Appendix A.4:
Zavoral Mining Project Site Tree Inventory

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Zavoral Mining Project Site

Tree Inventory
Scandia, Washington County, Minnesota
March 30, 2011

Client:

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Critical Connections
Ecological Services, Inc.

Introduction

Critical Connections Ecological Services, Inc. (CCES) was retained by Tiller Corporation (Tiller) to conduct a tree inventory for approximately sixty acres of land located within the proposed Zavoral Mining and Reclamation Project Site that is located in the City of Scandia east of Highways 95 and north of Quinnell Avenue. The proposed Zavoral Mining and Reclamation Project Site is sixty-four acres in total size and includes approximately fifty-six acres of inactive aggregate mining areas and eight acres of agricultural land and forest. At the request of Tiller, CCES completed this tree inventory to compliment other natural resource studies that have been completed for the site as part of a comprehensive environmental review of the proposed Project and to also provide valuable information for planning and engineering purposes. The tree inventory for this project was started in the fall of 2010 and was completed in February 2011. In total CCES estimates there to be somewhere in the range of 2,500 to 3,000 significant trees[1] located within the proposed mining limits.

For purposes of this tree inventory CCES divided the portion of the Zavoral property that is proposed to be mined into two general areas and inventoried the significant trees in each of these areas using two different methods. The first area that was inventoried (Area A) included treed areas on the site where mining had not previously taken place. The second area that was inventoried (Area B) included all other areas within the proposed mining limits where past mining and agricultural activities had previously taken place.

Area A is located within the south and southeastern parts of the proposed mining limits and includes a part of the property where mining had not taken place in the past. Over the years trees growing in Area A have influenced the natural successional change from what was a shrubland/woodland just sixty to seventy years ago to the current forest system that is there today. Area A connects to part of the larger contiguous forest of the St. Croix River valley and is a mix of mature deciduous hardwood and coniferous trees. In general trees located within Area A range in size from young saplings to large mature overstory trees. Significant trees that dominate the overstory canopy of Area A include mainly Red Oak (*Quercus rubra*), Ironwood (*Ostrya virginiana*), and Paper Birch (*Betula papyrifera*) with several other deciduous and coniferous trees also present but in lesser densities.

The other area inventoried by CCES for significant trees, Area B, is located in the remainder of the proposed mining limits which now consists of an inactive mine and areas of former agricultural land. Existing stands of trees growing within nearly all of Area B have developed from volunteers which are composed predominantly of White Pine (*Pinus strobus*), Eastern Cottonwood (*Populus deltoides*), and Eastern Red Cedar (*Juniper virginiana*) with an herbaceous layer that is dominated by non-native plants. It was evident from historical air photo review utilized for this project that throughout Area B agricultural activity was predominant prior to 1953 and mining activity and stockpile removal was present from 1953 to the early 2000's. The majority of significant trees located in Area B generally

[1] For this tree inventory a significant tree, as defined by the City's Tree Preservation Ordinance, is any healthy tree measuring a minimum of six (6) caliper inches for all primary deciduous trees, a minimum of twenty (20) caliper inches for all secondary deciduous trees or a minimum of twelve (12) feet in height for all native coniferous trees.

range in age from about ten years old to approximately 40 years old and range in height from 6' to 40' depending on when previous land altering activities had ceased in the area. The tree inventory completed within Area B involved aerial photo interpretation followed by ground surveys to estimate the total number of significant trees along with recording the different tree species encountered and their range in height.

As part of this tree inventory CCES included a historical air photo review of the Zavoral property to determine the changes in tree cover at the site over time. **Appendix A** includes figures for the historical air photos of the Zavoral Site that were used in preparation of this report. These historical air photos depict the changes in land use over the past seventy years and the influence these changes in land use have had on the vegetation present today. Over the past seventy years the Zavoral property was utilized for mainly agricultural and mining land uses. With its proximity to the St. Croix River it is likely that where timber resources were available on-site much of the Zavoral Property was also logged at one time in the past.

This tree inventory provides detailed current as well as historical information regarding the significant trees that are present within the proposed Project area. The results of this tree inventory will be useful to Tiller, the Zavoral family and the City of Scandia to assess the impacts to the significant trees within the proposed Project area.

Methods

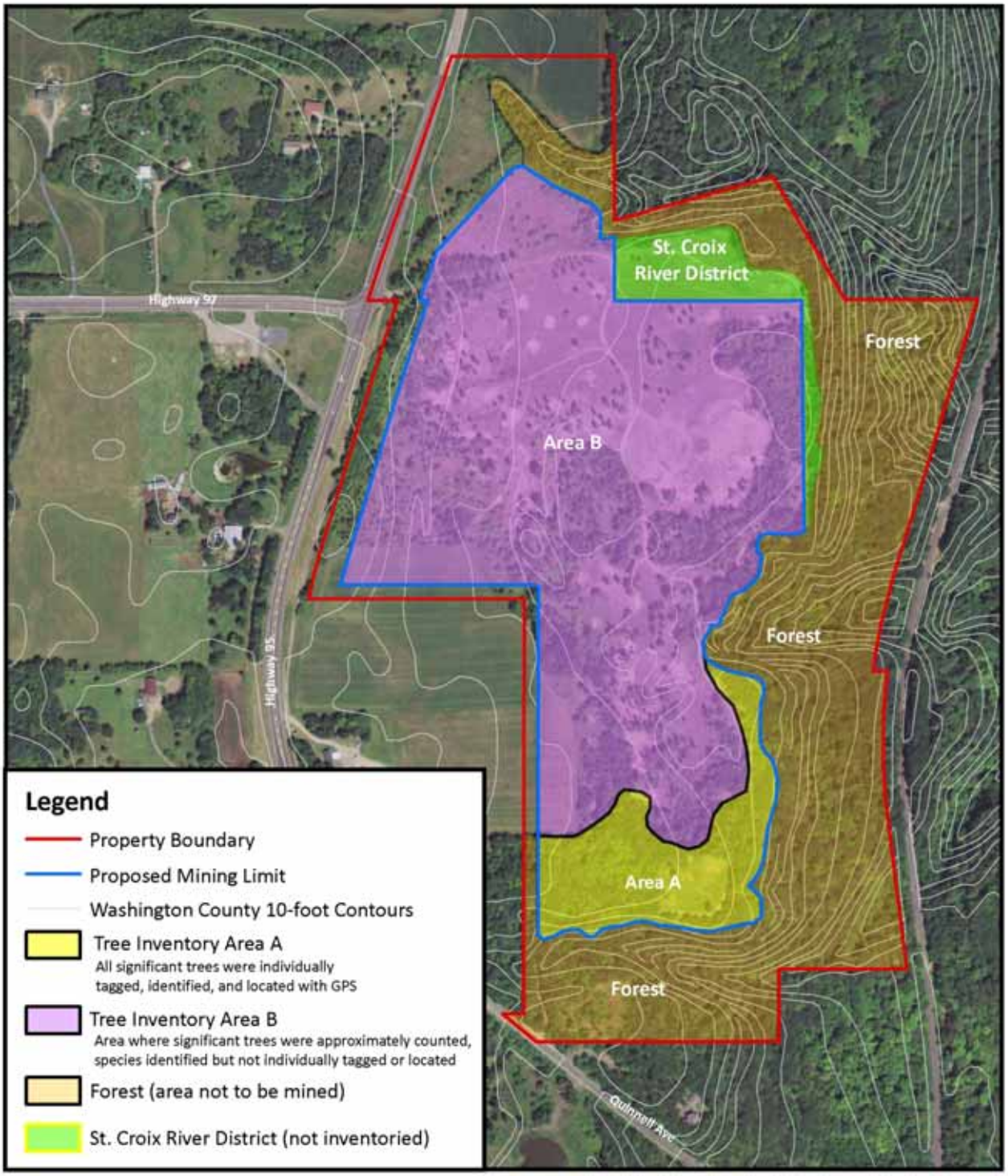
Although City of Scandia Ordinances do not require a tree inventory or tree replacement for mining and reclamation activities, the City's Tree Preservation Ordinance along with two methods developed by CCES were used to estimate the total number of significant trees located within the proposed sixty-four acre mining and reclamation area. Since previous agricultural production and mining had taken place over much of the property located within the proposed mining limits, CCES delineated the proposed mining limits into two distinct areas to survey: Area A (area of existing forest where no mining had previously occurred) and Area B (area of volunteer trees where agricultural production and mining activity had previously occurred). Tree data for this type of inventory was collected in two different ways.

The method for inventorying significant trees within Area A involved tagging, identifying, and locating with a GPS unit each significant tree. The method for inventorying significant trees located within Area B involved utilizing aerial photo interpretation and extensive ground surveys to count approximately the total number of significant trees. Data collected for significant trees in Area B included recording the name of each different tree species encountered as well as their general range in size. **Figure 1** on Page 4 depicts the boundaries of the two different tree inventory areas within the proposed mining limits where significant trees were either individually surveyed for or visually counted. The few trees that were located within the St. Croix River District and USA Scenic Easement area (depicted by a green polygon on the figure) were not inventoried since this area will only be included as part of reclamation.

