drain pipes to facilitate lateral drainage of infiltrating precipitation and snowmelt off the
151 stockpile cover; a 40 mil geomembrane barrier layer; and a 6-inch soil bedding layer below the
152 geomembrane (PolyMet 2013c). The stockpile would then be locally contoured to provide some
153 topographic variety to the surface. Finally, the stockpile would be seeded with a certain selection
154 of grasses/forbs at the top and bench flats and a potentially different group of species for the
155 slopes, depending on the availability and suitability of the species (PolyMet 2012n). The three
156 groups of species designated for the top and benches would include a native, slow growth mix, a

157 | non-native, rapid growth mix, and a mix of both native and non-native species. The species mix
 158 | for the stockpile slopes would contain the same native species as the stockpile bench and flats,
 159 | and a slightly modified group of non-native species. The cover would store precipitation within
 160 | the loose layer during the period when vegetation is dormant. The trapped water would then be
 161 | removed from the cover system by transpiration of the plants during the growing season and
 162 | evaporation. Vegetation would also aid in stabilizing the cover from wind and rain erosion
 163 | (PolyMet 2012s).

164 | Both the Category 2/3 Stockpile and the Category 4 Stockpile would be temporary and would be
 165 | removed at closure. Temporary stockpile reclamation would begin during operations. The
 166 | material in these stockpiles would be relocated to the East Pit starting in year 11 (PolyMet
 167 | 2013c). After removal of the material, the footprint of the Category 2/3 Stockpile and portions of
 168 | the Category 4 Stockpile that do not become the Central Pit would be reclaimed by subsequent
 169 | seeding and planting of grass and forb species similar to those planted for the Category 1
 170 | Stockpile top and benches (PolyMet 2012n). Depressions in both temporary stockpile footprints
 171 | with sufficient hydrology and soil conditions would be seeded with a different group of native
 172 | grasses (e.g., fringed brome, bluejoint, Virginia wild rye, tall manna grass, fowl bluegrass,
 173 | tussock sedge, pointed broom sedge, dark green bulrush, and woolgrass) and forbs (e.g., Canada
 174 | anemone, marsh milkweed, flat-topped aster, common boneset, grass-leaved goldenrod, spotted
 175 | Joe Pye weed, blue monkey flower, giant goldenrod, and Eastern panicled aster) suitable for wet
 176 | soils. The West Pit would become open water, while the combined East Central Pit would be
 177 | partially filled with material from the Category 2/3 Stockpile and Category 4 Stockpile to
 178 | support wetland vegetation with species discussed above for the removed stockpile depressions
 179 | (see Table 5.2.4-2). The pit wall overburden slopes would be planted with the same mix
 180 | mentioned for stockpile slopes above (PolyMet 2012n). The acres reclaimed (see Table 5.2.4-2)
 181 | do not equal the acres disturbed as some haul roads and buildings would remain after cessation
 182 | of operations.

183 | Following demolition of Mine Site buildings and parking areas, suitable overburden would be
 184 | placed over the footprint, to a depth of 2 ft., and revegetated (PolyMet 2013a). Mine Site roads
 185 | deemed unnecessary for future access by the MDNR would be scarified and revegetated, as well.
 186 | Disturbed areas, building sites, and reclaimed roads would all be seeded with a similar mix of
 187 | grass and forb species as that planted on the Category 1 Stockpile top and benches (PolyMet
 188 | 2012n).

189 | Table 5.2.4-2 Proposed Vegetation Types and Acreages for Reclaimed Stockpiles and Pits at the Mine
 190 | Site

Type	Proposed Reclamation Vegetation	Acres
Category 1 Stockpile	Grassland/herbaceous	526
Category 2/3 Stockpile (Removed)	Wetland; Grassland/herbaceous	180
Category 4 Stockpile (Removed)	Wetland; Grassland/herbaceous	57
Lean Ore Surge Pile (Removed)	Wetland; Grassland/herbaceous	31
Overburden Storage and Laydown Area (Removed)	Wetland; Grassland/herbaceous	41
East and Central Pits	Wetland	207
West Pit	Open pit lake	321
Roads, Parking Areas, Buildings	Grassland/herbaceous	88
Total		1,451

191 | Source: PolyMet 2012n; PolyMet 2013c; PolyMet 2012s; Kearney, Barr Engineering, Pers. Comm., February 6, 2013.

192 **Effects of Invasive Non-native Plants**

193 Disturbances associated with the construction of the Mine Site would result in exposed soil
194 surfaces that would have the potential for colonization by invasive species. PolyMet proposes to
195 temporarily vegetate and stabilize disturbed areas during operation and permanently reclaim
196 during closure by spreading seeds. Species proposed for revegetation on most disturbed areas
197 and the Category 1 Stockpile top and benches include native and non-native species. There are
198 native grass species (e.g., fringed brome, switchgrass, Canada wild rye, bluejoint, poverty
199 oatgrass, slender wheatgrass, fowl bluegrass, and false melic) and native forb species (e.g.,
200 common yarrow, pearly everlasting, flat-topped aster, tall cinquefoil, large-leaved aster, stiff
201 goldenrod, smooth wild rose, black-eyed susan, gray goldenrod, upland white goldenrod,
202 Lindley's aster, smooth aster, and American vetch). According to the PolyMet Reclamation
203 Seeding and Mulching procedure (PolyMet 2012n), preference would be given to establishing
204 native plant communities, and the introduction of invasive plant species would be avoided to the
205 extent that such a practice would not interfere with the timely and effective accomplishment of
206 the primary objectives for establishing vegetation. These objectives include rapidly establishing a
207 self-sustaining plant community, controlling air emissions, controlling soil erosion, providing
208 wildlife habitat, and minimizing the need for maintenance. Minnesota's noxious weed law
209 (Minnesota Statute, § 18.75-18.91) contains procedures for controlling and eradicating noxious
210 weeds on all lands within the state. None of the invasive non-native species proposed to be
211 potentially planted are considered state-prohibited noxious weeds.

212 Non-native species that could be planted include: oats, winter wheat, alfalfa, timothy, redtop,
213 alsike clover, white clover, Canada bluegrass, intermediate wheatgrass, cicer milkvetch,
214 birdsfoot trefoil, perennial ryegrass, smooth brome grass, meadow brome, and red fescue. These
215 species are known to establish quickly and form a nearly complete groundcover, which can help
216 prevent erosion, maintain water quality, and increase soil stability on more susceptible areas. The
217 legume species listed would also fix atmospheric nitrogen into the soil to help re-establish soil
218 nutrients. Generally, these species would be planted as temporary cover crops until the native
219 species develop and can out-compete them. However, some of the proposed species are
220 considered invasive (e.g., birdsfoot trefoil, redtop, smooth brome grass, Canada bluegrass).
221 Section 5.2.4.2.4 discusses suggested mitigation measures for non-native or invasive species.

