

2016 Wildlife Species & Vegetative Assessment

Eagle Mine LLC

January 2017

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1.0 INTRODUCTION

King & MacGregor Environmental, Inc. (KME) was contracted by Eagle Mine LLC to collect ecological information within the Eagle Project Site (Study Area) located in northern Marquette County, Michigan (Figure 1-1.). All figures are provided in Appendix A. KME conducted ecological surveys in 2006-2008 and 2011-2016 for birds, small mammals, large mammals, and frogs and toads. In addition, wetland monitoring and upland vegetative surveys were conducted in 2007, 2008, and 2011-2016. As noted in previous reports, vegetation Survey Points 11W and 12W are no longer monitored as they still appear to be active roadways for logging and drilling traffic. This report is intended to describe the findings of the surveys conducted during 2016, and is considered a supplement to the previously submitted surveys.

1.1 Study Area

The Study Area is located in Sections 1, 2, 3, 10, 11, and 12, Michigamme Township (T50N, R29W), Marquette County, Michigan (Figure 1-2.).

1.2 Project Purpose

The purpose of these surveys is to continue the ecological investigation of birds, small mammals, large mammals, frogs and toads, wetland vegetation, and upland vegetation within the Study Area. Survey points are shown on Figure 1-3. The methodologies employed in the 2016 bird, small mammal, frog and toad, and vegetation surveys are described in Wildlife Species Assessment: Kennecott Eagle Minerals Company, Eagle Project Site, Marquette County, Michigan (KME 2008).

2.0 BIRDS

2.1. Methods

A breeding bird survey was conducted June 14, 16, and 17, 2016, at 28 survey points including two meander surveys—one north and one south from Triple A Road. A fall bird survey was conducted September 26, 28, and 29, 2016, at 18 survey points (Figure 1-3.). Points were surveyed twice (i.e., two days) during the breeding and fall surveys. Any incidental observations of bird species not associated with survey points were also recorded and reported.

2.2 Results

During the June 2016 breeding bird survey, 582 birds representing 33 species were observed (Tables 2-1a. and 2-1b.). All monitoring data tables are provided in Appendix B. During the September 2016 survey, 168 birds representing 21 species were observed (Tables 2-2a. and 2-2b.). A combined total of 750 birds representing 37 species were identified during the 2016 (June and September) bird surveys (Table 2-3.). As in previous years, the Nashville warbler (*Vermivora ruficapilla*) was the most abundant bird observed during the June 2016 survey. In recent years, the Canada goose (*Branta canadensis*) was the most abundant species recorded during the September surveys as they are usually beginning to flock during this time period, resulting in flyovers of relatively large numbers. However, during the September 2016 survey, only 2 Canada geese were observed, making the dark-eyed junco (*Junco hyemalis*) the most abundant species observed.

2.3 Discussion

The bird species identified and numbers recorded during 2016 are similar to those species in previous surveys conducted within the Study Area and are consistent with the bird species expected to be found in the habitats present, with the exception of the reduction in the number of Canada geese observations. With the lower Canada geese numbers considered, the remaining number of individuals observed and species represented are consistent with those of previous years. Many factors influence the timing of Canada goose migratory departure including local cloud cover, wind speed and direction, declining mean daily temperatures, etc. Occurring in pulses, Canada goose flocking/flyover events are unpredictable and episodic by nature, where a single flyover observation can greatly affect the total number of individual birds recorded during any given survey period (Wedge and Raveling 1983). Additionally, the well-above average temperatures during the fall of 2016 (NOAA 2016) may have delayed departure.

3.0 MAMMALS

3.1 Small Mammals

3.1.1 Methods

Small mammal capture methods employed the use of an array of four traps including Sherman box traps, large snap traps, and small snap traps at every survey point. Sampling

was conducted September 27 through 29, 2016. Ten points were surveyed during the 2016 survey (Figure 1-3.). Each survey point was sampled on three consecutive days, for a total of 30 sampling events.

3.1.2 Results

Thirty-one small mammals representing six species were collected during the September survey period: American pygmy shrew (*Sorex hoyi*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), southern redback vole (*Clethrionomys gapperi*), red squirrel (*Sciurus vulgaris*), and white-footed mouse (*Peromyscus leucopus*; Table 3.). The most common small mammal identified during the survey was the deer mouse. Snowshoe hares (*Lepus americanus*), red squirrels, and chipmunk species were incidentally observed throughout the Study Area during the 2016 surveys.

3.1.3 Discussion

The small mammals encountered within the Study Area during the 2016 surveys are typical of those expected in the habitats present and are generally consistent with previous survey results. Red squirrels appear to be relatively common throughout the Study Area but usually appear to be highly adept at trap avoidance. Other regionally common species possibly present or previously observed within the Study Area but not noted during the 2016 surveys include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), fisher (*Martes pennant*), raccoon (*Procyon lotor*), and river otter (*Lutra canadensis*). Small mammals appear to be distributed throughout wooded and open areas, in both upland and wetland habitats.

3.2 Large Mammals

3.2.1 Methods

Although the KME methodology does not include surveying specifically for large mammals, all observed evidence of large mammal presence was noted in the course of conducting field work for other wildlife and vegetation within the Study Area.

3.2.2 Results

Whitetail deer (*Odocoileus virginianus*) was the only large mammal species directly observed during the 2016 surveys. Deer were seen infrequently throughout the Study Area

during the course of the ecological surveys, however, track and scat observations were common. Evidence of American black bear (*Ursus americanus*) feeding on young black cherry trees was observed throughout the southwestern portion of the Study Area. As in previous years, fresh scat and tracks of moose (*Alces alces*) and coyote (*Canis latrans*) were also observed occasionally throughout the Study Area.

3.2.3 Discussion

All of the large mammal species detected during the 2016 surveys are species that would be expected in the habitats present. Other regionally common species possibly present or previously observed within the Study Area but not observed during the 2016 surveys include red fox (*Vulpes vulpes*), the federally endangered gray wolf (*Canis lupus*), and bobcat (*Lynx rufus*). Indirect evidence of gray wolves, which included tracks and scat, was observed during the 2006, 2007, 2011, and 2012 ecological surveys. KME biologists also directly observed a single gray wolf in 2012.

4.0 FROGS AND TOADS

4.1 Methods

KME used the same three frog and toad sampling points previously established in 2006 (Figure 1-3.). Surveys were conducted after sunset on May 3, May 31, and June 30, 2016.

4.2 Results

Two frog species were heard during the survey: green frog (*Rana clamitans*), and northern spring peeper (*Pseudacris crucifer*; Table 4). Calling activity included Call Index values of 1, 2, and 3.

4.3 Discussion

All three of the sampling points exhibited use by frogs for breeding. The northern spring peeper exhibited the highest Call Index Values. The frog species identified are typical of those expected in the habitats present in the Study Area. The 2016 survey results are similar to those of previous years, however, fewer species were recorded in 2016. The absence of calls during the May 3 survey and diminished species observations in general is likely due, in-part, to weather conditions including low temperatures and persistent ice and snow cover in early spring as well as frequent cold snaps occurring into the summer.

Additionally, operations noise from the vent raise area was noted at all three survey points. At Survey Point 3 in particular, the noise may be intense enough to diminish the observers' ability to hear and/or distinguish calls.

5.0 THREATENED AND ENDANGERED SPECIES

5.1 Methods

The Michigan Natural Features Inventory (MNFI) maintains a database of rare plants and animals in Michigan. KME requested a Rare Species Review (Appendix C) to determine if any protected species are known to occur within or nearby the Study Area (MNFI 2013). MNFI lists the narrow-leaved gentian (NLG; *Gentiana linearis*) as a state threatened species, and the spruce grouse (*Falcapennis canadensis*) as a state special concern species. In accordance with Michigan Department of Natural Resources (MDNR) guidelines (MDNR 2001), KME surveyed for MNFI listed species and/or their habitats during the appropriate season.

The presence of NLG along the Salmon Trout River within the Study Area and the north side of the Yellow Dog River is well documented. The methods used to conduct the 2016 NLG field investigation were consistent with the previous NLG studies. Photographic and Global Positioning System documentation were collected on August 17, 2016 (Appendix D and Figure 5-1.). The area of investigation for NLG was expanded in 2014 to include an area just north of the Yellow Dog River and west to the Salmon Trout River, in addition to the main branch of the Salmon Trout River south of Triple A Road. Local climate changes and overall health of the NLG colonies were assessed relative to previous years.

5.2 Results

The 2016 NLG survey results were similar to those of the 2010-2015 surveys (Meier 2010 and KME 2015). Flowering NLG were found in abundance (hundreds of individual plants) both along the Salmon Trout River and in the area north of the Yellow Dog River, in approximately the same areas where they were observed in previous years.

In 2006, the state and federally endangered Kirtland's warbler (*Dendroica kirtlandii*) was observed in Marquette County. Kirtland's warbler was not detected at any time during any of the 2016 ecological surveys. Spruce grouse is a state species of special concern; this

species was occasionally observed in 2016 during the seasonal ecological surveys near the Salmon Trout River as well as during the September bird survey. Scat and tracks of moose, also listed as state species of special concern, were observed occasionally in 2016 throughout the Study Area. No evidence of gray wolf activity was observed.

5.3 Discussion

The NLG colonies appeared healthy in 2016 relative to previous observances. NOAA weather data (NOAA 2016), mean precipitation totals were within between 25 and 50 percent above normal for the area during the 2016 water year and mean monthly temperatures were near average for April through July and above average for August and September. Flow in the Salmon Trout River and Yellow Dog River appeared normal. The necessary hydrology to support the NLG population appears to have been present in 2016. Although not observed in 2016, evidence of gray wolf activity and direct observation have been recorded as recently as 2012. Kirtland's warbler has not been detected in the Study Area since KME began monitoring; however, suitable habitat for the species exists on site. Moose and spruce grouse appear to be active residents of the Study Area.

6.0 WETLAND VEGETATIVE MONITORING

6.1 Methods

Eight of the original ten wetland sampling points established in 2006 were surveyed (Figure 1-3.). As noted in the introduction, Sampling Points 11W and 12W are no longer surveyed due to permanent disturbance. The wetland indicator statuses, native species ratings, and coefficients of conservatism used in the vegetation survey tables provided in this report are consistent with the *National Wetland Plant List* (U.S. Army Corps of Engineers, 2014) and the University of Michigan Herbarium's online database (Reznicek et al., 2011). Wetland points were surveyed on June 14 and 15, 2016.

6.2 Results

The 2016 wetland sampling point data are presented in Tables 6a. through 6c. Table 6a. summarizes the herbaceous data collected within each wetland quadrat; percent duff/bare soil, dead vegetation, and moss cover are also listed for each quadrat. Table 6b. summarizes the woody species data collected within each 30-foot radius wetland plot. Table 6c. is an overall species list of the plants found within all of the wetland sampling

plots; this table summarizes the combined data and lists the total number of species, total number of native species, mean wetland indicator number, floristic quality index (FQI), and mean coefficient of conservatism.

A total of 56 different vascular plant species were observed during the 2016 wetland vegetation surveys, of which 52 were native (Table 6c.). The four species identified as non-native exhibited a low percent cover. Overall, the plots contain an average of 93 percent native species. Wetland indicator values in the herbaceous stratum range from UPL to OBL (Table 6a.). As in previous years, the most commonly encountered species in this stratum were blue-joint (*Calamagrostis canadensis*), bunchberry (*Cornus canadensis*), low sweet blueberry (*Vaccinium angustifolium*), and tussock sedge (*Carex stricta*).