For this tree inventory a significant tree, as defined by the City's Tree Preservation Ordinance, is any healthy tree measuring a minimum of six (6) caliper inches for all primary deciduous trees, a minimum of twenty (20) caliper inches for all secondary deciduous trees or a minimum of twelve (12) feet in height for all native coniferous trees. The trunk diameter of deciduous trees is measured at breast height or 4.5 feet up from the ground. This measurement is referred to as *diameter at breast height* (DBH) throughout the report. The height of coniferous trees that were located within the Project area was visually estimated in order to determine their general range in height.

By City definition the types of significant trees to be included in a tree inventory include all primary deciduous trees, secondary deciduous trees, and native coniferous trees. According to City ordinance a primary deciduous tree is a native deciduous tree that includes but is not limited to American Mountain Ash (*Sorbus americana*), Showy Mountain Ash (*Sorbus decora*), Black Ash (*Fraxinus nigra*), White Ash (*Fraxinus americana*), American Basswood (*Tilia americana*), Paper Birch (*Betula papyrifera*), Yellow Birch (*Betula alleghaniensis*), Black Walnut (*Juglans nigra*), Butternut (*Juglans cinerea*), Blue Beech (*Carpinus caroliniana*), Black Cherry (*Prunus serotina*), Pin Cherry (*Prunus pensylvanica*), American Elm (*Ulmus americana*), Bitternut Hickory (*Carya cordiformis*), Shagbark Hickory (*Carya ovata*), Hackberry (*Celtis occidentalis*), Ironwood (*Ostrya virginiana*), Sugar Maple (*Acer saccharum*), Black Maple (*Acer nigrum*), Red Maple (*Acer rubrum*), Mountain Maple (*Acer spicatum*), Silver Maple (*Acer saccharinum*), Black Oak (*Quercus velutina*), Bur Oak (*Quercus macrocarpa*), Chestnut Oak (*Quercus muehlenbergii*), Northern Pin Oak (*Quercus ellipsoidalis*), Northern Red Oak (*Quercus rubra*), and White Oak (*Quercus alba*). By definition a secondary deciduous trees are native deciduous trees that are Quaking Aspen (*Populus tremuloides*), Box Elder (*Acer negundo*), Green Ash (*Fraxinus pennsylvanica*), and Eastern Cottonwood (*Populus deltoides*). Native coniferous trees by definition includes, but is not limited to White Pine (*Pinus strobus*), Jack Pine (*Pinus banksiana*), and Tamarack (*Larix laricina*).

Non-native trees that occur on-site were not included in any tree inventory totals. Non-native trees are considered by the City to be invasive tree species and are not required to be inventoried. The only non-native trees that were encountered on-site were Scotch Pine (*Pinus sylvestris*) and Siberian Elm (*Ulmus pumila*).



Zavoral Mining and Reclamation Project
Tree Inventory Site Map

0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Figure 1

Results

Tree Inventory *Area A*

Of the sixty-four acres within the Project area approximately eight acres has never been mined and currently consists of active agricultural land and part of a mixed deciduous forest that is dominated by Red Oak, Ironwood, and Paper Birch along with several other types of native deciduous and coniferous trees. It is within this forested area that the individual significant trees were tagged, identified, and located with GPS.

This part of the property is located in the southern portion of the site and is positioned on somewhat level to sloping topography that is adjacent to steep forested slopes that include two ravine systems to the south and east. The specific area inventoried is part of the White Pine Hardwood Forest that runs contiguously off-site to the south, west, and east. Approximately 50% of the significant trees inventoried in this area include three tree species: Red Oak, Ironwood, and Paper Birch. The remaining 50% of significant trees inventoried included a total of fifteen different species.

Within Area A, 979 significant trees of eighteen different species were documented and inventoried which totaled 10,152 caliper inches. Of all of the trees in this survey area, the largest mature trees tended to be the Red and White oaks with the occasional larger Basswood, Black Cherry, or Paper Birch which together comprise the majority of the overall canopy. Deciduous trees like Ironwood, Paper Birch, and Bitternut Hickory contribute less to the canopy and sub canopy, but were also common as saplings and young trees in the shrub layer within Area A.

From an ecological evaluation of Area A by CCES and based on the Minnesota's Department of Natural Resources (DNR) Natural Heritage's Element Occurrence Ranking (EOR) Guidelines, Area A would be considered a moderate quality forest with invasive species present but not dominant (Rank C). EOR Guidelines describe the manner in which occurrences of specific, Minnesota natural communities are ranked by ecologists. On a continuum of "A" through "D", an "A" rank indicates an excellent quality natural community, while "D" indicates a poor quality natural community. To assess quality, ecologists primarily consider the presence or absence of unnatural human-induced disturbances such as logging, plowing, overgrazing, and development. These guidelines were written by Minnesota Natural Heritage Program ecologists and are based primarily on field experience. The guidelines are designed to be used by experienced ecologists who have some knowledge of the community across its entire range in the state.

By definition of the DNR's EOR Guidelines a moderate quality ranking (C-rank on a level of A to D) is typical of areas with obvious past disturbance but is still clearly recognizable as a native community and is not dominated by weedy species in any layer. Plant communities that are of A-rank are of highest natural community quality, show no disturbances and still have their natural processes intact. Plant communities that are of B-rank are defined as being a good quality natural community that still has natural processes intact, but can show signs of past human impacts, and also have low levels of exotics.

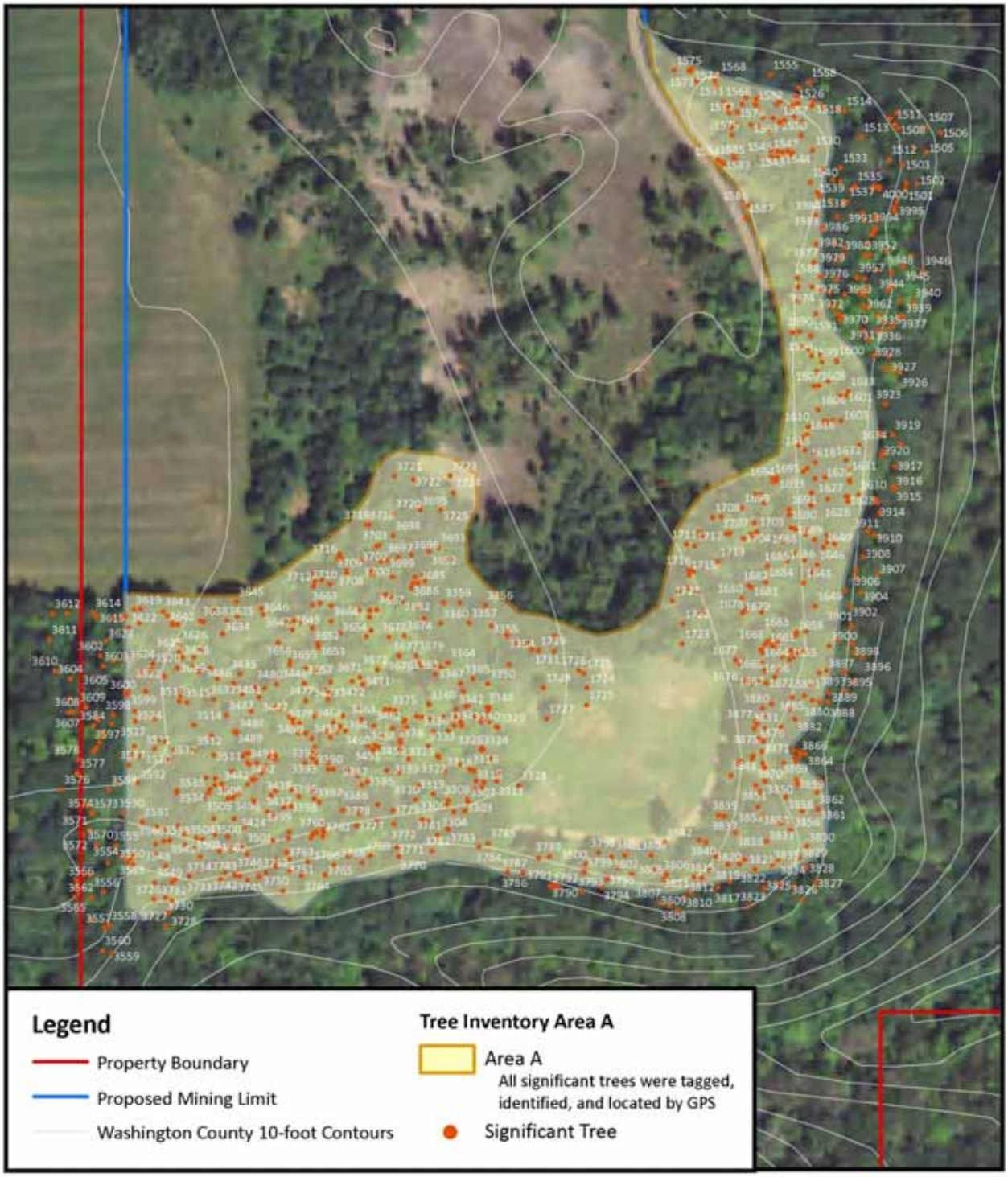
Plant communities that are of a D-rank are in poor condition and may include some natives but are dominated by non-natives and/or are widely disturbed and altered.