222 The proposed Type 1 mulch (hay, straw, and agricultural grass/legume cuttings) would be
223 relatively free of seed-bearing stalks or propagules of noxious weed species, as defined by the
224 rules and regulations of the Minnesota Department of Agriculture (PolyMet 2012n).

225 The introduction of invasive non-native species would be more detrimental to the relatively high-
226 quality vegetation communities at the Mine Site than to those at the Plant Site, which is already
227 heavily disturbed. Using invasive non-native species would result in decreased diversity of plant
228 species and habitats available to wildlife species. Several ETSC plant species at the Mine Site
229 may be susceptible to increased competition from invasive non-native species. There are already
230 a few occurrences of yellow sweetclover and bladder campion at the Mine Site, which may
231 invade future disturbed areas.

232 **Effects on Threatened and Endangered Plant Species**

233 The MDNR NHIS and separate rare species surveys were utilized to map known ETSC species
234 locations using GIS data. Updated MDNR Element Occurrence attribute data were used to

235 estimate the NorthMet Project area and statewide population numbers of a species, per MDNR
236 guidance (Joyal, MDNR, pers. comm., February 13, 2012). An individual is defined here as a
237 single plant of a species. A colony (observation) is a group of individual plants of one species in
238 a distinct geographic location. A population is a group of individuals or colonies of one species
239 that may be separated geographically, but are close enough geographically to interbreed and
240 persist over time.

241 No federally listed threatened or endangered plant species occur at the Mine Site. However, the
242 NorthMet Project Proposed Action would have both direct (9 species) and indirect (2 species)
243 effects on state-listed ETSC plant species at the Mine Site, affecting 1 percent of the known
244 statewide populations for these 11 species. Table 5.2.4-3 summarizes the direct and indirect
245 NorthMet Project Proposed Action effects on each of the ETSC plant species that are located in
246 the vicinity of the Mine Site, which includes some of the Transportation and Utility Corridor.
247 These numbers may overestimate the actual effects as a proportion of the number of actual
248 populations in the state. Intensive surveys, such as those performed at the Mine Site, have not
249 been performed throughout the state; therefore, the actual number of statewide populations may
250 be larger than that identified in the MDNR NHIS.

251 Rulemaking was conducted with the intent to update the list of Endangered, Threatened, and
252 Special Concern Species (Minnesota Rules, part 6134.0100 to 6134.0400), with new listings
253 becoming effective on August 19, 2013. The FEIS will consider any new listings, or changes in
254 the previous listings, associated with the updated list.

255 Table 5.2.4-3 Effects on Known State-listed ETSC Plant Populations in the Vicinity of the Mine Site, Including the Transportation and Utility
 256 Corridor

Plant Species (state status/ global status ¹)	Known Mine Site Populations					Known Statewide Populations				
	Total Populations ^{2,7}	Total Individuals	Direct Effects ³ (Populations)	Indirect Effects ⁴ (Populations)	Unaffected Populations	Total Known Populations ^{5,7}	Average Individuals per Population ⁶	Percent Directly Affected (Populations)	Percent Indirectly Affected (Populations)	Total Percent Affected (Populations)
<i>Botrychium campestre</i> (SC/G3)	1	1	1	0	0	69	unknown	1	0	1
<i>Botrychium pallidum</i> (E/G3)	1	21	1	0	0	99	15	1	0	1
<i>Botrychium rugulosum</i> (T/G3)	1	4	1	0	0	72	14	1	0	1
<i>Botrychium simplex</i> (SC/G5)	3	1,580	3	0	0	210	25	1	0	1
<i>Caltha natans</i> (E/G5)	1	56	1	0	0	12	unknown	8	0	8
<i>Eleocharis nitida</i> (T/G4)	1	~1,562 ft ²	1	0	0	49	450	2	0	2
<i>Juncus stygius</i> var. <i>americanus</i> (SC/G5)	1	1	0	1	0	30	unknown	0	3	3
<i>Platanthera clavellata</i> (SC/G5)	1	3	0	1	0	123	unknown	0	1	1
<i>Ranunculus lapponicus</i> (SC/G5)	1	~919 ft ²	1	0	0	83	51	1	0	1

Plant Species (state status/ global status ¹)	Known Mine Site Populations					Known Statewide Populations				
	Total Populations ^{2,7}	Total Individuals	Direct Effects ³ (Populations)	Indirect Effects ⁴ (Populations)	Unaffected Populations	Total Known Populations ^{5,7}	Average Individuals per Population ⁶	Percent Directly Affected (Populations)	Percent Indirectly Affected (Populations)	Total Percent Affected (Populations)
<i>Sparganium glomeratum</i> (SC/G4)	1	78	1	0	0	158	82	1	0	1
<i>Torreyochloa pallida</i> (SC/G5)	1	~25 ft ²	1	0	0	74	unknown	1	0	1
Total	13	NA	11	2	0	979	NA	NA	NA	NA

257 Source: MDNR 2011m; MDNR 2013a.

258 ¹ The state status is E – Endangered; T – Threatened; and SC – Species of Concern. The global ranks range from G1 to G5. A lower global ranking (e.g., G3) indicates a species at
 259 higher global risk than higher ranking (e.g., G5) (NatureServe 2011).

260 ² Populations are interpreted from MDNR NHIS data using Element Occurrence, which differs from the DEIS, which used colonies as the population estimate.

261 ³ Direct effects are expected for those populations that would be removed or buried by mine activities. Effects are calculated for populations rather than individuals because of the
 262 large variation and inaccuracies in the estimates of number of individuals per population.

263 ⁴ Indirect effects may occur to those populations within or near the Mine Site. These populations may be affected by changes in hydrology, water quality, dust, or inadvertent
 264 activities. As above, effects are given for populations rather than individuals.

265 ⁵ Statewide population data provided by Lisa Joyal (MDNR) on March 26, 2013.

266 ⁶ Population estimates are approximate and used for comparative purposes only. The number of individuals is based upon populations for which data exist.