In the shrub/sapling and overstory stratum (i.e., woody species), the wetland rating values range from FACU to OBL (Table 6b.). Within the 30-foot radius plots, 20 woody species were identified during the June survey. As in previous years, the most commonly encountered species were red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*).

The coefficients of conservatism ranged from 0 to 10 for all plots combined, with a mean of 4.3 (Table 6c.). The FQI for all wetland plots was 32.5 (Table 6c.) and the mean wetland indicator value was -0.4 (Table 6c.).

6.3 Discussion

The data gathered provide qualitative and quantitative baselines against which to measure future monitoring results and determine if significant changes are occurring in any wetland monitoring plots. Overall, the wetland botanical species assemblages do not appear to have changed significantly since the beginning of the KME study period. The mean wetland indicator code value for all of the plots is within the FAC to FACW range, indicating a species assemblage adapted to moderately wet conditions. The coefficients of conservatism associated with each plot generally indicate a flora with moderate to low fidelity to specific natural communities. The exception to this remains plot 26W, which is within a bog/muskeg. Photos of wetland vegetation plots are provided in Appendix E.

7.0 UPLAND VEGETATIVE MONITORING

7.1 Methods

The 2016 early growing season monitoring of upland vegetation was conducted during June 13 through 15. Monitoring occurred at 18 survey points along seven transects (Fig. 1-3.). Late summer monitoring was conducted on August 16.

7.2 Results

The 2016 upland vegetative survey point data are presented in Tables 7-1a. through 7-2c. Tables 7-1a. (June) and 7-2a. (August) summarize the herbaceous data collected within each quadrat; percent duff/bare soil is also listed for each quadrat. Tables 7-1b. (June) and 7-2b. (August) summarize the woody species data collected within each 30-foot radius plot. Table 7-1c. is an overall species list of the plants found within all of the upland vegetative survey plots during June. Table 7-2c. is an overall species list of the plants found within all of the upland vegetative survey plots during August. Tables 7-1c. and 7-2c. summarize the combined data and list the total number of species, total number of native species, mean wetland indicator number, and mean coefficient of conservatism. A total of 45 different vascular plant species were observed during the June 2016 upland vegetative surveys (Table 7-1c.). A total of 44 different vascular plant species were observed during the August 2016 upland vegetative surveys (Table 7-2c.). All but Survey Plot 14 exhibited 100 percent native species during both upland survey periods. Plot 14, cleared and seeded during a road improvement project exhibited a 5 percent cover of non-native white clover (*Trifolium repens*) during the August survey.

In both the June and August upland surveys, the most commonly observed plants within the herbaceous quadrats were bracken fern (*Pteridium aquilinum*), low sweet blueberry, and various moss species. Bare soil/duff was also frequently noted in both June and August. Please note that because the foliage of different species can overlap, the total cover in some plots exceeds 100 percent.

Within the 30-foot radius plots, 19 woody species were identified in a combination of both the June and August upland surveys. The most frequently encountered species were red maple (*Acer rubrum*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), and jack pine (*Pinus banksiana*).

The coefficients of conservatism ranged from 0 to 10, with a mean coefficient of conservatism of 4.8 for both June and August plots (Tables 7-1c. and 7-2c.). No state or federally protected plant species were documented. Photos of upland vegetation plots are provided in Appendix F. The overall FQI for upland plots was 31.9 in June and 31.6 in August.

7.3 Discussion

The data gathered provide qualitative and quantitative baselines against which to measure future monitoring results and determine if significant changes are occurring in any upland monitoring plots. The minor difference between the June and August 2016 herbaceous plant lists is likely due to seasonal plant emergence and senescence. The wide range of wetland indicator codes indicates a wide variability of microtopographical conditions. The moderate overall mean coefficient of conservatism reflects the lack of non-native species encountered. In general, the vegetative assemblage appears to be similar to previous vegetation surveys.

8.0 CONCLUSION

The wildlife and plant species identified during the 2016 surveys within the Study Area are similar to those identified during previous KME surveys. Thirty-six species of birds, none of which are threatened or endangered, were observed during the bird surveys. Six small mammal species, none of which are threatened or endangered, were documented. Although only one large mammal species, white tailed deer, was directly observed in 2016, evidence of American black bear, moose, and coyote was observed. No evidence of threatened or endangered large mammal species was recorded. Vegetative sampling plots in both wetland and upland communities identified plant species that are common within the region. No threatened or endangered plant species were encountered within the vegetative survey plots. The population of narrow-leaved gentian (a state threatened species) observed within the revised study area remains robust. All of the wildlife and plant species identified within the Study Area are typically associated with vegetative communities that are relatively common within the region.

9.0 REFERENCES AND LITERATURE CITED

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- Michael L. Wege and Dennis G. Raveling. Factors Influencing the Timing, Distance, and Path of Migrations of Canada Geese Wilson Bull., 95(2), 1983, pp. 209-221.

APPENDIX A: FIGURES

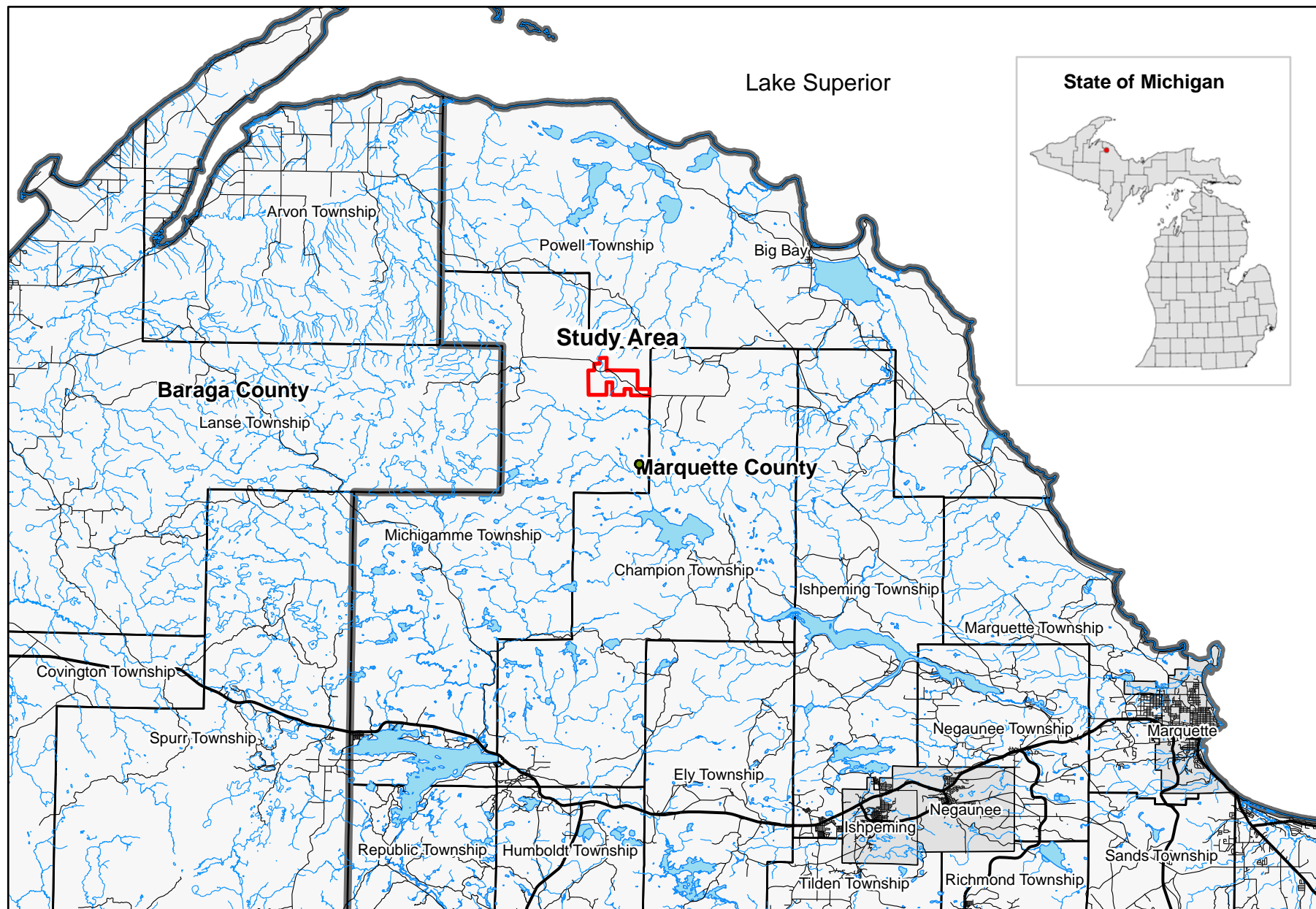








Figure 1-1. Project Location

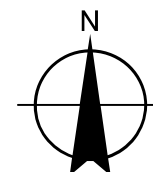


King & MacGregor Environmental, Inc.

Legend

- | | | | |
|---|------------|---|-----------------|
|  | Study Area |  | State Highways |
|  | City |  | Roads |
|  | County |  | Lakes & Streams |

0 2 4 8 Miles



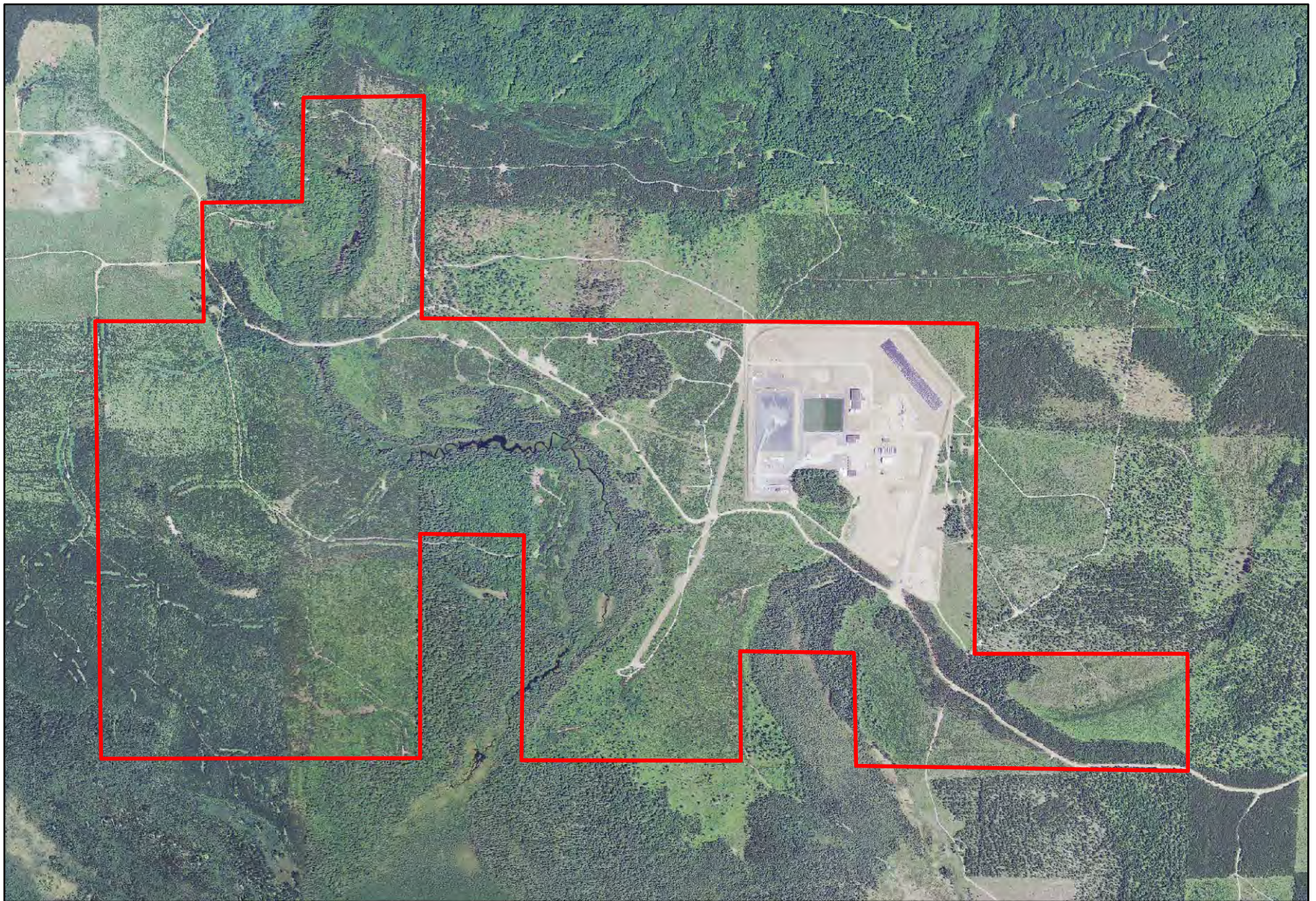



Figure 1-2. Study Area

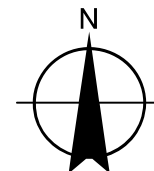


King & MacGregor Environmental, Inc.