This forest community in the absence of disturbance such as fire or wind throw will tend to succeed to a more shade tolerant forest community where trees species such as Bitternut Hickory, Black Cherry, Red Maple, Basswood, and Ironwood will become the dominant overstory trees. This is due primarily to their moderate tolerance to shading from a partially closed canopy and a lack of past disturbance within this area. However, this successional process to a more shade tolerant community takes many generations and pockets of oaks may persist within the future plant community, especially along forest edges and gaps in the canopy where more available sunlight will occur.

One natural occurrence that exists in this forest community that may have a strong influence on future tree succession is the presence of the invasive shrub/understory tree Common Buckthorn (*Rhamnus cathartica*). Common Buckthorn is found throughout much of Area A with in many areas it being the dominant plant in the shrub layer. Some portions of this forest have become established with moderate levels of Common Buckthorn whereas adjacent forested areas to the south and east on the steeper slopes have a lower density of Common Buckthorn present. When Common Buckthorn becomes heavily infested within a forest system it has the ability to greatly affect seed germination of other plants, establishment of tree and shrub seedlings, and can aggressively compete with the forest's native trees, shrubs, and herbaceous layer plants for available sunlight, water, and nutrients.

Figure 2 on the following page is a close-up map depicting the area on the property where Area A of the tree inventory is located. In general this area is located at the southern limits of the proposed mining area. Each significant tree on this map is denoted by a small dot with its corresponding tree tag number next to it. Trees shown on this map as being outside of the western property boundary are not included in any tree total calculations for this report but were identified and located.

A complete list of significant trees located within Area A is found in **Appendix B** of this report. The tree list includes each tagged tree's number, common name, scientific name, size of DBH as measured in caliper inches, and any general notes regarding concerns for health or structure.



Zavoral Mining and Reclamation Project
Tree Inventory Area A Map

0 37.5 75 150 225 300 Feet

NORTH

Critical Connections Ecological Services, Inc.

Figure 2

Table 1 below depicts the tree species inventoried on-site within Area A of the property and includes the number of significant trees for each species expressed in total number and percent of overall trees inventoried. This table also lists for each significant tree species their caliper inches totals and percents, average DBH (Diameter at Breast Height measured in caliper inches), range of DBH, and largest DBH for each tree species. Trees located off-site are not included in the tree totals within this report.

Table1.

Scientific Name	Common Name	No. of Trees Tagged	% of Trees Tagged	Total Caliper Inches	% of Total Caliper inches	Average DBH	Range of DBH	Largest DBH
Quercus rubra	Red Oak	202	20.63	2696	26.56	13.34	6-29"	29"
Ostrya virginiana	Ironwood	162	16.54	1145	11.28	7.07	6-14"	14"
Betula papyrifera	Paper Birch	131	13.38	1045	10.29	7.98	6-16"	16"
Carya cordiformis	Bitternut Hickory	97	9.9	792	7.8	8.16	6-15"	15"
Tilia americana	Basswood	97	9.9	1010	9.95	10.41	6-20"	20"
Quercus alba	White Oak	68	6.95	1148	11.31	16.88	7-30"	30"
Pinus strobus	White Pine	55	5.63	655	6.45	11.9	3-40"	40"
Prunus serotina	Black Cherry	50	5.11	511	5.03	10.22	6-14"	14"
Acer rubrum	Red Maple	38	3.88	350	3.45	9.21	6-20"	20"
Ulmus americana	American Elm	25	2.55	233	2.3	9.32	6-15"	15"
Celtis occidentalis	Hackberry	17	1.74	161	1.59	9.47	6-20"	20"
Juglans cinerea	Butternut	11	1.12	99	0.98	9	6-15"	15"
Acer saccharum	Sugar Maple	9	0.92	73	0.72	8.11	6-15"	15"
Populus deltoides	Cottonwood	7	0.72	152	1.5	21.7	20-35"	35"
Fraxinus nigra	Black Ash	3	0.31	20	0.19	6.67	6-7"	7"
Fraxinus pennsylvanica	Green Ash	3	0.31	28	0.27	9.33	6-12"	12"
Juniperus virginiana	Red Cedar	3	0.31	14	0.14	4.67	4-6"	6"
Quercus macrocarpa	Bur Oak	1	0.1	20	0.19	20	20"	20"
Totals		**979**	**100.00%**	**10152**	**100.00%**	**10.38**	**3-40"**	**40"**

Tree Inventory *Area B*

Within much of the proposed mining limit approximately fifty-six of sixty-four acres had been farmed and subsequently mined sometime in the past. It is within this previously farmed and subsequently mined area that significant trees were only visually counted and were not included in any individual tree list or located with GPS. Area B was broken into seven separate sub areas B1 to B7. Based on aerial photo interpretation of tree densities the seven sub areas that comprise Area B were created to simplify inventorying significant trees located within this fifty-six acre area. **Figure 3** on the second following page depicts areas B1 to B7 that were delineated within Area B. Areas within the property that did not have any trees present or areas only proposed for reclamation were not included in the ground survey of Area B.

The plant communities that have established within Area B are a result of human disturbance from prior agricultural and mining activities and therefore are not considered to be natural plant communities. The (EOR) Guidelines used to assess natural quality ranking for Area A was used to determine the ranking for Area B. Based on EOR Guidelines, CCES determined that the plant communities established in Area B would be listed as non-native, altered and disturbed communities and therefore are given a non-native ranking of either NN or NA. Non-native plant communities ranked as NN are a plant community that does not qualify for natural quality ranking and is confirmed as being a semi-natural community. Non-native plant communities ranked as NA are also a plant community that does not qualify for natural quality ranking but is confirmed to have some native species present within a non-native community. All of the sub-areas of Area B would have a NA natural quality modifier to describe its ranking due to the presence of native trees within each area.

Early survey work in 2010 indicated that much of these previously farmed and subsequently mined areas were populated by trees with smaller height and DBH and were typically of three different species that include: Eastern Cottonwood, White Pine, and Eastern Red Cedar trees. These three tree species have become established throughout the area and now occupy small pockets of deciduous and coniferous woodlands. These tree species are also found scattered throughout in areas of partially open grassland.

For this part of the tree inventory CCES did not tag or record individual tree names and sizes for each significant tree encountered. To adequately survey these areas, CCES first conducted an aerial photo interpretation of the areas followed by extensive ground surveys to count approximately the number of significant trees within each of the seven sub areas of Area B. Within each survey area trees of significant size were recorded by name with their general range in size measured in height for coniferous trees and DBH for deciduous trees. Other tree species that were encountered but were not of significant size had only their species name recorded as well as their general occurrence within the specific survey area.

The dominant tree species of significant size found throughout the previously mined areas were Eastern Cottonwood and White Pine. Of these two species, White Pine had more trees of significant size counted within all of the survey areas. Other significant sized tree species encountered during the