267 ⁷ Data included here were provided by the Division of Ecological Resources, MDNR, and were current as of March 13, 2013. These data are not based on an exhaustive inventory
 268 of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

269 The NorthMet Project Proposed Action would directly affect 9 of the 11 stated-listed ETSC plant
270 species found at or in the immediate vicinity of the Mine Site (see Table 5.2.4-3). Most of the
271 direct effects would involve the complete loss of colonies within a population as a result of
272 excavation of the mine pits, burial under stockpiles, or disturbance during infrastructure
273 construction.

274 The NorthMet Project Proposed Action would indirectly affect 2 of the 11 state-listed ETSC
275 plant species found at or in the immediate vicinity of the Mine Site (see Table 5.2.4-3). The
276 NorthMet Project Proposed Action may also result in indirect effects on some colonies of the
277 directly affected state-listed ETSC plant species at the Mine Site. These indirect effects may
278 occur as a result of changes in hydrology or water quality, deposition of particulate matter (dust),
279 application of road salts, or weed incursion. Individual species appear to differ in their response
280 to these indirect effects. For example, several of the ETSC plant species typically occur along or
281 in old tailings ponds or along roadsides where disturbance and dust are frequent. To a certain
282 extent, each species' sensitivity to disturbance can be inferred from currently occupied habitats.
283 Habitats were considered "disturbed" if they consisted of tailings ponds, gravel pits, landing
284 pads, logging roads, ditches, or roadsides. Disturbance-tolerant species may, in some cases,
285 actually be disturbance-dependent. However, several species may not actually be disturbance-
286 tolerant, as much as they are able to colonize previously disturbed sites. Repeated soil
287 disturbance near these species may have an effect on such populations in the short term. Overall,
288 less than 1 percent of the known statewide populations for these state-listed ETSC species would
289 be indirectly affected by the NorthMet Project Proposed Action. In some cases, potential indirect
290 effects on ETSC plant species that would be near, but outside, the footprint of these facilities
291 could be avoided or reduced by fencing or flagging ETSC populations to prevent disturbance.

292 Minnesota's endangered species law (*Minnesota Statute*, § 84.0895) and associated rules
293 (*Minnesota Rules*, parts 6212.1800–6212.2300 and 6134) impose a variety of restrictions,
294 permits, and exemptions pertaining to ETSC species. "The law and rules prohibit taking,
295 purchasing, importing, possessing, transporting, or selling" endangered or threatened plants,
296 including their parts or seeds, without a permit (MDNR 2011m). "Taking," as it relates to plants
297 includes picking, digging, or destroying. There is the potential that PolyMet would need to seek a
298 Take Permit from the MDNR for state-listed ETSC plant species. If it is determined by the
299 MDNR that there are no feasible alternatives to taking, the applicant must pursue compensatory
300 mitigation. Transplantation is generally not considered by the MDNR to be acceptable mitigation
301 for taking of endangered or threatened species (MDNR 2011m). The MDNR suggests that
302 typical compensatory mitigation for taking endangered or threatened species in Minnesota
303 include the following:

- 304 • funding state acquisition of another site where the species occurs that is currently unprotected
305 and vulnerable to destruction,
- 306 • funding additional survey work to locate other sites, and/or
- 307 • funding research to improve our understanding of the habitat requirements or protection
308 needs of the species (MDNR 2011m).

309 A discussion of the effects on each individual ETSC species is provided below.

310 *Botrychium campestre* (prairie moonwort) populations are commonly observed on sparsely
311 vegetated mineral soil from sediments of iron mine tailings ponds and grassy railroad

312 embankments (NatureServe 2011). Of the 69 known populations statewide, one colony of one
313 population within the Mine Site area, along Dunka Road, could be directly affected by pipeline
314 construction and road improvements/maintenance as part of the NorthMet Project Proposed
315 | Action (1 percent affected) (see Table 5.2.4-3). This species is less tolerant of disturbance than
316 other *Botrychium* species; however, since it prefers sparsely vegetated areas, it may actually
317 expand into disturbed areas along Dunka Road in the future. At the Mine Site, grassland areas
318 would not be affected, but around 34 percent of previously disturbed areas would be affected,
319 | resulting in potentially reduced on-site habitat for this species (see Table 5.2.4-1).

320 *Botrychium pallidum* (pale moonwort) populations are most commonly observed on mine
321 tailings basins and along roadsides. Of the 99 known populations statewide, three colonies of one
322 population within the Mine Site, along Dunka Road, could be directly affected by pipeline
323 construction and road improvements/maintenance as part of the NorthMet Project Proposed
324 | Action (1 percent affected) (see Table 5.2.4-3). One separate colony is located near the railroad
325 track and may be indirectly affected. This species, however, appears to be semi-tolerant of
326 disturbance since sites that are kept open by regular disturbance are particularly suitable
327 (NatureServe 2011). Colonies may actually expand into newly disturbed areas along Dunka
328 Road and at the Mine Site. Grassland areas at the Mine Site would not be affected, but around 34
329 percent of previously disturbed areas would be affected, resulting in reduced on-site habitat for
330 | this species (see Table 5.2.4-1).

331 *Botrychium rugulosum* (ternate, or St. Lawrence, grapefern) often occurs on tailings basins,
332 along roadsides, and in shaded wetland forests. Of the 72 known extant populations in
333 Minnesota, one population (with four individuals) occurs along Dunka Road at the Mine Site (1
334 | percent affected) (see Table 5.2.4-3). This population may be directly affected by vehicle
335 operation or road improvements and maintenance as part of the NorthMet Project Proposed
336 Action. This species appears to be semi-tolerant of disturbance and populations. At the Mine
337 Site, around 62 percent of upland conifer forests and around 55 percent of upland deciduous
338 | forests would be affected, resulting in much less on-site habitat for this species (see Table 5.2.4-
339 1).

340 *Botrychium simplex* (least moonwort) frequently occurs in shrublands, forests, tailings basins,
341 and along roadsides. Of the 210 known populations statewide, three occur at the Mine Site, all of
342 | which are expected to be directly affected (see Table 5.2.4-3). Of these populations, 21 colonies
343 are expected to be directly affected—7 from stockpiles and mine pits, and another 14 from
344 construction of the haul roads, water pipeline, ditches, railroad track, or transmission line (1
345 percent affected). The colonies affected by stockpiles and mine pits would be removed, while the
346 colonies affected by construction of pipelines or ditches may be reduced in the short term.
347 Depending on proximity to construction activities, some of these colonies would likely recover
348 by expanding along Dunka Road and at the Mine Site post-closure, as this species appears to be
349 semi-tolerant of disturbance. At the Mine Site, around 34 percent of disturbed areas and around
350 55 percent of shrublands would be directly affected, resulting in less on-site habitat for this
351 | species (see Table 5.2.4-1).