Legend

 Study Area

0 0.25 0.5
Miles



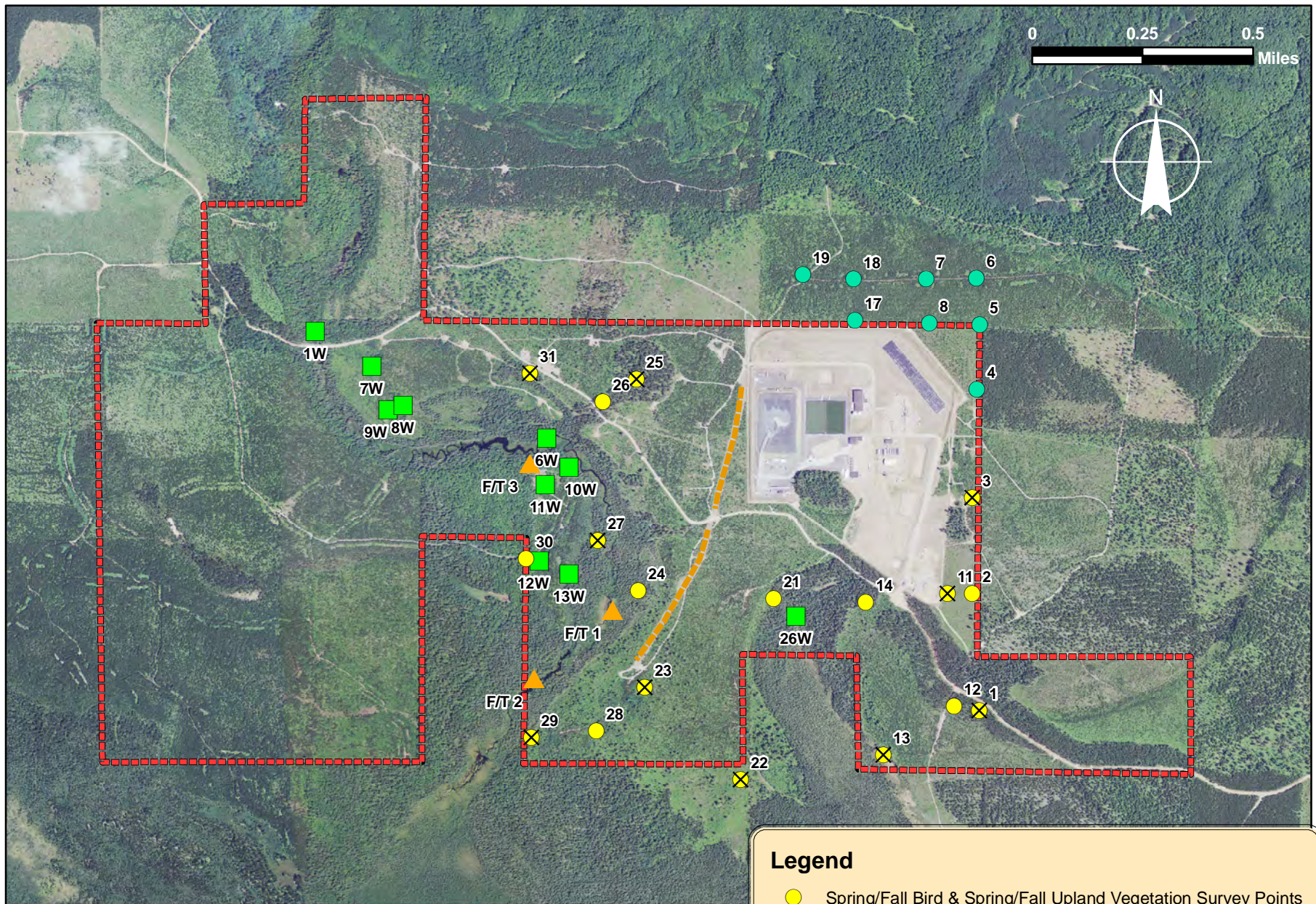


Figure 1-3. Biological and Wetland Survey Areas



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Legend

- Spring/Fall Bird & Spring/Fall Upland Vegetation Survey Points
- Spring-Only Bird Survey Points
- Meander Survey
- X Small Mammal Trapping Points (Fall Only)
- Wetland Vegetation Survey Point
- ▲ Frog/Toad Survey Point
- Study Area

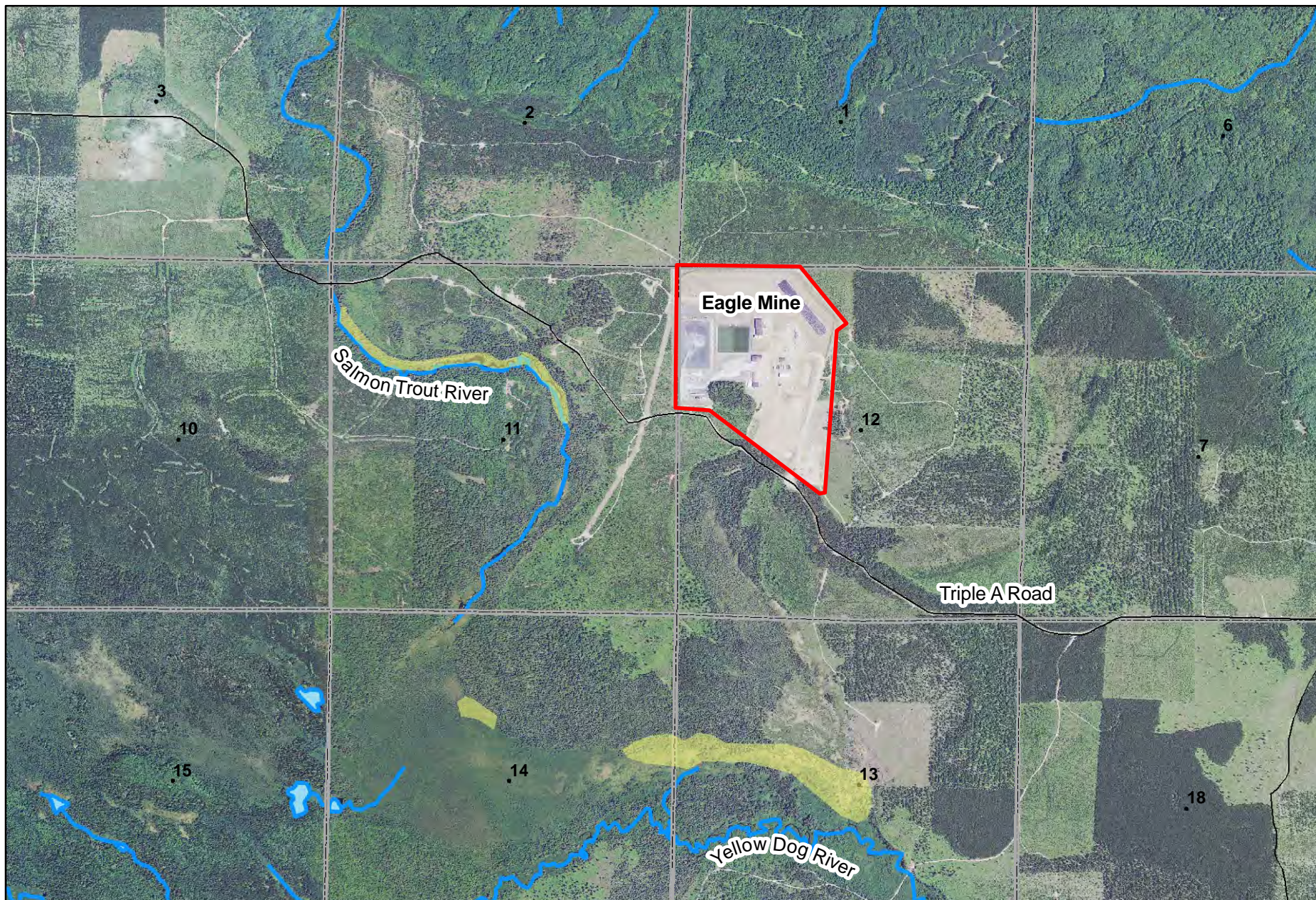


Figure 5-1. Narrow-leaved Gentian Survey (August 2016)



King & MacGregor Environmental, Inc.