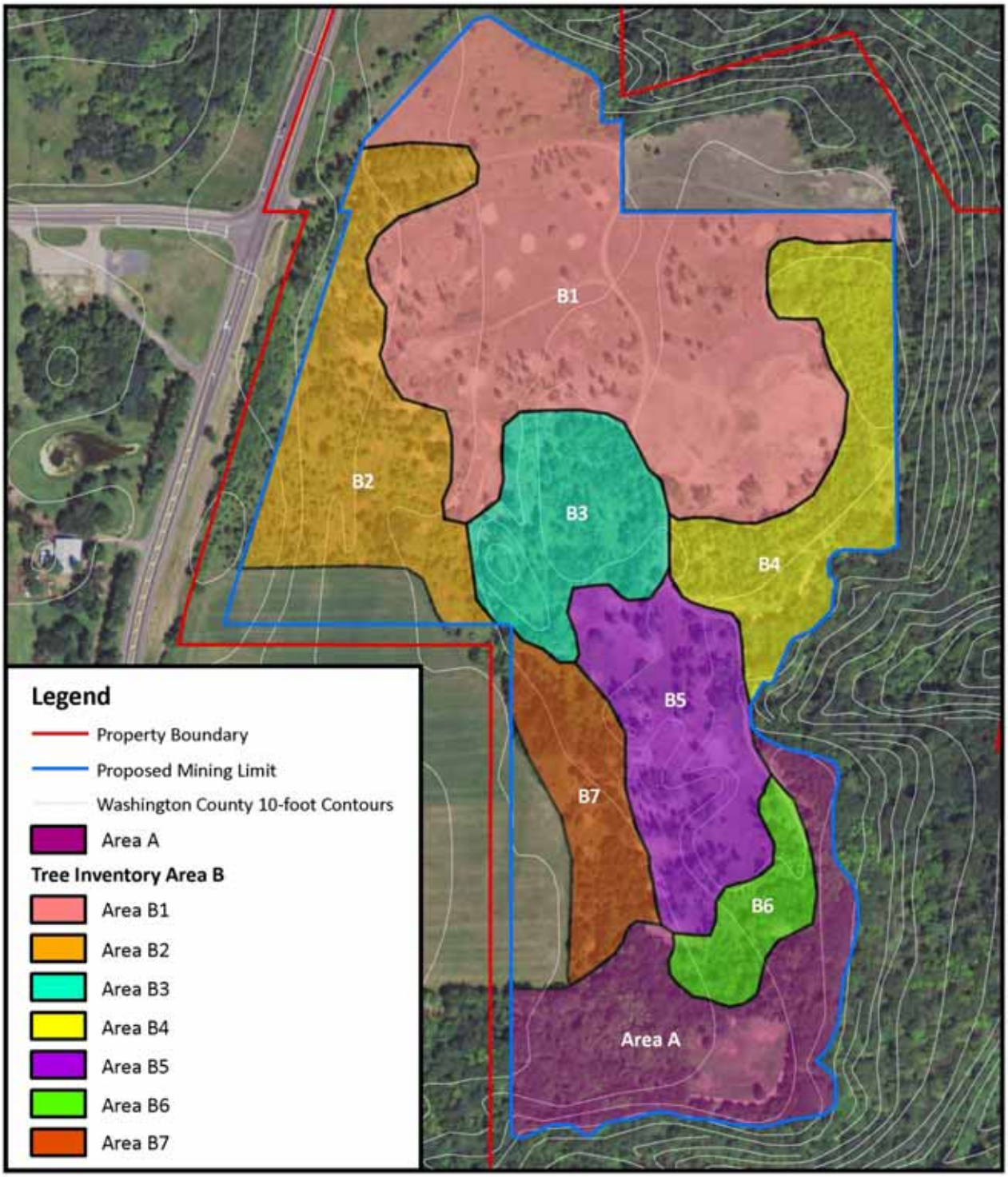
ground survey of Area B include: Paper Birch and Eastern Red Cedar. Of the four tree species with significant-sized trees counted there were approximately 1,300 to 1,670 White Pine, 135 to 195 Paper Birch, 40 to 70 Eastern Red Cedar, and 38 to 67 Eastern Cottonwood trees within the seven sub areas of Area B. From the survey work conducted, CCES has determined there are approximately 1,500 to 2,000 significant trees within Area B.

Table 2 below lists the type of tree species encountered in all of Area B (Sub Areas B1 through B7) as well as the approximate number of significant-sized trees and general notes describing each tree species relative occurrence.

Table 2.

Tree Species	Appx. # of Sig. Trees	Notes
White Pine	1300 to 1670	Dominant tree throughout Areas B1-B7
Cottonwood	38 to 67	Dominant tree throughout Areas B1-B7
Paper Birch	135 to 195	Found occasionally in Areas B4-B7
Red Cedar	40 to 70	Scattered within Areas B1-B7
Quaking Aspen	0	Scattered within Areas B1-B7
Box Elder	0	Scattered within Areas B1-B7
American Elm	0	Non-significant sized trees were very few in number throughout all of Areas B1-B7
Green Ash	0	Non-significant sized trees were very few in number throughout all of Areas B1-B7
Willow	0	Non-significant sized trees were very few in number throughout all of Areas B1-B7
Red Oak	0	Non-significant sized trees were very few in number throughout all of Areas B1-B7
Approximate Total	**1513 to 2002**	

The following paragraphs of this report detail for the seven sub areas of Area B their general location within the site, the dominant plant community cover, the dominant tree species encountered, the range of size of significant trees and the approximate number of significant trees. Also included for each sub area is a review of eleven historic air photos from 1938 to 2010 that analyzes past to present land use and vegetation changes that have taken place over the last seventy years within the Zavoral property. Years that were included in the historical air photo review are: 1938, 1949, 1953, 1964, 1970, 1980, 1986, 1991, 1997, 2003, and 2010 (**Appendix A**). At the end of each sub area section a table lists all tree species encountered within the sub area, the estimated number of significant trees found within the sub area, and the range in size of trees surveyed.



Zavoral Mining and Reclamation Project
Tree Inventory Area B Map

0 100 200 400 600 800 Feet

NORTH

Critical Connections Ecological Services, Inc.

Figure 3

Area B1

Area B1 is located in the northern portion of the proposed mining limits and covers approximately 20.5 acres. Area B1 is primarily herbaceous grasses and forbs with few scattered Eastern Cottonwood and Eastern Red Cedar trees. Of the overall cover within this area, trees comprise approximately 10% or less with grasses and forbs comprising approximately 90% or more.

Dominant tree species present within this area include Eastern Cottonwood and Eastern Red cedar with very few other species present. Nearly all of the Eastern Cottonwood trees growing in this area range in size from 4” to 16” in DBH with only a few larger than 20” in diameter. In the southern portion of Area B1 where it borders Area B4 approximately 6-10 cottonwood trees over 20” in DBH were encountered. The Eastern Red Cedar trees throughout Area B1 typically range in height from 2’ to 10’. There were approximately 20 Eastern Red Cedar trees within this area that were 12’ in height or taller. In total there were approximately 20 to 35 significant trees encountered within Area B1.

Historic air photo review of Area B1 indicates that this area was used for agricultural purposes during 1938 up to approximately 1949. In 1938, during the period of agricultural land use, there were very few trees located within Area B1 just around the farmstead. In 1953 the southeastern portion of the area appears to have a mining operation in its early stages of production. Mining expands to the north in this area by 1964 and by 1970 the majority of Area B1 is actively being mined. Mining in this area continues through the 1980’s. In 1991 several large stockpiles are clearly visible with portions of the north half of Area B1 starting to establish with herbaceous vegetation. By 1997 herbaceous vegetation continues to establish and several large stockpiles remain as a dominant feature of Area B1. Very few trees are visible until the 2003 photograph which indicates only a few deciduous and coniferous trees becoming established throughout the whole area. The 2010 air photo depicts current vegetative cover with much of the area being open grassland with very few trees.

The following table for Area B1 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 3.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
Cottonwood	4" to 22" in DBH	6 to 10	Very few, scattered throughout area
Red Cedar	2' to 12' in Height	15 to 25	Very few, scattered throughout area
	Approximate Total	**21 to 35**	

Area B2

Area B2 is located in the western portion of the proposed mining limits that is closest to Highway 95 and covers approximately 6.7 acres. Area B2 consists of mainly herbaceous grasses with a higher density of scattered trees than Area B1. Of the overall cover within this area, trees comprise approximately 50% with grasses comprising the remaining 50%. This area includes the entrance, the former main hauling road, a steep relic mining face, and a sloping field area that had historically been used for agriculture and is now scattered with coniferous and deciduous trees.

Dominant tree species located within Area B2 include primarily Eastern Cottonwood and White Pine, which account for approximately 70 to 80% of all trees, with Eastern Red Cedar, Box Elder, Quaking Aspen, Green Ash, and Red Oak making up the remainder of the tree species. Of the Cottonwood trees in this area, very few were of significant size with approximately 90% or more of being less than 18" in DBH. The vast majority of Cottonwood trees in this area ranged in size from 6" to 14" in DBH. There was approximately 10 or fewer Cottonwood trees of significant size located within Area B2. The other dominant tree in this area, White Pine, was located throughout the area with a higher portion of them occurring in the sloping field area down to the bottom of the mining face. The survey revealed there to be over 200 White Pine of significant size, with approximately 80% of them less than 20' in height. Red Cedar was the only other tree species of significant size within this area, of which approximately 15-25 were 12' or greater in height. From reviewing historic air photos of the site trees in this area started to establish sometime around 1970.

Historic air photo review of Area B2 indicates that this area was used for agricultural purposes during 1938 up to approximately 1964. The photo from 1970 shows that mining was starting to take place along the eastern portion of Area B2 with the western portion being fallow with a few scattered trees starting to become established. By 1980 a larger portion of the eastern side was still being mined and expanded somewhat with the western side going back into agricultural use. Somewhere between 1980 and 1986 the Cottonwood trees currently located along the main haul road start growing. By 1986 mining expanded to the west more in this area with the southern portion no longer being used for agricultural purposes, instead remaining fallow with trees becoming established. Between 1991 and 1997 much of the area that was previously mined has now become established with woody vegetation except the southern part which still remains relatively tree-free. By 2010 a mix of deciduous and coniferous trees is becoming well established throughout Area B2. Based on this historic air photo review of sub area B2 tree age for the largest/oldest trees is approximately 35 years old. Much of this area started to establish with trees by around 1991.