352 *Caltha natans* (floating marsh-marigold) is found primarily in relatively undisturbed habitats and
353 is not likely to be tolerant of disturbance. Of the 12 known populations statewide, one
354 | population, which consists of 13 colonies, occurs at the Mine Site (see Table 5.2.4-3). One
355 colony is expected to be directly affected by stockpile development. Two other colonies are
356 located close to Dunka Road and could be indirectly affected by road construction or

357 improvements. Ten other colonies are located in the vicinity of, but outside, the Mine Site,
358 several of which occur along the Partridge River. Since water from the West Pit would be
359 discharged downstream of these colonies, it is unlikely there would be indirect effects on them.
360 Since the known statewide population for this species is rather small, the effect on its population
361 in Minnesota would be correspondingly larger (8 percent affected). The mitigation measures
362 mentioned above, particularly the purchase of an unprotected site with a population of the
363 species, should be assessed. At the Mine Site, around 47 percent of aquatic environments would
364 be directly affected, resulting in reduced on-site habitat for this species (see Table 5.2.4-1).

365 *Eleocharis nitida* (neat spike-rush) at the Mine Site is primarily observed in roadside ditches
366 along Dunka Road with gravel or sandy substrates. Of the 49 known populations in the state, one
367 occurs on the Mine Site (2 percent affected) (see Table 5.2.4-3). Of this population, eight
368 colonies are found along Dunka Road, and three colonies are located along the railroad tracks.
369 All of the eight Dunka Road colonies are likely to be directly affected by ditch construction. The
370 other three colonies may be indirectly affected by changes in hydrology or water quality. This
371 species seems to be semi-tolerant of disturbance since it has inhabited roadside ditches. At the
372 Mine Site, around 47 percent of aquatic environments and 34 percent of disturbed areas would be
373 directly affected, resulting in less on-site habitat for this species (see Table 5.2.4-1).

374 *Juncus stygius* var. *americanus* (bog rush) has 30 known populations in the state, none of which
375 occur at the Mine Site; however, one population is located upgradient of the Mine Site within the
376 One Hundred Mile Swamp (see Table 5.2.4-3). This population would not be directly affected,
377 but it may be indirectly affected by changes in hydrology (3 percent affected). However, Section
378 5.2.3 indicates there would likely be no wetland hydrology effects in this area. At the Mine Site,
379 around 56 percent of lowland coniferous forests would be directly affected, resulting in reduced
380 habitat nearby for this species (see Table 5.2.4-1).

381 *Platanthera clavellata* (club-spur orchid) has 123 known populations in the state, none of which
382 occur at the Mine Site; however, one population is located upgradient of the Mine Site within the
383 One Hundred Mile Swamp (see Table 5.2.4-3). This population would not be directly affected,
384 but three colonies may be indirectly affected by changes in hydrology, since the species is
385 sensitive to this type of change (1 percent affected). However, Section 5.2.3 indicates there
386 would likely be no wetland hydrology effects in this area. At the Mine Site, around 56 percent of
387 lowland coniferous forests would be directly affected, resulting in reduced habitat nearby for this
388 species (see Table 5.2.4-1).

389 *Ranunculus lapponicus* (lapland buttercup) is found in conifer/sphagnum bogs on the Mine Site.
390 Of the 83 known populations statewide, one population occurs at the Mine Site (1 percent
391 affected) (see Table 5.2.4-3). Of this population, three colonies are expected to be directly
392 affected by construction of a waste rock stockpile. The other four colonies may be indirectly
393 affected by changes in hydrology, water chemistry, or dust. This species may face short- and
394 long-term effects at the Mine Site since it is most likely intolerant of disturbance. At the Mine
395 Site, around 56 percent of lowland coniferous forests would be directly affected, resulting in
396 much less on-site habitat for this species (see Table 5.2.4-1).

397 *Sparganium glomeratum* (clustered bur-reed) has been observed along roadsides and in lowland
398 forests. Of the 158 known populations statewide, one population occurs at the Mine Site (1
399 percent affected) (see Table 5.2.4-3). Of this population, eight colonies would be directly
400 affected—three colonies by construction of the mine pits and stockpiles, and five colonies along

401 Dunka Road by construction of the water pipeline, railroad track, or transmission line. The
402 remaining five colonies may be indirectly affected by changes in hydrology, water quality, or
403 dust. This species may be slightly tolerant of some disturbance, since it can be found along
404 disturbed wetland edges; however, short-term effects may be more pronounced than long-term
405 effects. At the Mine Site, around 47 percent of aquatic environments and 56 percent of lowland
406 coniferous forests would be directly affected, resulting in much less on-site habitat for this
407 species ([see Table 5.2.4-1](#)).

408 *Torreyochloa pallida* (Torrey's manna-grass) is often seen along roadsides and may be semi-
409 tolerant of disturbance. Of the 74 known populations statewide, one occurs at the Mine Site (1
410 percent affected) ([see Table 5.2.4-3](#)). Of this population, one colony along Dunka Road may be
411 directly affected by construction of a transmission line. The remaining three colonies are located
412 away from any proposed construction and may be sufficiently removed from potential direct and
413 indirect effects of the NorthMet Project Proposed Action. At the Mine Site, around 47 percent of
414 aquatic environments and 56 percent of lowland coniferous forests would be directly affected,
415 resulting in less on-site habitat for this species ([see Table 5.2.4-1](#)).

416 ***Regional Foresters Sensitive Species***

417 The USFS RFSS data layer indicates there are no known RFSS plants on the federal lands, which
418 include the majority of the Mine Site. However, several state-listed ETSC plant species known to
419 exist on the Mine Site are also listed as RFSS plants in the Superior National Forest. Six of these
420 species would be affected by the NorthMet Project Proposed Action, including *Botrychium*
421 *pallidum*, *Botrychium rugulosum*, *Botrychium simplex*, *Caltha natans*, *Eleocharis nitida*, and
422 *Juncus stygius* var. *americanus*.