Legend

Narrow-leaved Gentian

0 0.25 0.5 1 Miles

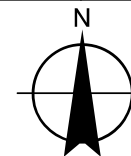


Table 2-1a. Bird Survey Point Data - June 2016

Eagle Mine LLC

Survey Point	Date	Alder Flycatcher	American Crow	American Goldfinch	American Herring Gull	American Kestrel	American Robin	Black-capped Chickadee	Blue Jay	Blue-headed Vireo	Brown Thrasher	Chestnut-sided Warbler	Chipping Sparrow	Clay-colored Sparrow	Common Grackle	Dark-eyed Junco	Golden-crowned Kinglet	Hermit Thrush	Mourning Dove	Nashville Warbler	Northern Flicker	Ovenbird	Pine Warbler	Red-eyed Vireo	Ruffed Grouse	Ruby-crowned Kinglet	Song Sparrow	Spruce Grouse	Vesper Sparrow	White-breasted Nuthatch	White-throated Sparrow	Wood Thrush	Yellow-bellied Sapsucker	Yellow-rumped Warbler	Total Count	Species Richness		
1	6/14/16												1					3		3			1									1				8	4	
1	6/16/16								1				1					3		2			2	1												10	6	
2	6/14/16															1				2			1									2				4	3	
2	6/16/16															3		2		3			1									2				11	5	
3	6/14/16												1			2				4											1					8	4	
3	6/16/16													1		2				2			1									2				8	5	
N ¹	6/16/16						2						1	1		1		2		2										2						11	7	
S ²	6/16/16		1				1		1									4		6		2					1				3					19	8	
N	6/14/16		3				2						3		1	4		2		4				1					1							21	9	
S	6/17/16	1							1		1					2		2		5		2	1		1					1		1				16	9	
4	6/14/16				1		1				1					1				2			1										1				6	5
4	6/16/16								1					1		3		1					1													7	5	
5	6/14/16								1				1			1		1				1	1													6	6	
5	6/16/16						1		1							1		2		3			1							1						10	7	
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22	6/16/16								1	1						1		2		2			1										1			9	7	
23	6/16/16	1	4				1	1										2		3		1		1												12	7	
23	6/17/16	1					1				1					1		2		2		1										1				10	8	
24	6/16/16	2							4									2		4				1												13	5	
24	6/17/16								1		1							2		4			1	1												14	7	
25	6/16/16	1					1		1		1					1		2		3		1		1							4					11	8	

Table 2-1a. Bird Survey Point Data - June 2016

Eagle Mine LLC

Survey Point	Date	Alder Flycatcher	American Crow	American Goldfinch	American Herring Gull	American Kestrel	American Robin	Black-capped Chickadee	Blue Jay	Blue-headed Vireo	Brown Thrasher	Chestnut-sided Warbler	Chipping Sparrow	Clay-colored Sparrow	Common Grackle	Dark-eyed Junco	Golden-crowned Kinglet	Hermit Thrush	Mourning Dove	Nashville Warbler	Northern Flicker	Ovenbird	Pine Warbler	Red-eyed Vireo	Ruffed Grouse	Ruby-crowned Kinglet	Song Sparrow	Spruce Grouse	Vesper Sparrow	White-breasted Nuthatch	White-throated Sparrow	Wood Thrush	Yellow-bellied Sapsucker	Yellow-rumped Warbler	Total Count	Species Richness
25	6/17/16								1							2		1		1											1		1		7	6
26	6/16/16		1				1		1		1					1		1		3				1											10	8
26	6/17/16						1				1		1			1		1		2															7	6
27	6/16/16	1																		2											2	1			6	4
27	6/17/16	1							3											4				1		1					3				13	6
28	6/16/16		1						1									2		3		2													9	5
28	6/17/16		1				2									1		1		3		2									1		1		12	8
29	6/17/16															1	2			2											1				6	4
29	6/16/16		1						1							1	2			3											2				10	6
30	6/16/16							1								1		2		2		1	1								3			1	12	8
30	6/17/16		1						3							2				2		2	1		1										12	7
31	6/16/16						1									1				4				1							2				9	5
31	6/17/16		1				2		2			1				1				3											2				12	7
Total		3	18	4	1	1	33	6	35	1	6	1	11	5	1	76	6	83	4	153	2	19	29	16	1	1	3	3	9	7	36	1	2	5	582	33

N¹ - Meander North
S² - Meander South

Mean of Species Richness per Survey Point per Day 6
Mean Count per Species 18

Table 2-1b. Bird Species Abundance Rankings - June 2016

Eagle Mine LLC

Common Name	Scientific Name	Count	Relative Abundance
Nashville Warbler	<i>Vermivora ruficapilla</i>	153	26.3%
Hermit Thrush	<i>Catharus guttatus</i>	83	14.3%
Dark-eyed Junco	<i>Junco hyemalis</i>	76	13.1%
White-throated Sparrow	<i>Zonotrichia albicollis</i>	36	6.2%
Blue Jay	<i>Cyanocitta cristata</i>	35	6.0%
American Robin	<i>Turdus migratorius</i>	33	5.7%
Pine Warbler	<i>Dendroica pinus</i>	29	5.0%
Ovenbird	<i>Seiurus aurocapilla</i>	19	3.3%
American Crow	<i>Corvus brachyrhynchos</i>	18	3.1%
Red-eyed Vireo	<i>Vireo olivaceus</i>	16	2.7%
Chipping Sparrow	<i>Spizella passerina</i>	11	1.9%
Vesper Sparrow	<i>Poocetes gramineus</i>	9	1.5%
White-breasted Nuthatch	<i>Sitta carolinensis</i>	7	1.2%
Black-capped Chickadee	<i>Poecile atricapillus</i>	6	1.0%
Brown Thrasher	<i>Toxostoma rufum</i>	6	1.0%
Golden-crowned Kinglet	<i>Regulus satrapa</i>	6	1.0%
Clay-colored Sparrow	<i>Spizella pallida</i>	5	0.9%
Yellow-rumped Warbler	<i>Dendroica coronata</i>	5	0.9%
American Goldfinch	<i>Spinus tristis</i>	4	0.7%
Mourning Dove	<i>Zenaida macroura</i>	4	0.7%
Alder Flycatcher	<i>Empidonax alnorum</i>	3	0.5%
Song Sparrow	<i>Melospiza melodia</i>	3	0.5%
Spruce Grouse	<i>Falcapennis canadensis</i>	3	0.5%
Northern Flicker	<i>Colaptes auratus</i>	2	0.3%
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	2	0.3%
American Herring Gull	<i>Larus argentatus</i>	1	0.2%
American Kestrel	<i>Falco sparverius</i>	1	0.2%
Blue-headed Vireo	<i>Vireo solitarius</i>	1	0.2%
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1	0.2%
Common Grackle	<i>Quiscalus quiscula</i>	1	0.2%
Ruffed Grouse	<i>Bonasa umbellus</i>	1	0.2%
Ruby-crowned Kinglet	<i>Regulus calendula</i>	1	0.2%
Wood Thrush	<i>Hylocichla mustelina</i>	1	0.2%

Total Count **582**
Mean Count per Species **18**
Total Number of Species **33**

Table 2-2a. Bird Survey Point Data - September 2016

Eagle Mine LLC

Survey Point	Date	American Crow	American Goldfinch	American Kestrel	American Robin	Black-capped Chickadee	Blue Jay	Canada Goose	Chipping Sparrow	Common Raven	Dark-eyed Junco	Hermit Thrush	Merlin	Northern Flicker	Pine Warbler	Red-breasted Nuthatch	Song Sparrow	Spruce Grouse	Vesper Sparrow	White-breasted Nuthatch	White-throated Sparrow	Yellow-rumped warbler	Total Count	Species Richness
1	9/26/16						1																1	1
1	9/28/16				1	1					1												3	3
2	9/28/16		2				1				6												9	3
2	9/29/16					3	1	2											1				7	4
3	9/28/16										2								1				2	1
3	9/29/16								1		3										2		6	3
11	9/28/16								1		4												5	2
11	9/29/16										7											1	8	2
12	9/26/16						1																1	1
12	9/28/16						1				4			2									7	3
13	9/28/16								1	1	3	1	1										7	5
13	9/29/16									2													2	1
14	9/28/16	1	2						1		2												6	4
14	9/29/16	1			1						2						1		9				14	5
21	9/28/16										2												2	1
21	9/29/16								1		1												2	2
22	9/28/16										8							1					9	2
22	9/29/16	2	3																				5	2
23	9/28/16				3						9										2		14	3
23	9/29/16	2			1						3												6	3
24	9/28/16				2	4								2									8	3
24	9/29/16								1	3	1												5	3
25	9/28/16										3												3	1
25	9/29/16										2												2	1
26	9/28/16				1															1			2	2
26	9/29/16		2	1							2				1								6	4
27	9/28/16					2												1					3	2
27	9/29/16					2																	2	1
28	9/28/16								1		3												4	2
28	9/29/16										1												1	1
29	9/28/16				1																		1	1
29	9/29/16									1		1											2	2
30	9/28/16					3					2				2						1		8	4
30	9/29/16	1																		1			2	2
31	9/28/16									2													2	1
31	9/29/16										1												1	1
Total		7	9	1	10	15	5	2	6	7	73	4	1	2	2	3	1	2	10	2	5	1	168	21

Mean of Species Richness per Survey Point per Day 2
Mean Count per Species 8

Table 2-2b. Bird Species Abundance Rankings - September 2016

Eagle Mine LLC

Common Name	Scientific Name	Count	Relative Abundance
Dark-eyed Junco	<i>Junco hyemalis</i>	73	43.5%
Black-capped Chickadee	<i>Poecile atricapilla</i>	15	8.9%
American Robin	<i>Turdus migratorius</i>	10	6.0%
Vesper Sparrow	<i>Poocetes gramineus</i>	10	6.0%
American Goldfinch	<i>Carduelis tristis</i>	9	5.4%
American Crow	<i>Corvus brachyrhynchos</i>	7	4.2%
Common Raven	<i>Corvus corax</i>	7	4.2%
Chipping Sparrow	<i>Spizella passerina</i>	6	3.6%
Blue Jay	<i>Cyanocitta cristata</i>	5	3.0%
White-throated Sparrow	<i>Zonotrichia albicollis</i>	5	3.0%
Hermit Thrush	<i>Catharus guttatus</i>	4	2.4%
Red-breasted Nuthatch	<i>Sitta canadensis</i>	3	1.8%
Canada Goose	<i>Branta canadensis</i>	2	1.2%
Northern Flicker	<i>Colaptes auratus</i>	2	1.2%
Pine Warbler	<i>Dendroica pinus</i>	2	1.2%
White-breasted Nuthatch	<i>Sitta carolinensis</i>	2	1.2%
Spruce Grouse	<i>Falcapennis canadensis</i>	2	1.2%
American Kestrel	<i>Falco sparverius</i>	1	0.6%
Merlin	<i>Falco columbarius</i>	1	0.6%
Song Sparrow	<i>Melospiza melodia</i>	1	0.6%
Yellow-rumped warbler	<i>Setophaga coronata</i>	1	0.6%

Total Count	168
Mean Count per Species	8
Total Number of Species	21

Table 2-3. Bird Species Abundance Rankings - June/September Combined 2016

Eagle Mine LLC

Common Name	Scientific Name	Count	Relative Abundance
Nashville Warbler	<i>Vermivora ruficapilla</i>	153	20.4%
Dark-eyed Junco	<i>Junco hyemalis</i>	149	19.9%
Hermit Thrush	<i>Catharus guttatus</i>	87	11.6%
American Robin	<i>Turdus migratorius</i>	43	5.7%
White-throated Sparrow	<i>Zonotrichia albicollis</i>	41	5.5%
Blue Jay	<i>Cyanocitta cristata</i>	40	5.3%
Pine Warbler	<i>Dendroica pinus</i>	31	4.1%
American Crow	<i>Corvus brachyrhynchos</i>	25	3.3%
Black-capped Chickadee	<i>Poecile atricapilla</i>	21	2.8%
Ovenbird	<i>Seiurus aurocapilla</i>	19	2.5%
Vesper Sparrow	<i>Poocetes gramineus</i>	19	2.5%
Chipping Sparrow	<i>Spizella passerina</i>	17	2.3%
Red-eyed Vireo	<i>Vireo olivaceus</i>	16	2.1%
American Goldfinch	<i>Carduelis tristis</i>	13	1.7%
White-breasted Nuthatch	<i>Sitta carolinensis</i>	9	1.2%
Common Raven	<i>Corvus corax</i>	7	0.9%
Brown Thrasher	<i>Toxostoma rufum</i>	6	0.8%
Golden-crowned Kinglet	<i>Regulus satrapa</i>	6	0.8%
Yellow-rumped Warbler	<i>Dendroica coronata</i>	6	0.8%
Clay-colored Sparrow	<i>Spizella pallida</i>	5	0.7%
Spruce Grouse	<i>Falcipecten canadensis</i>	5	0.7%
Mourning Dove	<i>Zenaidura macroura</i>	4	0.5%
Northern Flicker	<i>Colaptes auratus</i>	4	0.5%
Song Sparrow	<i>Melospiza melodia</i>	4	0.5%
Alder Flycatcher	<i>Empidonax alnorum</i>	3	0.4%
Red-breasted Nuthatch	<i>Sitta canadensis</i>	3	0.4%
American Kestrel	<i>Falco sparverius</i>	2	0.3%
Canada Goose	<i>Branta canadensis</i>	2	0.3%
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	2	0.3%
American Herring Gull	<i>Larus argentatus</i>	1	0.1%
Blue-headed Vireo	<i>Vireo solitarius</i>	1	0.1%
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1	0.1%
Common Grackle	<i>Quiscalus quiscula</i>	1	0.1%
Merlin	<i>Falco columbarius</i>	1	0.1%
Ruby-crowned Kinglet	<i>Regulus calendula</i>	1	0.1%
Ruffed Grouse	<i>Bonasa umbellus</i>	1	0.1%
Wood Thrush	<i>Hylocichla mustelina</i>	1	0.1%