The following table for Area B2 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 4.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 30' in Height	225 to 275	Dominant tree of area
Cottonwood	4" to 24" in DBH	5 to 10	Dominant tree of area
Red Cedar	2' to 14' in Height	15 to 25	Moderate number present
Quaking Aspen	4" to 11" in DBH	0	Non-significant sized trees scattered within area
Box Elder	4" to 12" in DBH	0	Non-significant sized trees scattered within area
Green Ash	3" to 5" in DBH	0	Very few non-significant sized trees present
Red Oak	2" to 4" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**245 to 310**	

Area B3

Area B3 is located in the central portion of the proposed mining limits and covers approximately 4.0 acres. Area B3 consists of a higher density of trees than Areas B1 & B2 with an herbaceous grass layer throughout. Of the overall cover within this area, trees comprise approximately 50-60% with grasses and forbs comprising approximately 40-50%. This area consists of two depressions surrounded by relic mining faces that are now vegetated with trees and grasses.

Dominant tree species located within this area include mainly Eastern Cottonwood and White Pine, which account for approximately 80% or more of all trees, with Eastern Red Cedar, Box Elder, Quaking Aspen, and Red Oak making up the remainder of tree species. Similar to results from Areas B1 & B2, significant Cottonwood trees were few in number with approximately only 10-15 present. The vast majority of Cottonwood trees in this area ranged in size from 6” to 14” in DBH. The other dominant tree species located within Area B3 were White Pine trees which ranged in height from 6’ to 35’, with most trees being less than 20’ in height. There were approximately 250 to 300 significant White Pine trees encountered in Area B3. Red Cedar was the only other tree of significant size within this area of which approximately 10-20 were 12’ or greater in height. The remainder of tree species encountered within Area B3, including Quaking Aspen, Box Elder, and Red Oak, were not of significant size.

Historic air photo review of Area B3 indicates that this area was used for agricultural purposes during 1938 up to approximately 1964 when in the far eastern part of the area; mining had started to take place. By 1970 nearly all of this area was being actively mined. The 1980 photo shows this area as no longer being mined and vegetative cover is establishing with some trees clearly visible that cover less than 20% of the area. Photos from 1986 to 2010 continue to show how vegetation cover is becoming dominated more by trees than open grassland. By 2010 aerial photography shows that approximately

50% of Area B3 is now covered by trees. Based on this historic air photo review of Area B3 tree age for the largest/oldest trees is approximately 35 years old.

The following table for Area B3 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 5.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 35' in Height	250 to 300	Dominant tree of area
Cottonwood	4" to 20" in DBH	11 to 15	Dominant tree of area
Red Cedar	2' to 14' in Height	10 to 20	Moderate number present
Quaking Aspen	4" to 10" in DBH	0	Non-significant sized trees scattered within area
Box Elder	4" to 10" in DBH	0	Non-significant sized trees scattered within area
Red Oak	2" to 5" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**270 to 335**	

Area B4

Area B4 is located in the eastern portion of the proposed mining limits and covers approximately 5.7 acres. Area B4 currently consists of a high density of White Pine trees and scattered Eastern Cottonwood trees with some shrubs and an herbaceous layer. Of the overall cover within this area, trees comprise approximately 75-80% with grasses, forbs, and shrubs comprising the remaining 25% or less. This area was formerly mined and consists of sloped to moderately level topography. The eastern boundary of this area is adjacent to steep slopes and a ravine system.

Dominant tree species located within this area include mainly White Pine, Eastern Cottonwood, and Paper Birch, which account for approximately 80% or more of all trees, with Eastern Red Cedar, Quaking Aspen, and Red Oak making up the remainder of tree species. Within Area B4 the larger/older White Pine and Cottonwood trees are located at the southern end where trees reach a general height of 25’ to 40’, while the northern part of this area has smaller trees present which are typically half the height. Of the dominant trees within this area, White Pine was most abundant with approximately 375 to 525 significant trees encountered that ranged in height from 12’ to 40’. The second most dominant tree present within Area B4 was Eastern Cottonwood. Only 5 to 10 significant Cottonwood trees were encountered even though there were upwards of 200+ total Cottonwood trees within this area. Similar to other areas that had been mined previously, most of the Cottonwood trees were 6” to 14” in DBH and were not of significant size. The only other tree species of significant size within this area was Paper Birch of which there were approximately 20 to 40 encountered that were 6” or greater in DBH. The largest Paper Birch trees in this area were only 9” in DBH. Non-dominant trees such as Quaking Aspen,

Red Cedar, and Red Oak were found occasionally within this area but were not of significant size to be included in our totals.

Historic air photo review of Area B4 indicates that this area was used for agricultural purposes during 1938 up to approximately 1949 or earlier, when in the southern portion what appears to be a small mining operation had started to develop. By 1953 mining had expanded to roughly half of the area and by 1970 all of Area B4 was being actively mined. The 1980 photograph shows that mining for the most part had ended in this area and was now becoming established with trees and herbaceous vegetation. Photos from 1986, 1991, 1997, and 2003 depict the continued increase in tree cover within this sub area and by 2010 roughly 80-90% of this area was now covered in trees. Based on this historic air photo review of Area B4 tree age for the largest/oldest trees is approximately 35-40 years old.

The following table for Area B4 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 6.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 40' in Height	375 to 525	Dominant tree of area
Cottonwood	4" to 20" in DBH	5 to 10	Dominant tree of area
Paper Birch	2" to 9'" in DBH	20 to 40	Dominant tree in northern part only
Quaking Aspen	4" to 8" in DBH	0	Non-significant sized trees scattered within area
Red Cedar	4' to 8' in Height	0	Non-significant sized trees scattered within area
Red Oak	2" to 5" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**400 to 575**	

Area B5

Area B5 is located in the southern half of the proposed mining limits and covers approximately 6.7 acres. Area B5 consists of mainly herbaceous grasses and forbs with a similar density of scattered trees to Area B2. Of the overall cover within this area, trees comprise approximately 30 to 40% with grasses and forbs comprising approximately 60 to 70%. This area was formerly mined and consists of sloped topography next to old mining faces and somewhat level topography at the bottom of the excavated areas. The eastern boundary of this area is adjacent to steep slopes and a ravine system.

Dominant tree species located within this area include mainly White Pine and Eastern Cottonwood, which account for approximately 80% or more of all trees, with Paper Birch, Quaking Aspen, Red Cedar, Box Elder, and Red Oak making up the remainder of tree species. Within Area B5 there were approximately 150 to 200 significant White Pine trees encountered that ranged in height from 12’ to 40’. The majority of these significant White Pine trees were less than 20’ in height. The other dominant

tree present within Area B5 was Cottonwood but only 5 to 10 were of significant size even though there were over 200+ Cottonwood trees growing within this area. Of the non-dominant trees found within this area, only one tree species (Paper Birch) had trees of significant size of which 35 to 50 trees with DBH's over 6" were present. The majority of Paper Birch trees ranged in size from 6" to 7" in DBH with the largest being only 9". The other non-dominant trees encountered within this area included Quaking Aspen, Red Cedar, Box Elder, and Red Oak but none were of significant size to be inventoried.

Historic air photo review of Area B5 indicates that this area was used for agricultural purposes during 1938 up to approximately 1964 or earlier when in the northern portion mining activity had started to develop. In addition to this area being utilized for agricultural purposes a forested ravine is located in the middle of this sub area. By 1970 the portion north of the forested ravine had been cleared of trees and was now being mined. The 1980 photograph shows mining taking place throughout the whole sub area and the forested ravine being cleared of nearly all trees. Stockpiles are visible in the 1986 and 1991 photos with few trees present throughout the area. Between 1997 and 2003 trees are becoming established and occur sporadically throughout the area. The 2010 photograph depicts tree coverage within this area as being approximately 25-30% with the remainder as open grassland. Based on this historic air photo review of Area B5 tree age for the largest/oldest trees is approximately 20-25 years old.

The following table for Area B5 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 7.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 40' in Height	150 to 200	Dominant tree of area
Paper Birch	4"to 9" in DBH	35 to 50	Few scattered within area
Cottonwood	4" to 20" in DBH	5 to 10	Dominant tree of area
Quaking Aspen	4" to 8" in DBH	0	Non-significant sized trees scattered within area
Red Cedar	4' to 8' in Height	0	Non-significant sized trees scattered within area
Box Elder	4" to 8" in DBH	0	Very few non-significant sized trees present
Red Oak	2" to 5" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**190 to 260**	

Area B6

Area B6 is located in the southeastern part of the proposed mining limits and covers approximately 1.7 acres. Area B6 consists mainly of White Pine and Eastern Cottonwood trees of smaller height and DBH with some herbaceous grasses and forbs present. Of the overall cover within this area, trees comprise approximately 70 to 80% with grasses, forbs, and shrubs comprising 30% or less. This area was formerly mined and consists of sloped topography next to old mining faces and somewhat level topography at

the bottom of the excavated areas. The eastern boundary of this area is adjacent to the limits of past mining and to Area A.