423 MIH types are not fully mapped for the Mine Site since not all of it consists of federal land, but
424 MIH types are mapped for the federal lands located within the Mine Site. On this portion of the
425 Mine Site, upland forest (MIH 1; 531 acres) would be affected the most of all MIH types, which
426 means RFSS plant species listed under the upland forest category ([see Table 4.2.4-5](#)) could be
427 most affected by the NorthMet Project Proposed Action. [However, since there are suitable](#)
428 [habitats for each RFSS species within each MIH type, a direct correlation between loss of MIH](#)
429 [and loss of RFSS plants cannot be made.](#) Upland conifer forest (MIH 5; 505 acres) lands would
430 be the next group most affected, though there is overlap of this category with upland forest since
431 upland conifer forest occurs within upland forest types. Some RFSS species that occupy upland
432 forest may also be affected by this category. Lowland black spruce-tamarack forest (MIH 9;
433 479.5 acres) would be subject to effects comparable to upland conifer forest, and [some of](#) the
434 RFSS species listed in this category would be affected similarly. The lowland emergent wetland
435 type would be affected (10.8 acres), [but likely only one of](#) the five RFSS plant species listed for
436 that type may be minimally affected. Aquatic habitat (MIH 14) is not mapped at the Mine Site;
437 however, there are some aquatic habitats on the parcel that would be affected and, thus, [some of](#)
438 the RFSS species listed in this category may be affected. Section 5.2.6 provides further
439 discussion of effects on aquatic habitats and species.

440 [The one RFSS plant not listed as an ETSC species but that is known to occur on the Mine Site](#)
441 [according to MDNR NHIS data is *Botrychium michiganense*, which is very closely related to](#)
442 [*Botrychium hesperium*. *B. hesperium* typically occurs in western states, while *B. michiganense*](#)
443 [typically occurs around the Great Lakes states. One population is known to occur on the Mine](#)
444 [Site, of which five colonies would be affected by stockpile development, haul road placement, or](#)

445 the Transportation and Utility Corridor immediately adjacent to the Mine Site (MDNR 2013a). It
 446 often occurs in grassy roadsides and fields, and requires at least somewhat open habitat created
 447 by natural disturbance events. While anthropogenically disturbed areas have been observed to
 448 harbor reasonably large numbers of individuals, habitat created in this way has not been proven
 449 to support long-term viable populations (NatureServe 2013). At the Mine Site, grassland areas
 450 would not be affected, but around 34 percent of previously disturbed areas would be affected,
 451 resulting in potentially reduced on-site habitat for this species (see Table 5.2.4-1).

452 **5.2.4.2.2 Transportation and Utility Corridor**

453 ***Effects on Cover Types***

454 ***Habitat Types***

455 Construction and transportation activities within the Transportation and Utility Corridor, as part
 456 of the NorthMet Project Proposed Action, would affect all 120.2 acres of the MDNR GAP land
 457 cover designations (see Table 5.2.4-4). The majority of effects would be on formerly disturbed
 458 (94.4 acres) and grassland areas (9.8 acres).

459 Table 5.2.4-4 Direct Effects on Cover Types at the Transportation and Utility Corridor

Cover Types	Affected Acres	Non-affected Acres	Total Cover Type Acres	Percent of Cover Type Affected
Disturbed	94.4	0	94.4	100
Cropland/grassland	9.8	0	9.8	100
Shrubland	7.7	0	7.7	100
Aquatic environments	2.7	0	2.7	100
Upland deciduous forest	2.7	0	2.7	100
Upland coniferous forest	2.6	0	2.6	100
Lowland coniferous forest	0.2	0	0.2	100
Lowland deciduous forest	0.0	0	0.0	100
Upland conifer-deciduous mixed forest	0.0	0	0.0	100
Total ¹	120.2	0	120.2	100

460 Source: MDNR 2006b.

461 ¹ Total acres may be more or less than presented due to rounding.

462 ***Minnesota Biological Survey***

463 The NorthMet Project Proposed Action would affect 22.5 acres of MBS Sites of High
 464 Biodiversity Significance (2.9 acres of the One Hundred Mile Swamp and 19.6 acres of the
 465 Upper Partridge River) within the Transportation and Utility Corridor. Similar to the Mine Site,
 466 this 22.5-acre area represents a very small portion of the mapped Sites of High Biodiversity
 467 Significance in St. Louis County (less than 1 percent) and the State of Minnesota (less than 1
 468 percent). Habitat effects associated with the NorthMet Project Proposed Action would not result
 469 in a large percentage decline in those areas ranked as high by the MBS.

470 NorthMet Project Proposed Action activities within the corridor would also affect approximately
 471 2 acres of “widespread and secure” native plant communities, including 2 acres of the aspen-
 472 birch forest: balsam fir subtype (FDn43b1; less than 1 percent of community within Laurentian

473 Uplands subsection), and less than 0.1 acre of the low shrub poor fen (APn91a; less than 1
474 percent of community within Laurentian Uplands subsection).

475 ***Indirect Effects***

476 Potential indirect effects on vegetative cover types remaining along the Transportation and
477 Utility Corridor could include those caused by dust from road traffic or spillage from rail cars.
478 Section 5.2.4.2.1 provides further discussion on the effects of dust. The new proposed side-dump
479 rail ore cars are a different design than the bottom-dump rail pellet cars that were used during
480 past LTVSMC operations. The side-dump rail ore cars are designed to contain fine ore pieces to
481 the center of the cars where they are unlikely to spill through the hinge gaps (PolyMet 2013c).
482 Larger pieces of ore that are spilled from the cars would be recovered during routine
483 maintenance of the track, thus minimizing indirect effects. As Section 5.2.7 further describes, no
484 significant reactive airborne fugitive dust from the rail transport is expected. Smaller effects in
485 already-disturbed areas could occur along Dunka Road near the Mine Site. A water pipeline for
486 treated water and a transmission line would be constructed along Dunka Road on previously
487 disturbed land. Construction of the pipeline and transmission line would expose soil during
488 construction and could bury vegetation under rock fill.

489 ***Reclamation***

490 Dunka Road would not be reclaimed after the NorthMet Project area is closed, since it is an
491 existing private road. Railroad track and ties that are not used by common carriers would be
492 removed and recycled (PolyMet 2013c). The treated water pipeline between the Mine Site and
493 Plant Site would be removed (PolyMet 2013a).

494 ***Effects of Invasive Non-native Plants***

495 The Transportation and Utility Corridor is already disturbed, and contains several non-native
496 and/or invasive species. Disturbance associated with the widening of Dunka Road and
497 installation of the water pipeline, transmission line, and rail line would result in exposed soil
498 surfaces that would have the potential for colonization of invasive species. Therefore, the general
499 effects of invasive non-native plant species at the Transportation and Utility Corridor would be
500 the same as the Mine Site or Plant Site.