Total Count **750**
Mean Count per Species **20**
Total Number of Species **37**

Table 3. Small Mammal Survey Point Data - 2016

Eagle Mine LLC

Survey Point	Date	Sherman Live Traps (2)			Large Snap Trap		Small Snap Trap				Total Count	Species Richness
		Deer Mouse (<i>Peromyscus maniculatus</i>)	Least Chipmunk (<i>Tamias minimus</i>)	Southern Redback Vole (<i>Clethrionomys gapperi</i>)	Least Chipmunk (<i>Tamias minimus</i>)	Red Squirrel (<i>Tamiasciurus hudsonicus</i>)	American Pygmy Shrew (<i>Sorex hoyi</i>)	Deer Mouse (<i>Peromyscus maniculatus</i>)	Southern Redback Vole (<i>Clethrionomys gapperi</i>)	White-footed Mouse (<i>Peromyscus leucopus</i>)		
1	9/27/16		1								1	1
1	9/28/16										0	0
1	9/29/16		1		1						2	1
3	9/27/16		1								1	1
3	9/28/16				1						1	1
3	9/29/16		2					1			3	2
11	9/27/16										0	0
11	9/28/16										0	0
11	9/29/16		1								1	1
13	9/27/16			1					1		2	1
13	9/28/16									1	1	1
13	9/29/16										0	0
22	9/27/16	2									2	1
22	9/28/16	1									1	1
22	9/29/16	2									2	1
23	9/27/16		1			1					2	2
23	9/28/16	2									2	1
23	9/29/16	1									1	1
25	9/27/16										0	0
25	9/28/16									1	1	1
25	9/29/16										0	0
27	9/27/16			1							1	1
27	9/28/16										0	0
27	9/29/16										0	0
29	9/27/16										0	0
29	9/28/16	1					1				2	2
29	9/29/16	1									1	1
31	9/27/16	1									1	1
31	9/28/16	1									1	1
31	9/29/16	2									2	1
Total		14	7	2	2	1	1	1	1	2	31	6

Total Species Richness 6
 Mean Species Richness per Survey Point per Day 0.8
 Mean Count per Species 5

Table 4. Frog and Toad Survey Point Data - 2016

Eagle Mine LLC

Survey Point	Survey Period	Date	Time	Temp (°F)	Wind Speed (MPH)	Call Index Value*		Species Richness
						Green Frog (<i>Rana clamitans</i>)	Northern Spring Peeper (<i>Pseudacris crucifer</i>)	
FT01	Early Spring	5/3/16	9:21 PM	50	0		3	1
FT02	Early Spring	5/3/16	9:03 PM	53	0		3	1
FT03	Early Spring	5/3/16	10:02 PM	56	3		3	1
FT01	Late Spring	5/31/16	10:16 PM	68	3		3	1
FT02	Late Spring	5/31/16	9:50 PM	66	2		2	1
FT03	Late Spring	5/31/16	10:53 PM	65	0		2	1
FT01	Summer	6/30/16	10:50 PM	65	0	1		1
FT02	Summer	6/30/16	10:25 PM	66	0	1		1
FT03	Summer	6/30/16	11:20 PM	65	1	2		1
Mean						1.3	2.5	1.0
Total Species Richness								2.0
						Mean Call Index Value per Survey Point per Day		1.9

*1 = Individuals can be counted and there is space between calls.

2 = Individuals can be counted but there is some overlapping of calls.

3 = Full chorus; calls are continuous and overlapping.

Table 6a. Herbaceous Species Wetland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Herbaceous Species Percent Cover Per 1m Quadrat							
							Plot 1W	Plot 6W	Plot 7W	Plot 8W	Plot 9W	Plot 10W	Plot 13W	Plot 26W
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes			10			5		
<i>Amelanchier sp.</i>	Serviceberry	NA	NA	NA	S/T	Yes				5				
<i>Anemone quinquefolia</i>	Wood Anemone	5	FACU	3	Herb	Yes	5							
<i>Avenella flexuosa</i>	Hair Grass	6	UPL	5	Herb	Yes					10			
<i>Brachyelytrum aristosum</i>	Northern Shorthusk	7	UPL	5	Herb	Yes	5							
<i>Calamagrostis canadensis</i>	Blue Joint Grass	3	OBL	-5	Herb	Yes		5	10	5			5	
<i>Carex brunnescens</i>	Brownish Sedge	5	FACW	-3	Herb	Yes			5					
<i>Carex leptalea</i>	Bristly-stalked Sedge	5	OBL	-5	Herb	Yes	5							
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes	60	60					50	
<i>Carex trisperma</i>	Three-seeded Sedge	9	OBL	-5	Herb	Yes						5		
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes								20
<i>Cirsium palustre</i>	European Swamp Thistle	0	FACW	-3	Herb	No	5							
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes				5		5		
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes				30	5	5		
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes					20			
<i>Diervilla lonicera</i>	Bush Honeysuckle	4	UPL	5	Shrub	Yes					5			
<i>Dryopteris carthusiana</i>	Spinulose Woodfern	5	FACW	-3	Herb	Yes	5							
<i>Dryopteris intermedia</i>	Intermediate Fern	5	FAC	0	Herb	Yes						10		
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes				25				
<i>Hieracium aurantiacum</i>	Orange Hawkweed	0	UPL	5	Herb	No					15			
<i>Hieracium caespitosum</i>	Yellow Hawkweed	0	UPL	5	Herb	No				5				
<i>Ilex verticillata</i>	Winterberry	5	FACW	-3	Shrub	Yes	5							
<i>Iris versicolor</i>	Varicolored Iris	5	OBL	-5	Herb	Yes							10	
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes								30
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes			10		5			
<i>Osmunda cinnamomea</i>	Cinnamon Fern	5	FACW	-3	Herb	Yes						10		
<i>Phleum pratense</i>	Timothy	0	FACU	3	Herb	No					5			
<i>Potentilla palustris</i>	Marsh Cinquefoil	7	OBL	-5	Herb	Yes		5						
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes				10				
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes				5	5			
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes								25
<i>Rubus pubescens</i>	Dwarf Raspberry	4	FACW	-3	Herb	Yes	10							
<i>Rubus setosus</i>	Bristly Blackberry	3	FACW	-3	Shrub	Yes			10		5			

Table 6a. Herbaceous Species Wetland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Herbaceous Species Percent Cover Per 1m Quadrat							
							Plot 1W	Plot 6W	Plot 7W	Plot 8W	Plot 9W	Plot 10W	Plot 13W	Plot 26W
<i>Solidago juncea</i>	Early Goldenrod	3	UPL	5	Herb	Yes				5				
<i>Thalictrum dasycarpum</i>	Purple Meadow Rue	3	FACW	-3	Herb	Yes	5							
<i>Trientalis borealis</i>	Starflower	5	FAC	0	Herb	Yes			5					
<i>Utricularia intermedia</i>	Bladderwort	10	OBL	-5	Herb	Yes		5						
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes				30	30			
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes					20			
NA	Dead Vegetation	NA	NA	NA	NA	NA		50	55	5			75	
NA	Duff / Bare Soil	NA	NA	NA	NA	NA	10				5			
NA	Moss	NA	NA	NA	Moss	Yes			10	40		15		95
Total Number of Species							9	4	6	10	11	6	3	3
Total Number of Native Species							8	4	6	9	9	6	3	3
Mean Wetland Indicator Value (W)							-1.9	-5.0	-1.8	1.6	2.1	-1.8	-5.0	-5.0
Mean Coefficient of Conservatism (C)							4.2	6.0	3.5	3.0	3.2	5.2	4.0	8.7
Floristic Quality Index (FQI)							12.7	12.0	8.6	9.5	10.6	12.7	6.9	15.0

Table 6b. Woody Species Wetland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Woody Species Stems Per Permanent 30' Radius Plot							
							Plot 1W	Plot 6W	Plot 7W	Plot 8W	Plot 9W	Plot 10W	Plot 13W	Plot 26W
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes	24		11	69	19	16	2	
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes	47		6	25	48	192		
<i>Alnus incana</i>	Speckled Alder	5	FACW	-5	Shrub	Yes	83	56	3					
<i>Amelanchier sp.</i>	Serviceberry	NA	NA	NA	S/T	Yes	4		11	3	7		1	
<i>Aronia prunifolia</i>	Chokeberry	5	FACW	-3	Shrub	Yes							1	
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes			5	9	9			
<i>Corylus cornuta</i>	Beaked Hazelnut	5	FACU	3	Shrub	Yes					5			
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes		1				7	3	9
<i>Lonicera canadensis</i>	Canada Honeysuckle	5	FACU	3	Shrub	Yes	8							
<i>Nemopanthus mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes						5	2	
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes	20			46	14	25	17	25
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes			4	19	12		1	
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes			2					
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes								2
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes			9		4			
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes					5			
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes	9		30	12	19			
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes	20							
<i>Salix discolor</i>	Pussy Willow	1	FACW	-3	Shrub	Yes			1					
<i>Salix humilis</i>	Prairie Willow	4	FACU	3	Shrub	Yes				1				

Total Number of Species	8	2	10	8	10	5	7	3
Total Number of Native Species	8	2	10	8	10	5	7	3
Mean Wetland Indicator Value (W)	-0.3	-4.0	0.1	0.8	0.9	-2.8	-2.0	-1.0
Mean Coefficient of Conservatism (C)	3.0	5.0	2.6	2.9	2.8	4.4	4.4	4.7
Floristic Quality Index (FQI)	8.5	7.1	8.2	8.1	8.9	9.8	11.7	8.1