Dominant tree species located within this area include mainly White Pine and Eastern Cottonwood, which account for approximately 80% or more of all trees, with Paper Birch, Red Cedar, American Elm, Willow, and Red Oak making up the remainder of tree species. Within Area B6 there were approximately 180 to 220 significant White Pine trees encountered that ranged in height from 12' to 35'. The majority of these significant White Pine trees were less than 20' in height with a very high density located at the southern part of Area B6. The other dominant tree species present within Area B6 was Eastern Cottonwood but no trees of significant size were present within this area. Of the non-dominant tree species encountered within Area B6, only the Paper Birch species had trees of significant size, with approximately 35 to 50 located in this area. Similar to other areas where Paper Birch was present the majority of significant-sized trees were typically 6" to 7" in DBH with the largest being 9". Non-dominant trees found within Area B6 that were not of significant size include: American Elm, Red Cedar, Willow, and Red Oak.

Historic air photo review of Area B6 indicates that this area was used for agricultural purposes during 1938 up to approximately 1980 or earlier. By 1980 mining was now taking place in the western half of this area. The 1991 and 1997 photographs show some mining activity in the northern part only with the rest of the area becoming established by trees and herbaceous plants. The 2003 photo depicts tree cover increasing. By 2010 tree coverage within this area was approximately 60-70% and dominated with mainly young White Pine trees. Based on this historic air photo review of Area B6 tree age for the largest/oldest trees is approximately 30 years old.

The following table for Area B6 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 8.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 35' in Height	180 to 220	Dominant tree of area
Paper Birch	4"to 9" in DBH	35 to 50	Few scattered within area
Cottonwood	4" to 16" in DBH	0	Dominant tree of area, no trees of significant size within the area
American Elm	4" to 6" in DBH	0	Non-significant sized trees scattered within area
Red Cedar	4' to 8' in Height	0	Very few non-significant sized trees present
Willow	6" to 10" in DBH	0	Very few non-significant sized trees present
Red Oak	2" to 5" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**215 to 270**	

Area B7

Area B7 is located in the southwestern part of the proposed mining limits and covers approximately 3.2 acres. Area B7 consists mainly of White Pine and Eastern Cottonwood trees with some herbaceous grasses and forbs present. Of the overall cover within this area, trees comprise approximately 75 to 80% with grasses, forbs, and shrubs comprising 25% or less. Parts of Area B7 were previously mined and now consist of wooded slopes above old mining faces and somewhat level topography adjacent to agricultural land. The southern boundary of Area B7 is adjacent to Area A.

Dominant tree species located within this area include mainly White Pine and Eastern Cottonwood, which account for approximately 80% or more of all trees, with Paper Birch, Red Cedar, Quaking Aspen, American Elm, Scotch Pine, and Red Oak making up the remainder of tree species. Within Area B7 there were approximately 120 to 150 significant White Pine trees encountered that ranged in height from 12' to 30'. The majority of these significant White Pine trees were less than 20' in height with a high density encountered along the western part of Area B7. The other dominant tree present within Area B7 was Eastern Cottonwood with approximately only 6 to 12 of significant size even though well over 150 Cottonwood trees were encountered. Similar to Area B1 through B6, the vast majority of Cottonwood trees were less than 18" in DBH. Of the non-dominant trees encountered within Area B7 only one tree species (Paper Birch) had trees of significant size, with approximately 45 to 55 located in this area. Similar to other areas where Paper Birch was present, the majority of significant-sized trees were typically 6" to 7" in DBH with the largest being 10" in DBH. Other non-dominant trees found within Area B7 include American Elm, Red Cedar, Scotch Pine, Quaking Aspen, and Red Oak of which only Scotch Pine were of significant size. Scotch Pine is a non-native tree and is not considered a significant tree within the City.

Historic air photo review of Area B7 indicates that this area was used for agricultural purposes during 1938 up to approximately 1980 or earlier when mining activity was clearly present throughout the northern two-thirds of the area. This area historically had a forested ravine located in the northern portion of it. The majority of the forested ravine area was cleared by 1980 with an area less than two-tenths of an acre on the western side left standing. From 1986 and 1991 photographs it appears that mining continued within this area and trees were establishing east of the existing trees left from the ravine clearing. By 1997 this area was becoming more established with trees. The 2003 photograph shows tree coverage within this area at approximately 50% and by 2010 tree coverage had increased to roughly 70%. Based on this historic air photo review of sub area B7 tree age for the largest/oldest trees is approximately 30 years old for areas that were previously mined. Trees remaining in the old ravine may be 70 years old or older.

The following table for Area B7 lists the tree species present, their range of size in either DBH or height, the approximate number of significant trees encountered, and general notes pertaining to the species.

Table 9.

Tree Species	Range in Size	Appx. # of Sig. Trees	Notes
White Pine	6' to 30' in Height	120 to 150	Dominant tree of area
Paper Birch	4"to 9" in DBH	45 to 55	Few scattered within area
Cottonwood	4" to 20" in DBH	6 to 12	Dominant tree of area
American Elm	4" to 6" in DBH	0	Non-significant sized trees scattered within area
Quaking Aspen	4"to 9" in DBH	0	Non-significant sized trees scattered within area
Red Cedar	4' to 8' in Height	0	Very few non-significant sized trees scattered within area
Scotch Pine	12' to 24' in Height	0	Non-native tree, very few present within area
Red Oak	2" to 5" in DBH	0	Very few non-significant sized trees present
	Approximate Total	**171 to 217**	

Summary

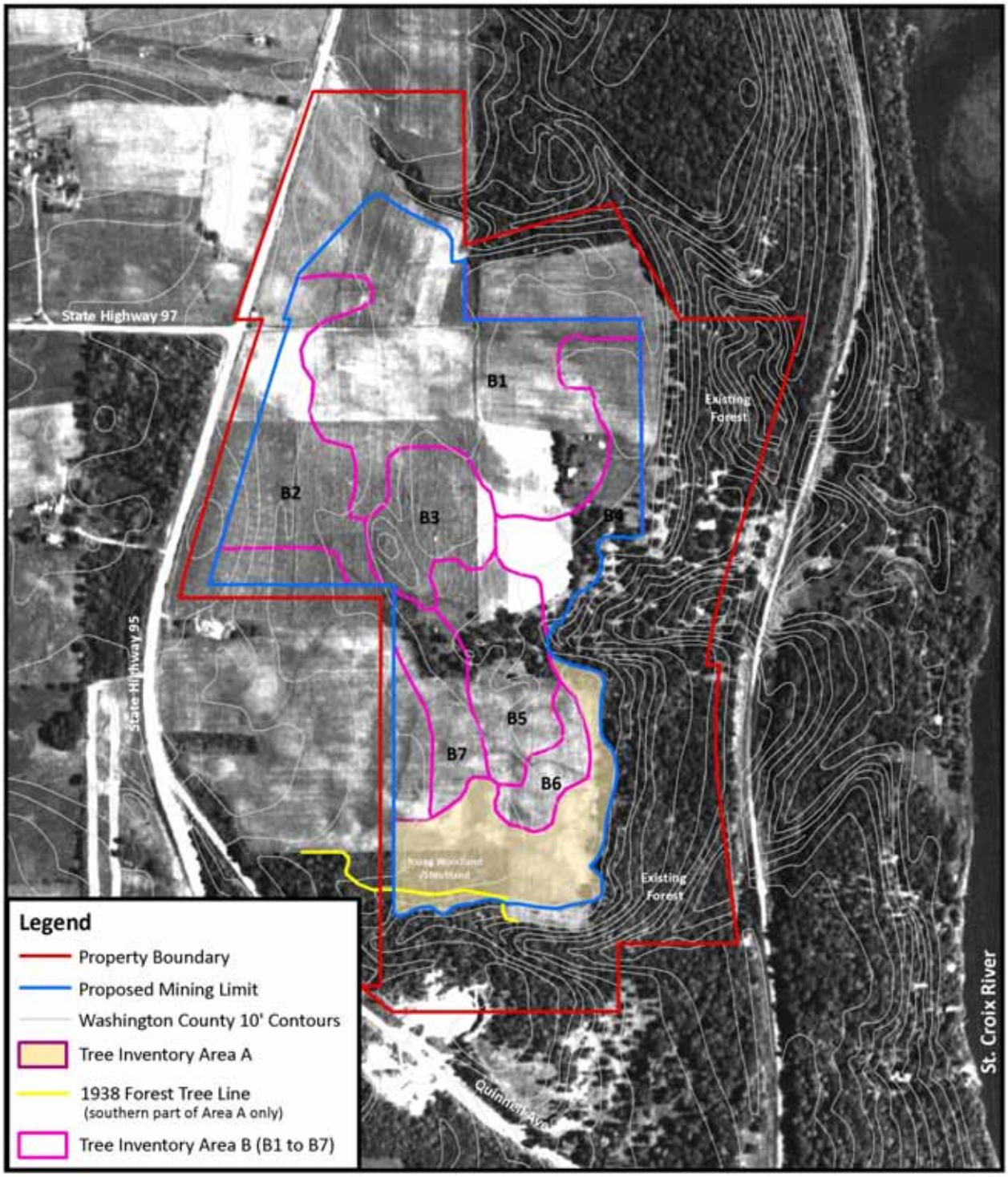
CCES completed a tree inventory for Tiller that was conducted from the fall of 2010 to February 2011 for areas located within the proposed mining limits of the Zavoral Mining and Reclamation Project Site. The tree inventory was conducted in two general areas of the Project area-Area A and Area B. Area A includes the part of the Project area where mining had never occurred previously. For this tree inventory all of the significant trees located within Area A were surveyed by CCES and were individually tagged, identified, and located with GPS. Area A consists of a moderate quality Red Oak dominated forest that extends off-site to the south, west, and east and is part of a larger White Pine Hardwood Forest system. For portions of the Project area where mining had occurred previously (Area B), significant trees were visually estimated by aerial photo interpretation and counted during extensive ground surveys. These previously farmed and subsequently mined areas were typically dominated by small DBH tree species including White Pine, Eastern Cottonwood, and Red Cedar that mix with open grassland. The grasslands found throughout Area B are dominated primarily by non-native grasses and forbs with several being listed on the State of Minnesota's noxious weed list.