501 ***Effects on Threatened and Endangered Plant Species***

502 No federally listed threatened or endangered plant species occur within the Transportation and
503 Utility Corridor. The NorthMet Project Proposed Action would have both direct and indirect
504 effects on the same state-listed ETSC plant species as those found at the Mine Site. Since some
505 of the populations occur along Dunka Road near or overlapping the Mine Site, they are discussed
506 in Section 5.2.4.2.1 along with the effects on plant populations at the Mine Site. Table 5.2.4-3
507 summarizes the direct and indirect effects of the NorthMet Project Proposed Action on each of
508 those ETSC plant species. For the ETSC species located within the Transportation and Utility
509 Corridor not adjacent to the Mine Site (*Botrychium pallidum*), effects are discussed below (see
510 Table 5.2.4-5). As mentioned for the Mine Site, these numbers may overestimate the actual
511 effects as a proportion of the number of actual populations in the state.

512 Rulemaking was conducted with the intent to update the list of Endangered, Threatened, and
513 Special Concern Species (Minnesota Rules, part 6134.0100 to 6134.0400), with new listings

514 | becoming effective on August 19, 2013. The FEIS will consider any new listings, or changes in
515 | the previous listings, associated with the updated list.

DRAFT

516 Table 5.2.4-5 Effects on Known State-listed ETSC Plant Populations in the Transportation and Utility Corridor

<u>Plant Species</u> <u>(state status/ global status¹)</u>	<u>Known Mine Site Populations</u>					<u>Known Statewide Populations</u>				
	<u>Total</u> <u>Populations</u>	<u>Total</u> <u>Individuals</u>	<u>Direct</u> <u>Effects²</u> <u>(Populations)</u>	<u>Indirect</u> <u>Effects</u> <u>(Populations)</u>	<u>Unaffected</u> <u>Populations</u>	<u>Total Known</u> <u>Populations³</u>	<u>Average</u> <u>Individuals</u> <u>per</u> <u>Population⁴</u> <u>(Populations)</u>	<u>Percent</u> <u>Directly</u> <u>Affected</u> <u>(Populations)</u>	<u>Percent</u> <u>Indirectly</u> <u>Affected</u> <u>(Populations)</u>	<u>Total</u> <u>Percent</u> <u>Affected</u> <u>(Populations)</u>
<u><i>Botrychium</i></u> <u><i>pallidum</i> (E/G3)</u>	<u>3</u>	<u>16</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>99</u>	<u>15</u>	<u>3</u>	<u>0</u>	<u>3</u>
<u>Total</u>	<u>3</u>	<u>16</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>99</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>

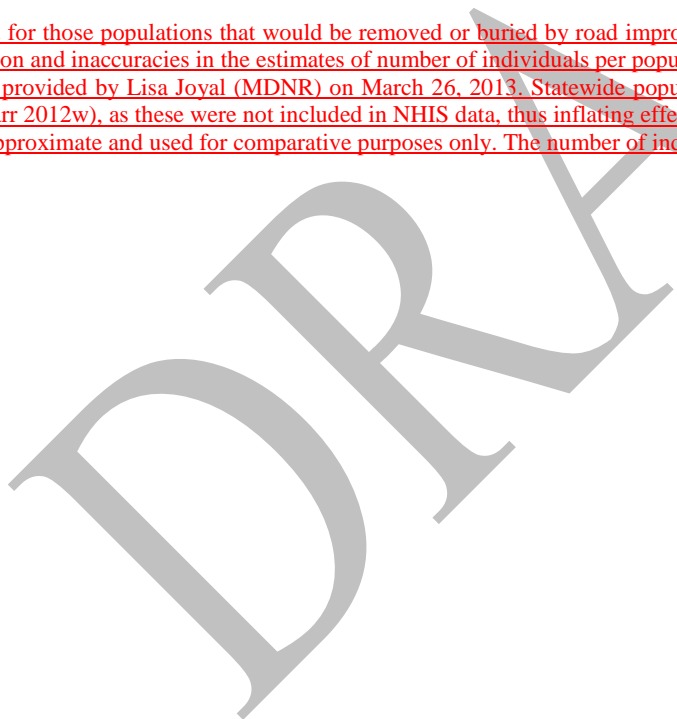
517 Source: Barr 2012w.

518 ¹ The state status is E – Endangered. The global ranks range from G1 to G5. A lower global ranking (e.g., G3) indicates a species at higher global risk than higher ranking (e.g.,
 519 G5) (NatureServe 2011).

520 ² Direct effects are expected for those populations that would be removed or buried by road improvement activities. Effects are calculated for populations rather than individuals
 521 because of the large variation and inaccuracies in the estimates of number of individuals per population.

522 ³ Statewide population data provided by Lisa Joyal (MDNR) on March 26, 2013. Statewide population data does not include the three populations of *B. pallidum* found during
 523 project-specific survey (Barr 2012w), as these were not included in NHIS data, thus inflating effects to statewide population.

524 ⁴ Population estimates are approximate and used for comparative purposes only. The number of individuals is based upon populations for which data exist.



525 The NorthMet Project Proposed Action would directly affect the one stated-listed ETSC plant
 526 species (*Botrychium pallidum*) found on the Transportation and Utility Corridor not adjacent to
 527 the Mine Site (see Table 5.2.4-5). The direct effects would involve the complete loss of
 528 populations as a result of disturbance during road construction and improvement activities.
 529 Section 5.2.4.2.1 above discusses Minnesota’s endangered species law, as well as permits and
 530 mitigation for ETSC species.

531 *Botrychium pallidum* (pale moonwort) populations are most commonly observed on mine
 532 tailings basins and along roadsides. Of the 99 known NHIS populations statewide, six colonies of
 533 three populations along Dunka Road could be directly affected by road improvements or
 534 maintenance as part of the NorthMet Project Proposed Action (3 percent affected) (see Table
 535 5.2.4-5). These populations were found during a separate species survey and are not included in
 536 the NHIS data. In addition, without the NHIS element occurrence attribute, it was estimated that
 537 there are three distinct populations by virtue of three separate locations of the six colonies. Thus,
 538 the effects to statewide populations are slightly inflated. All of the grassland and previously
 539 disturbed areas along the Transportation and Utility Corridor would be affected, resulting in
 540 reduced on-site habitat for this species (see Table 5.2.4-4).