Table 6c. Overall Wetland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes
<i>Alnus incana</i>	Speckled Alder	5	FACW	-3	Shrub	Yes
<i>Amelanchier sp.</i>	Serviceberry	NA	NA	NA	S/T	Yes
<i>Anemone quinquefolia</i>	Wood Anemone	5	FAC	0	Herb	Yes
<i>Aronia prunifolia</i>	Chokeberry	5	FACW	-3	Shrub	Yes
<i>Avenella flexuosa</i>	Hair Grass	6	UPL	5	Herb	Yes
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes
<i>Brachyelytrum aristosum</i>	Northern Shorthusk	7	UPL	5	Herb	Yes
<i>Calamagrostis canadensis</i>	Blue Joint Grass	3	OBL	-5	Herb	Yes
<i>Carex brunnescens</i>	Brownish Sedge	5	FACW	-3	Herb	Yes
<i>Carex leptalea</i>	Bristly-stalked Sedge	5	OBL	-5	Herb	Yes
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes
<i>Carex trisperma</i>	Three-seeded Sedge	9	OBL	-5	Herb	Yes
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes
<i>Cirsium palustre</i>	European Swamp Thistle	0	FACW	-3	Herb	No
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes
<i>Corylus cornuta</i>	Beaked Hazelnut	5	FACU	3	Shrub	Yes
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes
<i>Diervilla lonicera</i>	Bush Honeysuckle	4	UPL	5	Shrub	Yes
<i>Dryopteris carthusiana</i>	Spinulose Woodfern	5	FACW	-3	Herb	Yes
<i>Dryopteris intermedia</i>	Intermediate Fern	5	FAC	0	Herb	Yes
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes
<i>Hieracium aurantiacum</i>	Orange Hawkweed	0	UPL	5	Herb	No
<i>Hieracium caespitosum</i>	Yellow Hawkweed	0	UPL	5	Herb	No
<i>Ilex verticillata</i>	Winterberry	5	FACW	-3	Shrub	Yes
<i>Iris versicolor</i>	Varicolored Iris	5	OBL	-5	Herb	Yes
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes
<i>Lonicera canadensis</i>	Canada Honeysuckle	5	FACU	3	Shrub	Yes
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes
<i>Nemopanthus mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes
<i>Osmunda cinnamomea</i>	Cinnamon Fern	5	FACW	-3	Herb	Yes
<i>Phleum pratense</i>	Timothy	0	FACU	3	Herb	No
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes
<i>Potentilla palustris</i>	Marsh Cinquefoil	7	OBL	-5	Herb	Yes
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes
<i>Rubus pubescens</i>	Dwarf Raspberry	4	FACW	-3	Herb	Yes
<i>Rubus setosus</i>	Bristly Blackberry	3	FACW	-3	Shrub	Yes

Table 6c. Overall Wetland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native
<i>Salix discolor</i>	Pussy Willow	1	FACW	-3	Shrub	Yes
<i>Salix humulis</i>	Prairie Willow	4	FACU	3	Shrub	Yes
<i>Solidago juncea</i>	Early Goldenrod	3	UPL	5	Herb	Yes
<i>Thalictrum dasycarpum</i>	Purple Meadow Rue	3	FACW	-3	Herb	Yes
<i>Trientalis borealis</i>	Star Flower	5	FAC	0	Herb	Yes
<i>Utricularia intermedia</i>	Bladderwort	10	OBL	-5	Herb	Yes
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes

Total Number of Species	56
Total Number of Native Species	52
Mean Wetland Indicator Value (W)	-0.4
Mean Coefficient of Conservatism (C)	4.3
Floristic Quality Index (FQI)	32.5

Table 7-1a. Herbaceous Species Upland Vegetative Survey Data - June 2016

Eagle Mine LLC

							Herbaceous Species Percent Cover Per 1m Quadrat																						
Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Plot 1	Plot 2	Plot 3	Plot 11	Plot 12	Plot 13	Plot 14	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29	Plot 30	Plot 31					
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes																5	5						
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes	5												5			5	15						
<i>Amelanchier sp.</i>	Serviceberry	NA	NA	NA	S/T	Yes									10		10			5									
<i>Aronia prunifolia</i>	Chokeberry	5	FACW	-3	Shrub	Yes														5									
<i>Avenella flexuosa</i>	Hair Grass	6	UPL	5	Herb	Yes		5						5	5	10		5	5		5				5				
<i>Carex lucorum</i>	Blue Ridge Sedge	4	UPL	5	Herb	Yes				5	10																		
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes														25									
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes														5									
<i>Clintonia borealis</i>	Bluebead Lily	5	FAC	0	Herb	Yes											5			5		5							
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes											5			10		5	5						
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes		5									5			5		10	10						
<i>Cypripedium acaule</i>	Moccasin Flower	5	FACW	-3	Herb	Yes															5								
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes				50					5						10								
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes	5	15						15				10											
<i>Festuca saximontana</i>	Rocky Mountain Fescue	6	UPL	5	Herb	Yes							20																
<i>Gaultheria hispida</i>	Creeping Snowberry	8	FACW	-3	Herb	Yes											5			5									
<i>Gaultheria procumbens</i>	Wintergreen	5	FACU	3	Herb	Yes	5				15				5	5			5	5		5							
<i>Iris versicolor</i>	Harlequin Blueflag	5	OBL	-5	Herb	Yes														5									
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes											5												
<i>Linnaea borealis</i>	Twinflower	6	FAC	0	Herb	Yes	5																						
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes	10	5		5	5												5	5					
<i>Melampyrum lineare</i>	Cow Wheat	6	FACU	3	Herb	Yes	5				5										5				5				
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes									5														
<i>Polygala paucifolia</i>	Fringed Polygala	7	FACU	3	Herb	Yes	5																						
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes									30														
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes																5							
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes	30				5			5	10	5		10	60		10	5		45					
<i>Quercus rubra</i>	Red Oak	5	FACU	3	Tree	Yes																	5						
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes											10			5									
<i>Rubus hispida</i>	Swamp Dewberry	4	FACW	-3	Shrub	Yes														5									
<i>Trientalis borealis</i>	Starflower	5	FAC	0	Herb	Yes															5								
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes	10		10	75	25	85		55	35		50	10	5	5	5		5	5					
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes	5	55			30			5	5	5	5						40	5					
NA	Duff / Bare Soil	NA	NA	NA	NA	NA	55	5		10				40	55	65	15	10	90		70	55	55	60					
NA	Lichen	NA	NA	NA	Lichen	Yes	5	30		5				10				5											
NA	Moss	NA	NA	NA	Moss	Yes	5				90	95		5		10	50	90	5	25	10	25	5	50					
Total Number of Species							10	5	3	3	6	1	1	5	9	4	9	4	5	13	7	9	8	5					
Total Number of Native Species							10	5	3	3	6	1	1	5	9	4	9	4	5	13	7	9	8	5					
Mean Wetland Indicator Value (W)							1.7	1.4	4.3	2.7	1.5	3.0	5.0	2.6	2.1	2.0	-1.8	4.0	2.8	-2.0	2.3	0.0	-0.4	2.8					
Mean Coefficient of Conservatism (C)							4.4	5.4	4.0	4.0	3.8	4.0	6.0	4.2	3.0	3.8	5.6	4.3	3.2	5.2	4.3	3.4	4.0	4.0	4.0				
Floristic Quality Index (FQI)							13.9	12.1	6.9	6.9	9.4	6.0	6.0	9.4	9.0	7.5	16.7	8.5	7.2	18.6	11.3	10.3	11.3	8.9					

Table 7-1b. Woody Species Upland Vegetative Survey Data - June 2016

Eagle Mine LLC

							Woody Species Stems Per Permanent 30-Foot Radius Circular Plot																	
Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Plot 1	Plot 2	Plot 3	Plot 11	Plot 12	Plot 13	Plot 14	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29	Plot 30	Plot 31
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes	10	1			1				2	1	4	2	6			13	19	22
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes	41				4			8	2	8	36	6	16	91		19	8	21
<i>Alnus incana</i>	Speckled Alder	5	FACW	-5	Shrub	Yes														43				
<i>Amelanchier sp.</i>	Serviceberry	NA	NA	NA	S/T	Yes	10				3			1	1	1	5			8		6		2
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes														1		1	1	1
<i>Corylus cornuta</i>	Beaked Hazelnut	5	UPL	5	Shrub	Yes																	1	
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes					5						2			7				
<i>Nemopanthus mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes											7			2		6		
<i>Picea glauca</i>	White Spruce	3	FACU	3	Tree	Yes									1									
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes	17	31			23	63		24		1	25	10		82	1	17		
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes	14	2	16	32	22	32		10	22	21		11	7		6			11
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes															7			
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes	2				1			2	5	1	2	4			2	4	3	
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes									44				2		52			
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes										7					1			
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes									25	18		3	5		22			3
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes															1			
<i>Rhododendron groenlandicum</i>	Labrador Tea	-5	OBL	-5	Shrub	Yes											1							
<i>Salix humilis</i>	Prairie Willow	4	FACU	3	Shrub	Yes	5	1						1										
Total Number of Species							7	4	1	1	6	3	0	6	8	8	8	6	5	7	8	7	5	6
Total Number of Native Species							7	4	1	1	6	3	0	6	8	8	8	6	5	7	8	7	5	6
Mean Wetland Indicator Value (W)							0.4	0.0	3.0	3.0	0.0	-1.0	N/A	1.0	1.1	0.8	-2.0	0.5	0.6	-1.9	1.9	-0.7	1.6	1.0
Mean Coefficient of Conservatism (C)							3.1	4.5	5.0	5.0	3.0	5.3	N/A	3.2	2.3	2.9	2.5	3.3	2.4	3.7	3.5	3.1	2.8	2.2
Floristic Quality Index (FQI)							8.3	9.0	5.0	5.0	7.3	9.2	N/A	7.8	6.4	8.1	7.1	8.2	5.4	9.8	9.9	8.3	6.3	5.3

Table 7-1c. Overall Upland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes
<i>Alnus incana</i>	Speckled Alder	5	FACW	-3	Shrub	Yes
<i>Amelanchier</i> sp.	Serviceberry	NA	NA	NA	S/T	Yes
<i>Aronia prunifolia</i>	Chokeberry	5	FACW	-3	Shrub	Yes
<i>Avenella flexuosa</i>	Hair Grass	6	UPL	5	Herb	Yes
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes
<i>Carex lucorum</i>	Blue Ridge Sedge	4	UPL	5	Herb	Yes
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes
<i>Clintonia borealis</i>	Bluebead Lily	5	FAC	0	Herb	Yes
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes
<i>Corylus cornuta</i>	Beaked Hazelnut	5	UPL	5	Shrub	Yes
<i>Cypripedium acaule</i>	Moccasin Flower	5	FACW	-3	Herb	Yes
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes
<i>Festuca saximontana</i>	Rocky Mountain Fescue	6	UPL	5	Herb	Yes
<i>Gaultheria hispidula</i>	Snowberry	8	FACW	-3	Herb	Yes
<i>Gaultheria procumbens</i>	Wintergreen	5	FACU	3	Herb	Yes
<i>Iris versicolor</i>	Harlequin Blueflag	5	OBL	-5	Herb	Yes
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes
<i>Linnaea borealis</i>	Twinflower	6	FAC	0	Herb	Yes
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes
<i>Melampyrum lineare</i>	Cow Weat	6	FACU	3	Herb	Yes
<i>Nemopanthes mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes
<i>Picea glauca</i>	White Spruce	3	FACU	3	Tree	Yes
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes
<i>Polygala paucifolia</i>	Fringed Polygala	7	FACU	3	Herb	Yes
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes
<i>Quercus rubra</i>	Red Oak	5	FACU	3	Tree	Yes
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes
<i>Rubus hispidus</i>	Swamp Dewberry	4	FACW	-3	Herb	Yes
<i>Salix humilis</i>	Prairie Willow	4	FACU	3	Shrub	Yes
<i>Trientalis borealis</i>	Starflower	5	FAC	0	Herb	Yes

Table 7-1c. Overall Upland Vegetative Survey Data - June 2016

Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes

Total Number of Species	45
Total Number of Native Species	45
Mean Wetland Indicator Value (W)	0.3
Mean Coefficient of Conservatism (C)	4.8
Floristic Quality Index (FQI)	31.9