For this tree inventory CCES tagged, identified, and located 979 significant trees within Area A and counted approximately 1,500 to 2,000 significant trees within Area B. In total CCES estimates there to be somewhere in the range of 2,500 to 3,000 significant trees located within the Project area. The City's ordinances do not require a tree inventory or tree replacement for this type of project. The tree inventory completed for the site is an accurate estimation of significant trees located within the Zavoral Mining and Reclamation Project Site.

Appendix A

Historical Air Photos

1938



Zavoral Property

Historic Aerial Photo Forest Cover Map-1938

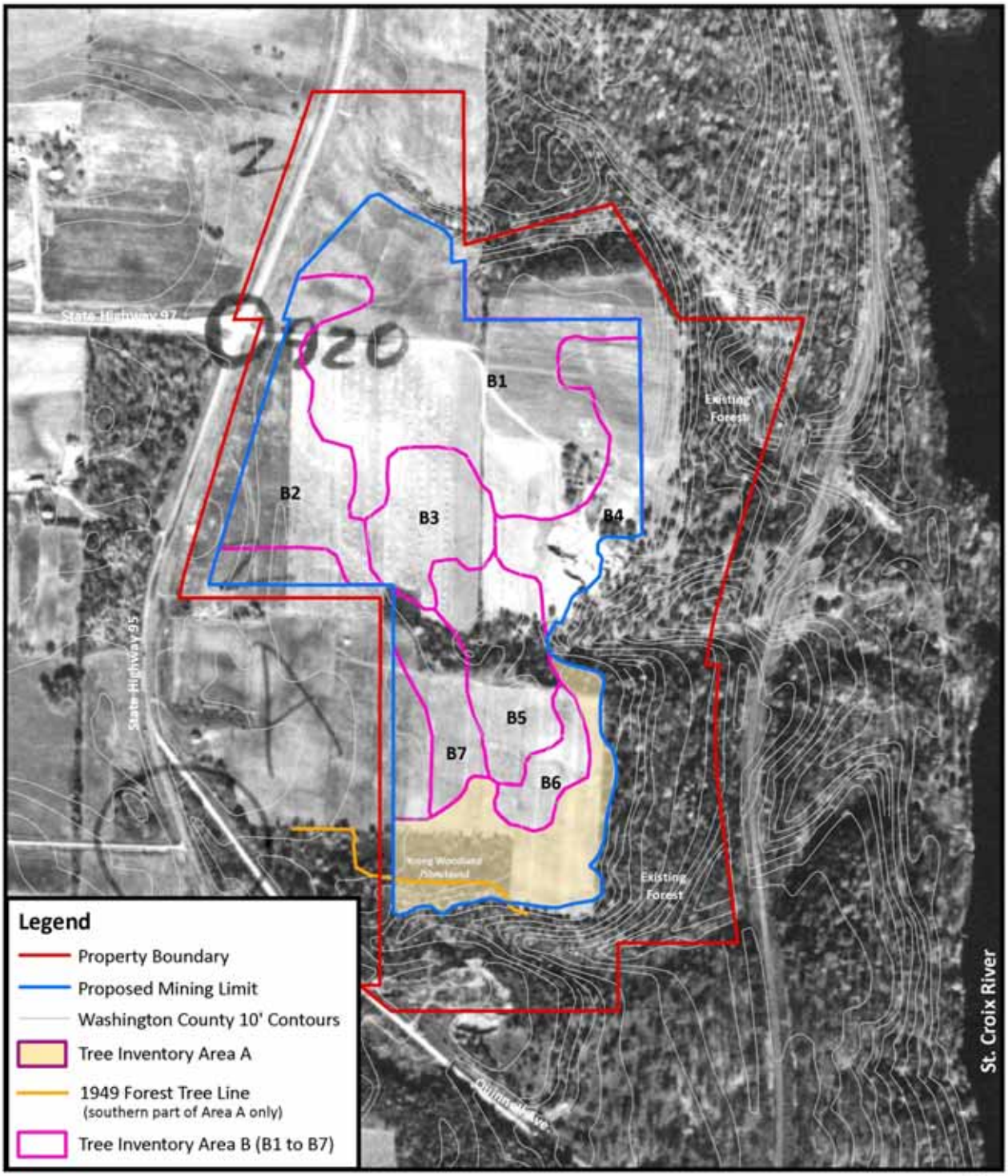
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1949



Zavoral Property

Historic Aerial Photo Forest Cover Map-1949

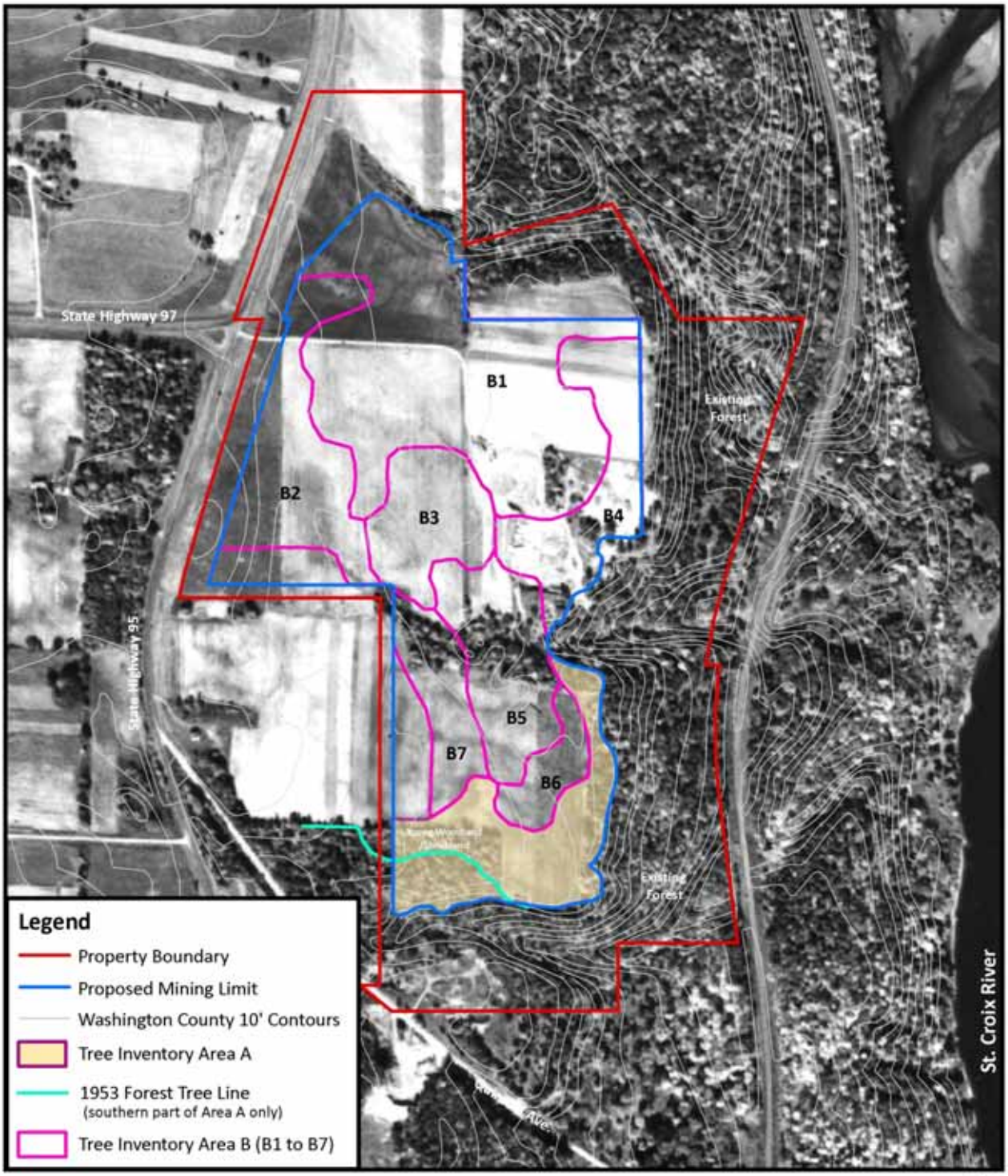
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1953