541

542 **5.2.4.2.3 Plant Site**

543 **Effects on Cover Types**

544 ***Habitat Types***

545 Construction, operation, and closure of the NorthMet Project area at the Plant Site would have
 546 fewer effects on native vegetation than at the Mine Site because much of the Plant Site (61
 547 percent) has already been heavily disturbed or is barren (see Table 4.2.4-8). Most of the effects
 548 of the NorthMet Project Proposed Action are on disturbed areas or tailings ponds, but other
 549 affected areas include isolated stands of forest or shrublands (see Table 5.2.4-6). Other effects on
 550 MDNR GAP land cover types at the Plant Site are smaller. Approximately 2,177.5 acres (48
 551 percent) of the Plant Site would be affected by NorthMet Project Proposed Action activities. A
 552 description of the potential effects on wetlands north of the Tailings Basin is presented in Section
 553 5.2.3.

554 Table 5.2.4-6 Direct Effects on Cover Types at the Plant Site ¹

Cover Types	Affected Acres	Non-affected Acres ²	Total Cover Type Acres	Percent of Cover Type Affected
Disturbed	1,102.5	1,653.0	2,755.5	40
Aquatic environments	572.7	64.0	636.7	90
Upland deciduous forest	290.1	356.6	646.7	45
Shrubland	139.5	193.9	333.4	42
Upland coniferous forest	52.0	47.8	99.8	52
Lowland coniferous forest	20.7	21.2	41.9	49
Cropland/grassland	0.0	0.0	0.0	0
Lowland deciduous forest	0.0	0.0	0.0	0
Upland conifer-deciduous mixed forest	0.0	0.0	0.0	0
Total	2,177.5	2,336.5	4,514.0	48

555 Source: MDNR 2006b.

556 ¹ This table reflects only those effects on plant populations occurring within the boundaries of the Plant Site. The table does not
557 include the potential indirect effects on the wetlands north of the Tailings Basin due to hydrology changes.
558 ² Areas of cover types not within a 50-ft buffer of buildings, Tailings Basin/spillway reclamation area, or railroad connection.

559 ***Minnesota Biological Survey***

560 There are no MBS Sites of Biodiversity Significance or native plant communities identified at
561 the Plant Site.

562 ***Indirect Effects***

563 In addition to the direct effects mentioned above, indirect effects to vegetation at and
564 surrounding the Plant Site could include dust or erosion. Vegetation would be established on
565 tailings dams during construction to minimize erosion and fugitive dust (PolyMet 2013m). Water
566 level would be managed in the Tailings Basin to limit the amount of exposed beach, which
567 would minimize dust. Additionally, other fugitive dust control measures (e.g., mulching,
568 temporary seeding, and dust suppressants) would be applied to inactive beaches. As Section
569 5.2.7 further describes, fugitive dust control measures would result in an 80 percent reduction of
570 emissions at the Plant Site. In the event erosion occurs on the Tailings Basin, it would be
571 corrected and re-vegetated; if necessary for repetitive or excessive erosion, channels or outfall
572 structures would be designed to address the issue.

573 ***Reclamation***

574 At closure, the buildings and other infrastructure at the Plant Site would be removed, and
575 foundations would be razed and buried to a minimum depth of 2 ft. with overburden material
576 suitable for vegetation. Plant Site roads that are not deemed necessary for access by the MDNR
577 would be scarified and vegetated, and asphalt from paved surfaces would be removed and
578 recycled. These disturbed areas would be seeded with the same potential three mixes (native,
579 non-native, or mixed) as those mentioned for disturbed areas in Section 5.2.4.2.1 (PolyMet
580 2012n).

581 The Tailings Basin would be incrementally reclaimed by a qualified professional pursuant to
582 *Minnesota Rules*, part 6132.2700. As dams are constructed, exterior slopes would be stabilized
583 and vegetated in accordance with requirements in the Fugitive Emissions Control Plan (PolyMet
584 2013m). Inactive interior beach areas would be temporarily vegetated as necessary for fugitive
585 dust control, using oats, winter wheat, annual ryegrass, white clover, redtop, and alsike clover, or
586 some combination of these species for various times of the year (PolyMet 2012n). The exterior
587 dam faces would be permanently vegetated by a qualified reclamation contractor according to
588 requirements of the Reclamation Seeding Plan. Upland areas would be planted with permanent
589 vegetation and mulched to control potential fugitive dust in accordance with requirements in the
590 Fugitive Emissions Control Plan. Upland beach areas would be planted with the same potential
591 three mixes (native, non-native, or mixed) as that mentioned for disturbed areas in Section
592 5.2.4.2.1, while the dam slopes and benches would be planted with the same mix as that
593 mentioned for the slopes of the Category 1 Stockpile (PolyMet 2012n). Interior portions would
594 be graded to provide a gently sloping surface that effectively routes storm water runoff to the
595 interior of the Tailings Basin and promotes wetlands creation between the beach and pond areas.
596 Exposed beach areas would be amended with bentonite to limit oxygen infiltration into the
597 tailings. The cover layer of tailings would be replaced and vegetated in accordance with
598 requirements of the Reclamation Seeding Plan (PolyMet 2013m). Wet soils near the Tailings

599 Basin pond would be planted with the same mix as that mentioned for the East Pit backfill and
600 depressions in the temporary stockpile footprints (see Section 5.2.4.2.1) (PolyMet 2012n).
601 Establishment of dense vegetative cover and root mass is among the most effective methods to
602 minimize erosion, so the quality and density of the vegetation would be periodically reviewed
603 after final reclamation construction is complete. Areas where vegetation does not become well
604 established would receive additional seeding and/or fertilizer and other amendments in
605 accordance with requirements of the Reclamation Seeding Plan. Reclamation areas would be
606 inspected in spring and fall to repair erosion areas and failed seeding areas, until MDNR
607 determines that the areas are stable and self-sustaining.