Table 7-2a. Herbaceous Species Upland Vegetative Survey Data - August 2016

Eagle Mine LLC

							Herbaceous Species Percent Cover Per 1m Quadrat																								
Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Plot 1	Plot 2	Plot 3	Plot 11	Plot 12	Plot 13	Plot 14	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29	Plot 30	Plot 31							
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes																	5	15							
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes	5								5				5			5	15								
<i>Agrostis scabra</i>	Ticklegrass	4	FAC	0	Herb	Yes			5																						
<i>Amelanchier</i> sp.	Serviceberry	NA	NA	NA	S/T	Yes									5		15			5											
<i>Avenella flexuosa</i>	Hair Grass	6	UPL	5	Herb	Yes		5						5	5	5		5	5		10			5							
<i>Carex lucorum</i>	Blue Ridge Sedge	4	UPL	5	Herb	Yes				5																					
<i>Carex lupulina</i>	Hop Sedge	4	OBL	5	Herb	Yes																									
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes														50											
<i>Carex trisperma</i>	Three-seeded Sedge	9	OBL	-5	Herb	Yes											5														
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes														5											
<i>Clintonia borealis</i>	Bluebead Lily	5	FAC	0	Herb	Yes											5			5	5	5									
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes											5			5		5	5								
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes											5			5		5	10								
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes		5	55						5						15										
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes	15	30						15				10													
<i>Festuca saximontana</i>	Rocky Mountain Fescue	6	UPL	5	Herb	Yes							30																		
<i>Gaultheria hispida</i>	Snowberry	8	FACW	-3	Herb	Yes														10											
<i>Gaultheria procumbens</i>	Wintergreen	5	FACU	3	Herb	Yes	15				25	5			5	5	10		5	5		10									
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes											5														
<i>Linnaea borealis</i>	Twinflower	6	FAC	0	Herb	Yes	5																								
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes	5	5				5											5	5							
<i>Melampyrum lineare</i>	Cow Weat	6	FACU	3	Herb	Yes	5																								
<i>Oryzopsis asperifolia</i>	Roughleaf Ricegrass	6	UPL	5	Herb	Yes	5																								
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes									5																
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes									5	5						5	5								
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes	80	10		5	25			80	55	75		15	80		55	25	5	70							
<i>Quercus rubra</i>	Red oak	5	FACU	3	Tree	Yes																		5							
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes											20			10											
<i>Trientalis borealis</i>	Starflower	5	FAC	0	Herb	Yes											5				5										
<i>Trifolium repens</i>	White Clover	0	FACU	3	Herb	No							5																		
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes	10	5	15	85		60		60	20		25	15	10				10	10							
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes	5	30			50	5				5	25					30	10								
NA	Duff / Bare Soil	NA	NA	NA	NA	NA				5						70		5	80		55	50		50							
NA	Lichen	NA	NA	NA	Lichen	Yes		40		10				5				5													
NA	Moss	NA	NA	NA	Moss	Yes	5				85	95		5		20	40	85	5	20	10	30	5	25							

Total Number of Species	10	7	3	3	3	4	2	4	9	5	11	4	5	9	5	9	10	4
Total Number of Native Species	10	7	3	3	3	4	1	4	9	5	11	4	5	9	5	9	10	4
Mean Wetland Indicator Value (W)	1.9	2.6	2.7	3.7	1.0	0.8	4.0	4.0	2.8	2.2	-1.4	4.0	2.8	-2.0	2.6	0.0	0.3	2.8
Mean Coefficient of Conservatism (C)	4.3	4.1	4.0	2.7	3.0	4.3	3.0	4.3	2.8	3.4	5.5	4.3	3.2	5.4	4.0	3.4	3.4	3.5
Floristic Quality Index (FQI)	13.6	11.0	6.9	4.6	5.2	8.5	4.2	8.5	8.3	7.6	18.4	8.5	7.2	16.3	8.9	10.3	10.8	7.0

Table 7-2b. Woody Species Upland Vegetative Survey Data - August 2016

Eagle Mine LLC

							Woody Species Stems Per Permanent 30' Foot Radius Plot																										
Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native	Plot 1	Plot 2	Plot 3	Plot 11	Plot 12	Plot 13	Plot 14	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29	Plot 30	Plot 31									
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes	11	1			1				2	1	5	2	6		1	13	19	22									
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes	39				6			9	1	6	36	6	16	91	13	19	8	21									
<i>Alnus incana</i>	Speckled Alder	5	FACW	-3	Shrub	Yes														43													
<i>Amelanchier sp.</i>	Serviceberry	N/A	N/A	N/A	S/T	Yes	7				4			1	2	3	7			8	6	6		2									
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes										1				1	1	1	1	1									
<i>Corylus cornuta</i>	Beaked Hazelnut	5	UPL	5	Shrub	Yes																		1									
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes						6					1			7													
<i>Nemopanthus mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes											11			2		6											
<i>Picea glauca</i>	White Spruce	3	FACU	3	Tree	Yes									1																		
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes	15	31			27	63		27		1	26	10		82	1	17		17									
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes	17	2	16	34	24	31		10	34	19		11	7		7			11									
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes															8												
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes	2				1			3	8	1	2	4	5		2	4	3										
<i>Populus tremuloides</i>	Quaking Aspen	1	FAC	0	Tree	Yes									44				2		52												
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes										7					2												
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes									26	18		3			23			3									
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes															1												
<i>Salix humilis</i>	Prairie Willow	4	FACU	3	Shrub	Yes	6	1			1			1																			
Total Number of Species							7	4	1	1	7	3	0	6	8	9	7	6	5	7	12	7	5	7									
Total Number of Native Species							7	4	1	1	7	3	0	6	8	9	7	6	5	7	12	7	5	7									
Mean Wetland Indicator Value (W)							0.4	0.0	3.0	3.0	0.4	-1.0	N/A	1.0	1.1	1.0	-1.6	0.5	0.6	-1.6	1.3	-0.7	1.6	0.4									
Mean Coefficient of Conservatism (C)							3.1	4.5	5.0	5.0	3.1	5.3	N/A	3.2	2.3	2.8	3.6	3.3	2.6	3.7	2.8	3.1	2.8	2.7									
Floristic Quality Index (FQI)							8.3	9.0	5.0	5.0	8.3	9.2	N/A	7.8	6.4	8.3	9.4	8.2	5.8	9.8	9.8	8.3	6.3	7.2									

Table 7-2c. Overall Upland Vegetative Survey Data - August 2016
Eagle Mine LLC

Scientific Name	Common Name	C	Wet Code	Wet #	Growth Habit	Native
<i>Abies balsamea</i>	Balsam Fir	3	FACW	-3	Tree	Yes
<i>Acer rubrum</i>	Red Maple	1	FAC	0	Tree	Yes
<i>Agrostis scabra</i>	Ticklegrass	4	FAC	0	Herb	Yes
<i>Alnus incana</i>	Speckled Alder	5	FACW	-3	Shrub	Yes
<i>Amelanchier</i> sp.	Serviceberry	NA	NA	NA	S/T	Yes
<i>Avenella flexuosa</i>	Hair-grass	6	UPL	5	Herb	Yes
<i>Betula papyrifera</i>	Paper Birch	2	FACU	3	Tree	Yes
<i>Carex lucorum</i>	Blue Ridge Sedge	4	UPL	5	Herb	Yes
<i>Carex lupulina</i>	Hop Sedge	4	OBL	5	Herb	Yes
<i>Carex stricta</i>	Tussock Sedge	4	OBL	-5	Herb	Yes
<i>Carex trisperma</i>	Three-seeded Sedge	9	OBL	-5	Herb	Yes
<i>Chamaedaphne calyculata</i>	Leatherleaf	8	OBL	-5	Shrub	Yes
<i>Clintonia borealis</i>	Blue Beadlily	5	FAC	0	Herb	Yes
<i>Coptis trifolia</i>	Goldthread	5	FACW	-3	Herb	Yes
<i>Cornus canadensis</i>	Bunchberry	6	FAC	0	Herb	Yes
<i>Corylus cornuta</i>	Beaked Hazelnut	5	UPL	5	Shrub	Yes
<i>Danthonia spicata</i>	Poverty Grass	4	UPL	5	Herb	Yes
<i>Epigaea repens</i>	Trailing Arbutus	7	UPL	5	Herb	Yes
<i>Festuca saximontana</i>	Rocky Mountain Fescue	6	UPL	5	Herb	Yes
<i>Gaultheria hispida</i>	Snowberry	8	FACW	-3	Herb	Yes
<i>Gaultheria procumbens</i>	Wintergreen	5	FACU	3	Herb	Yes
<i>Kalmia polifolia</i>	Bog Laurel	10	OBL	-5	Shrub	Yes
<i>Larix laricina</i>	Tamarack	5	FACW	-3	Tree	Yes
<i>Linnaea borealis</i>	Twinflower	6	FAC	0	Herb	Yes
<i>Maianthemum canadense</i>	Canada Mayflower	4	FAC	0	Herb	Yes
<i>Melampyrum lineare</i>	Cow Weat	6	FACU	3	Herb	Yes
<i>Nemopanthus mucronatus</i>	Mountain Holly	7	OBL	-5	Shrub	Yes
<i>Oryzopsis asperifolia</i>	Roughleaf Ricegrass	6	UPL	5	Herb	Yes
<i>Picea glauca</i>	White Spruce	3	FACU	3	Tree	Yes
<i>Picea mariana</i>	Black Spruce	6	FACW	-3	Tree	Yes
<i>Pinus banksiana</i>	Jack Pine	5	FACU	3	Tree	Yes
<i>Pinus resinosa</i>	Red Pine	6	FACU	3	Tree	Yes
<i>Pinus strobus</i>	White Pine	3	FACU	3	Tree	Yes
<i>Prunus pensylvanica</i>	Bird Cherry	3	FACU	3	Tree	Yes
<i>Prunus serotina</i>	Black Cherry	2	FACU	3	Tree	Yes
<i>Prunus virginiana</i>	Choke Cherry	2	FACU	3	Shrub	Yes
<i>Pteridium aquilinum</i>	Bracken Fern	0	FACU	3	Herb	Yes
<i>Quercus rubra</i>	Red oak	5	FACU	3	Tree	Yes
<i>Rhododendron groenlandicum</i>	Labrador Tea	8	OBL	-5	Shrub	Yes
<i>Salix humilis</i>	Prairie Willow	4	FACU	3	Shrub	Yes
<i>Trifolium repens</i>	White Clover	0	FACU	3	Herb	No
<i>Trientalis borealis</i>	Starflower	5	FAC	0	Herb	Yes
<i>Vaccinium angustifolium</i>	Low Sweet Blueberry	4	FACU	3	Shrub	Yes
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	4	FACW	-3	Herb	Yes

Total Number of Species	44
Total Number of Native Species	43
Mean Wetland Indicator Value (W)	0.8
Mean Coefficient of Conservatism (C)	4.8
Floristic Quality Index (FQI)	31.6

APPENDIX C:
MICHIGAN NATURAL FEATURES INVENTORY REPORT

John R. Vigna
King & MacGregor Environmental, Inc.
2520 Woodmeadow Drive SE
Grand Rapids, MI 49546
jvigna@king-macgregor.com

December 4, 2013

**Re: Rare Species Review #1313 – Eagle Mine Ecological Survey, Michigamme Township,
Marquette County, Michigan, T50N, R29W, Section 12.**

John:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.