608 Reclamation of the Hydrometallurgical Residue Facility would include removal of ponded water
609 from the cell surface, removal of pore water from the residue, construction of the cell cover
610 system, and establishment of vegetation and surface water runoff controls. The exterior slopes of
611 the Hydrometallurgical Residue Facility dams would be incrementally reclaimed throughout the
612 life of the mine. This would include stabilization and vegetation in accordance with *Minnesota*
613 *Rules*, part 6132.3200. Final reclamation would generally consist of grading the cell area into a
614 gently sloping surface. The cover would consist of a layer of LTVSMC tailings immediately
615 above the drained residue. This would be topped, if necessary, with a non-woven needle-punched
616 geotextile fabric. Next, a geosynthetic clay barrier layer and a 40 mm LDPE or similar MPCA-
617 approved geomembrane barrier layer would be placed (PolyMet 2013c). Additional LTVSMC
618 coarse tailings and/or common borrow and cover soils would be placed on top of the barrier layer
619 to create a surface capable of sustaining a vegetated cover (PolyMet 2012e). The
620 Hydrometallurgical Residue Facility dam slopes and benches would be planted with the same
621 mix as that mentioned for the Category 1 Stockpile slopes in Section 5.2.4.2.1 (PolyMet 2012n).
622 Turf and final cover would be inspected and maintained by mowing once per year or as needed,
623 fertilizing when visual inspection indicates poor vegetation growth, and implementing repairs.

624 The Colby Lake Water Pipeline Corridor would not be subject to any additional disturbance or
625 effects as a result of the NorthMet Project Proposed Action. Maintenance activities would likely
626 continue to occur on the pipeline.

627 **Effects of Invasive Non-native Plants**

628 The revegetation plan following closure at the Plant Site is similar to what is planned at the Mine
629 Site as described above. Use of the proposed seed mix could introduce invasive non-native
630 species, depending on which species are used, to an area of primarily native vegetation that
631 surrounds the Plant Site. However, the existing LTVSMC Tailings Basin and most of the Plant
632 Site are already heavily disturbed, and several invasive non-native species currently inhabit these
633 areas (e.g., smooth brome grass, reed-canary grass, yellow sweet clover). These species, once
634 introduced, are difficult to remove and could spread to and colonize susceptible areas following
635 future disturbance (e.g., blowdown, logging, fire). These species may reduce diversity, out-
636 compete native vegetation, and provide lower quality habitat for some specialist animal species.
637 Generally, dominance by invasive non-native species would reduce the quality of native cover
638 types and habitat remaining at the Plant Site.

639 **Effects on Threatened and Endangered Plant Species**

640 The NorthMet Project Proposed Action would likely have no effect on federal or state ETSC
641 plant species at the Plant Site or Colby Lake Water Pipeline Corridor because none are known to

642 occur within the boundaries of these areas, according to MDNR NHIS data. However, no site-
643 specific studies have been conducted at the Plant Site and so potential species not reported in the
644 NHIS data may not be represented.

645 **5.2.4.2.4 Potential Mitigation Measures**

646 ***Mine Site Mitigation Measures***

647 A preferred mitigation measure would be to reseed with the native species, provided they can
648 perform as effectively as the non-native species. In some areas where erosion control would be
649 critical to prevent slope failures, non-native species may be needed. Temporary stabilization
650 efforts using non-native species should use non-invasive plant species to minimize the long-term
651 risk to surrounding plant communities. In the event invasive non-native species are used, an
652 additional mitigation measure would be to implement a monitoring and control program for
653 invasive species (including noxious weeds) to ensure these species do not overtake surrounding
654 native communities. Additionally, the purchase of an unprotected site with a population of
655 *Caltha natans* should be assessed as mitigation, since the statewide population is lower than the
656 other ETSC species affected.

657 ***Plant Site Mitigation Measures***

658 The measures outlined in the Mine Site Mitigation Measures section above should be applied to
659 the Plant Site as well. Another recommended mitigation measure may also benefit vegetation at
660 the Plant Site specifically. The addition of organic amendments (peat) to the top foot of the
661 Tailings Basin would improve soil and water quality and promote the development of shoreline
662 and near-shore wetland vegetation.

663 **5.2.4.3 NorthMet Project No Action Alternative**

664 **5.2.4.3.1 Effects on Cover Types**

665 Under the NorthMet Project No Action Alternative, the Mine Site would not be developed, the
666 Transportation and Utility Corridor would not be disturbed beyond routine maintenance, and the
667 Plant Site would have no additional tailings added to the existing LTVSMC Tailings Basin.
668 Forest-harvesting would continue to occur on the federal land portions of the Mine Site under the
669 Forest Plan. While timber harvests would result in the immediate loss of some habitat types,
670 permanent changes are not expected. The Forest Plan calls for an increase in older-age stands,
671 which would likely come at the expense of younger-age stands in the long term. The majority of
672 the federal lands are designated as General Forest – Longer Rotation Management Area, which
673 correlates with the increase in older-age stands overall. The former LTVSMC processing plant
674 would be reclaimed and revegetated in accordance with its separate closure plan sooner than
675 under the NorthMet Project Proposed Action. Direct and indirect effects of the NorthMet Project
676 No Action Alternative on cover types are considered minimal, as the Mine Site and portions of
677 federal lands would continue to be managed in the same way they have been, and the
678 Transportation and Utility Corridor and Plant Site have been disturbed in the past.

679 **5.2.4.3.2 Effects of Invasive Non-native Plants**

680 Invasive or non-native species may still invade the Mine Site as a result of logging, mineral
681 exploration, vehicle traffic, and natural disturbances, but are likely to do so much more slowly
682 than under the NorthMet Project Proposed Action. Invasive non-native species already exist at
683 the Transportation and Utility Corridor and Plant Site, but they would likely spread more slowly
684 under the NorthMet Project No Action Alternative than under the NorthMet Project Proposed
685 Action due to less disturbance.

686 **5.2.4.3.3 Effects on Threatened and Endangered Plant Species**

687 Under the NorthMet Project No Action Alternative, colonies of state-listed ETSC plant species
688 would not be affected. Timber harvests are expected to continue to occur on the federal land
689 portions of the Mine Site. The NorthMet Project area has historically been logged and the state-
690 listed ETSC plant species present on site have persisted. It is unlikely that continued logging,
691 which now is more likely to employ best management practices to minimize detrimental effects,
692 would affect the species in the long term. Likely indirect effects under the NorthMet Project No
693 Action Alternative could come from increased competition as succession proceeds to older-age
694 forest stands or with invasive non-native species. Effects of increased competition could include
695 reduced spore production and consequently reduced population size in the early successional
696 plant species (e.g., *Botrychium* spp.). Continued maintenance would likely occur along Dunka
697 Road and the railroad where several of the *Botrychium* populations occur. Long-term succession
698 at these locations is unlikely due to this maintenance, and these populations could persist given
699 available habitats. The Transportation and Utility Corridor and Plant Site contain no occurrences
700 of state-listed ETSC plant species and so the NorthMet Project No Action Alternative is not
701 expected to have any effects.

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