MSU EXTENSION

**Michigan Natural
Features Inventory**

PO Box 13036
Lansing MI 48901

(517) 373-1552
Fax (517) 373-9566

mnfi.anr.msu.edu

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, ...fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

According to the natural heritage database, legally protected species have been known to occur within 1.5 miles of the proposed project site. Therefore, it is **likely** that listed species will be negatively impacted. Keep in mind that MNFI cannot fully assess potential impacts without an on-site survey. MNFI offers more detailed reviews including field surveys which I would be happy to discuss with you.

Sincerely,

Michael Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

Table 1: Legally protected species within 1.5 miles of #1315

SNAME	SCOMNAME	FIRSTOBS	LASTOBS	USESA	SPROT	GRANK	SRANK	ELCAT
<i>Gentiana linearis</i>	Narrow-leaved gentian		1959-07-21		T	G4G5	S2	Plant
<i>Gentiana linearis</i>	Narrow-leaved gentian	1952	1952-07-28		T	G4G5	S2	Plant
<i>Gentiana linearis</i>	Narrow-leaved gentian	2004-08-21	2005-09-09		T	G4G5	S2	Plant

Table 2: Special Concern Species and Rare Natural Communities within 1.5 miles of #1315

SNAME	SCOMNAME	FIRSTOBS	LASTOBS	USESA	SPROT	GRANK	SRANK	ELCAT
<i>Falci pennis canadensis</i>	Spruce grouse	2004-09-05	2004-09-05		SC	G5	S2S3	Animal

Comments for Rare Species Review #1313: Legally protected species have been documented within 1.5 miles of the proposed project. Therefore, it is **likely** that rare natural resources will be impacted by this project. Keep in mind that MNFI cannot fully assess potential impacts without conducting an on-site field survey.

Populations of **narrow-leaved gentian** (*Gentian linearis*) in Michigan are located primarily in areas with soils derived from granite and at least somewhat acidic. This species thrives in wet meadows dominated by sedges and grasses, typically located along river or stream margins and kettle-holes. Narrow-leaved gentian has also been found along sandy lakeshores and bog margins, and can colonize moist disturbed ground such as borrow pits and depressions along road cuts. Elsewhere in its range, this species has a similar close association with granitic soils, occurring in bogs, springy areas, wet meadows, and shores. *G. linearis* flowers from about mid-July to August and possibly as late as early September. Flowers and fruit may occur simultaneously. Management notes: This gentian is a wetland species undoubtedly sensitive to hydrological alterations, and requiring protection from both flooding and excessive drainage. Please see [MNFI's Rare Species Explorer](#) for further information on this and other rare natural features.

Note: If a State listed species occurs at a project site, and you think you need an endangered species permit please contact: Lori Sargent, Nongame Wildlife Biologist, Wildlife Division, Michigan Department of Natural Resources, P.O. Box 30444, Lansing, MI 48909, 517-373-9418, or SargentL@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Barb Hosler, Endangered Species Program, U.S. Fish and Wildlife Service, East Lansing office, 517-351-6326, or Barbara_Hosler@fws.gov.

Codes to accompany Tables 1 & 2

State Protection Status Code Definitions (SPROT)

E: Endangered

T: Threatened

SC: Special concern

Global Heritage Status Rank Definitions (GRANK)

The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Q: Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)

The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.

S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = apparently secure in state, with many occurrences.

S5 = demonstrably secure in state and essentially ineradicable under present conditions.

SX = apparently extirpated from state.

**APPENDIX D:
NARROW LEAVED GENTIAN PHOTOGRAPHS**

(All photos taken during August, 2016)



Robust population of NLG North of Yellow Dog River



Individuals north bank of the Yellow Dog River



Typical NLG Specimen



NLG North of Yellow Dog River



NLG East side of Salmon Trout River



NLG East side of Salmon Trout River

APPENDIX E:
WETLAND VEGETATIVE SURVEY PHOTOGRAPHS

(All photos taken during June, 2016)

Photo 1. Plot 1W, north view



Photo 2. Plot 1W, south view



Photo 3. Plot 1W, quadrat view



Photo 4. Plot 6W, north view



Photo 5. Plot 6W, south view



Photo 6. Plot 6W, quadrat view



Photo 7. Plot 7W, north view



Photo 8. Plot 7W, south view



Photo 9. Plot 7W, quadrat view



Photo 10. Plot 8W, north view



Photo 11. Plot 8W, south view



Photo 12. Plot 8W, quadrat view



Photo 13. Plot 9W, north view



Photo 14. Plot 9W, south view



Photo 15. Plot 9W, quadrat view



Photo 16. Plot 10W, north view



Photo 17. Plot 10W, south view



Photo 18. Plot 10W, quadrat view



Photo 19. Plot 13W, north view



Photo 20. Plot 13W, south view



Photo 21. Plot 13W, quadrat view



Photo 22. Plot 26W, north view



Photo 23. Plot 26W, south view



Photo 24. Plot 26W, quadrat view



**APPENDIX F:
UPLAND VEGETATIVE SURVEY PHOTOGRAPHS**

(All photos taken during August, 2016)

Photo 1. Plot 1, north view



Photo 2. Plot 1, south view



Photo 3. Plot 1, quadrat view



Photo 4. Plot 2, north view



Photo 5. Plot 2, south view



Photo 6. Plot 2, quadrat view



Photo 7 Plot 3, north view

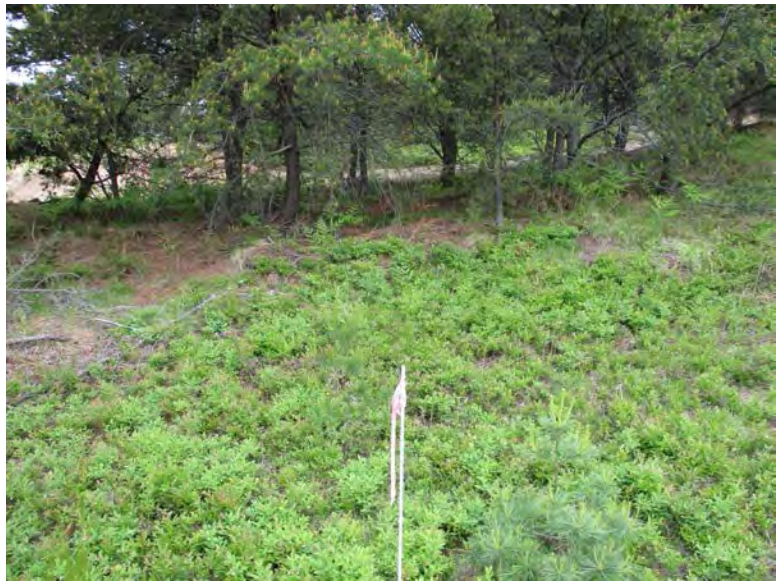


Photo 8 Plot 3, south view



Photo 9 Plot 3, quadrat view



Photo 10. Plot 11, north view



Photo 11. Plot 11, south view

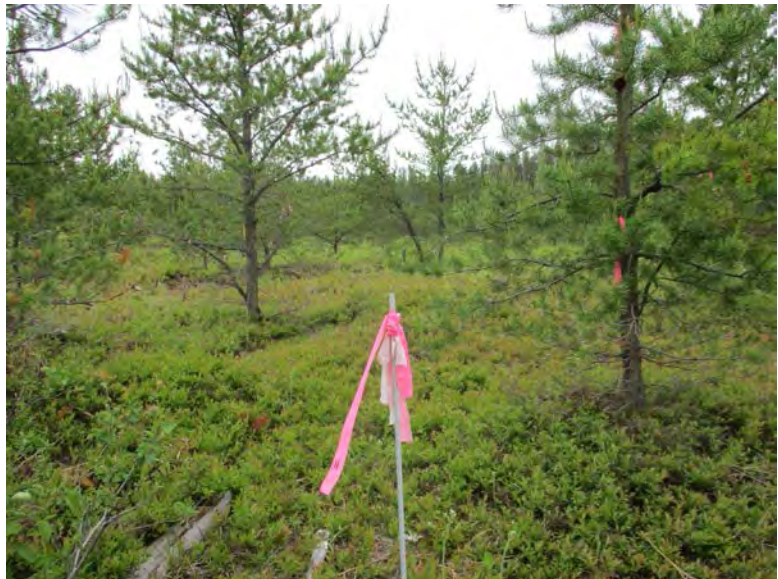


Photo 12. Plot 11, quadrat view



Photo 13. Plot 12, north view



Photo 14. Plot 12, south view



Photo 15. Plot 12, quadrat view



Photo 16. Plot 13, north view



Photo 17. Plot 13, south view



Photo 18. Plot 13, quadrat view



Photo 19. Plot 14, north view



Photo 20. Plot 14, south view

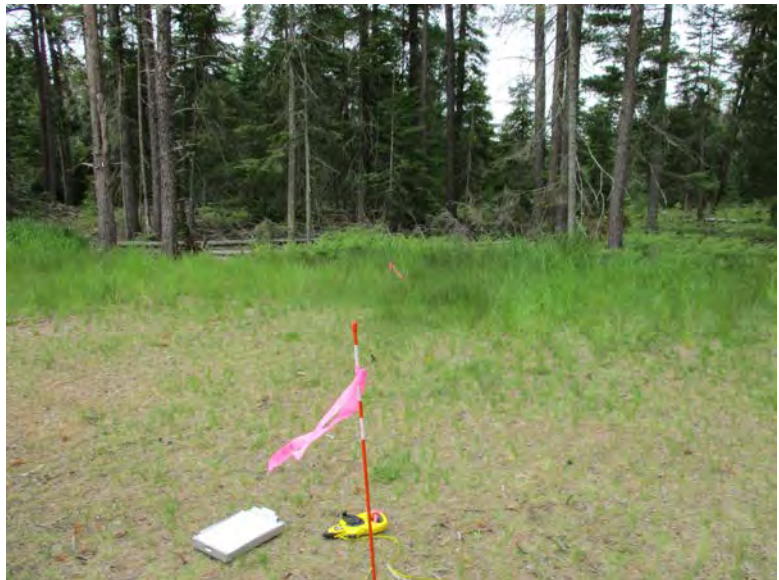


Photo 21. Plot 14, quadrat view



Photo 22. Plot 21, north view



Photo 23. Plot 21, south view



Photo 24. Plot 21, quadrat view



Photo 25. Plot 22, north view



Photo 26. Plot 22, south view



Photo 27. Plot 22, quadrat view



Photo 28. Plot 23, north view



Photo 29. Plot 23, south view



Photo 30. Plot 23, quadrat view



Photo 31. Plot 24, north view



Photo 32. Plot 24, south view



Photo 33. Plot 24, quadrat view



Photo 34. Plot 25, north view



Photo 35. Plot 25, south view



Photo 36. Plot 25, quadrat view



Photo 37. Plot 26, north view



Photo 38. Plot 26, south view



Photo 39. Plot 26, quadrat view



Photo 40. Plot 27, north view



Photo 41. Plot 27, south view



Photo 42. Plot 27, quadrat view



Photo 43. Plot 28, north view



Photo 44. Plot 28, south view



Photo 45. Plot 28, quadrat view



Photo 46. Plot 29, north view



Photo 47. Plot 29, south view



Photo 48. Plot 29, quadrat view



Photo 49 Plot 30, north View



Photo 50 Plot 30, south View



Photo 51 Plot 30, quadrat view



Photo 52. Plot 31, north view



Photo 53. Plot 31, south view



Photo 54. Plot 31, quadrat view