Zavoral Property

Historic Aerial Photo Forest Cover Map-1953

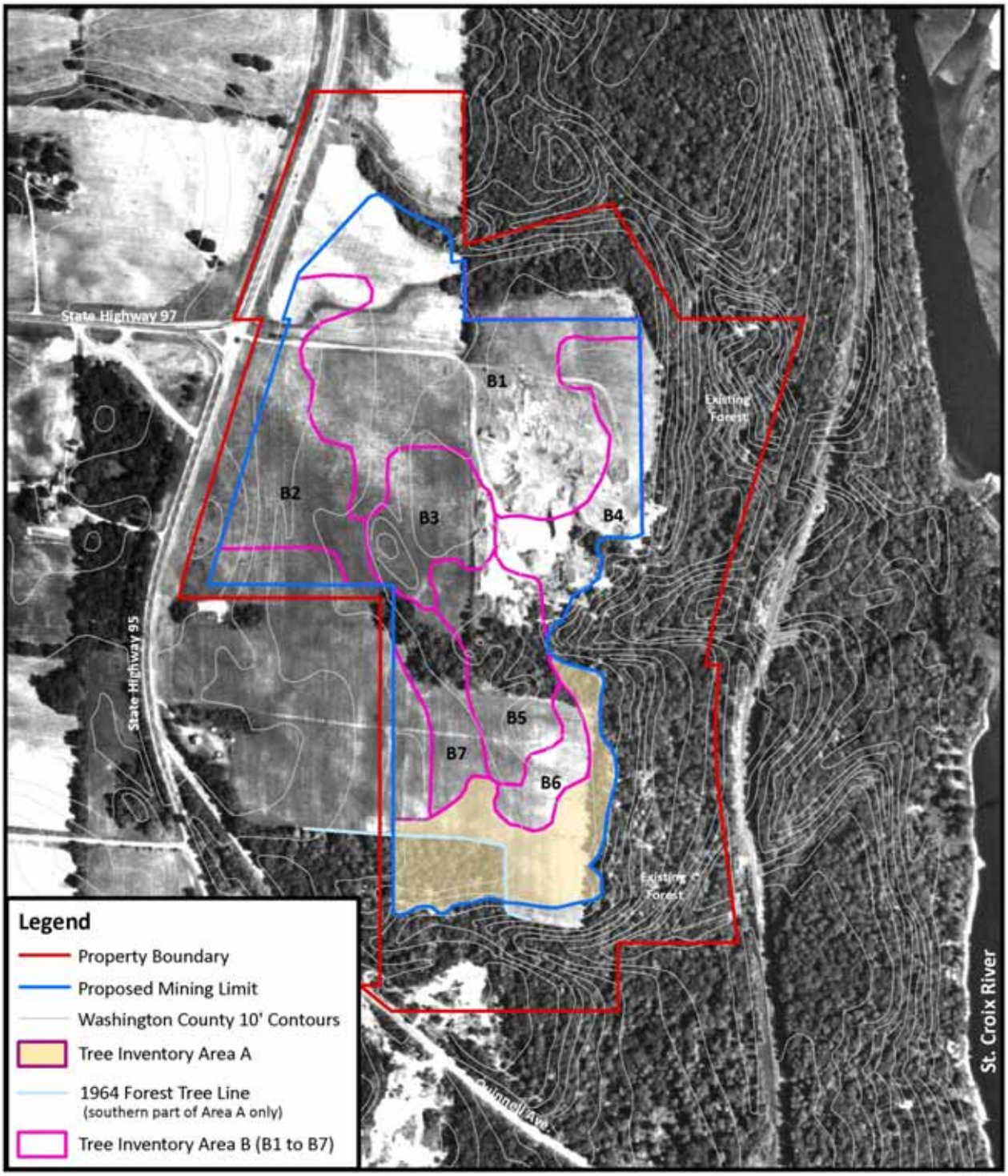
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1964



Zavoral Property

Historic Aerial Photo Forest Cover Map-1964

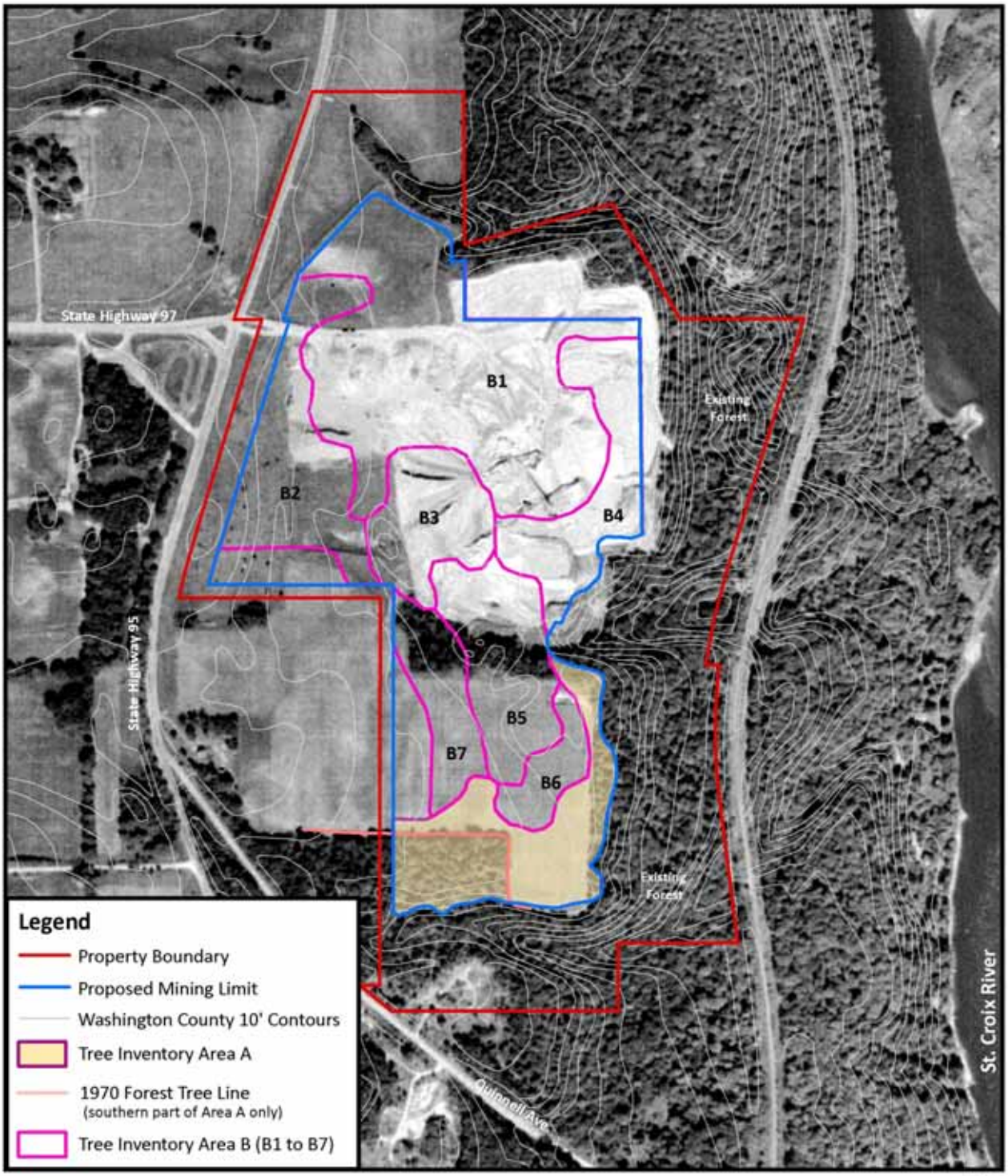
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1970



Zavoral Property

Historic Aerial Photo Forest Cover Map-1970

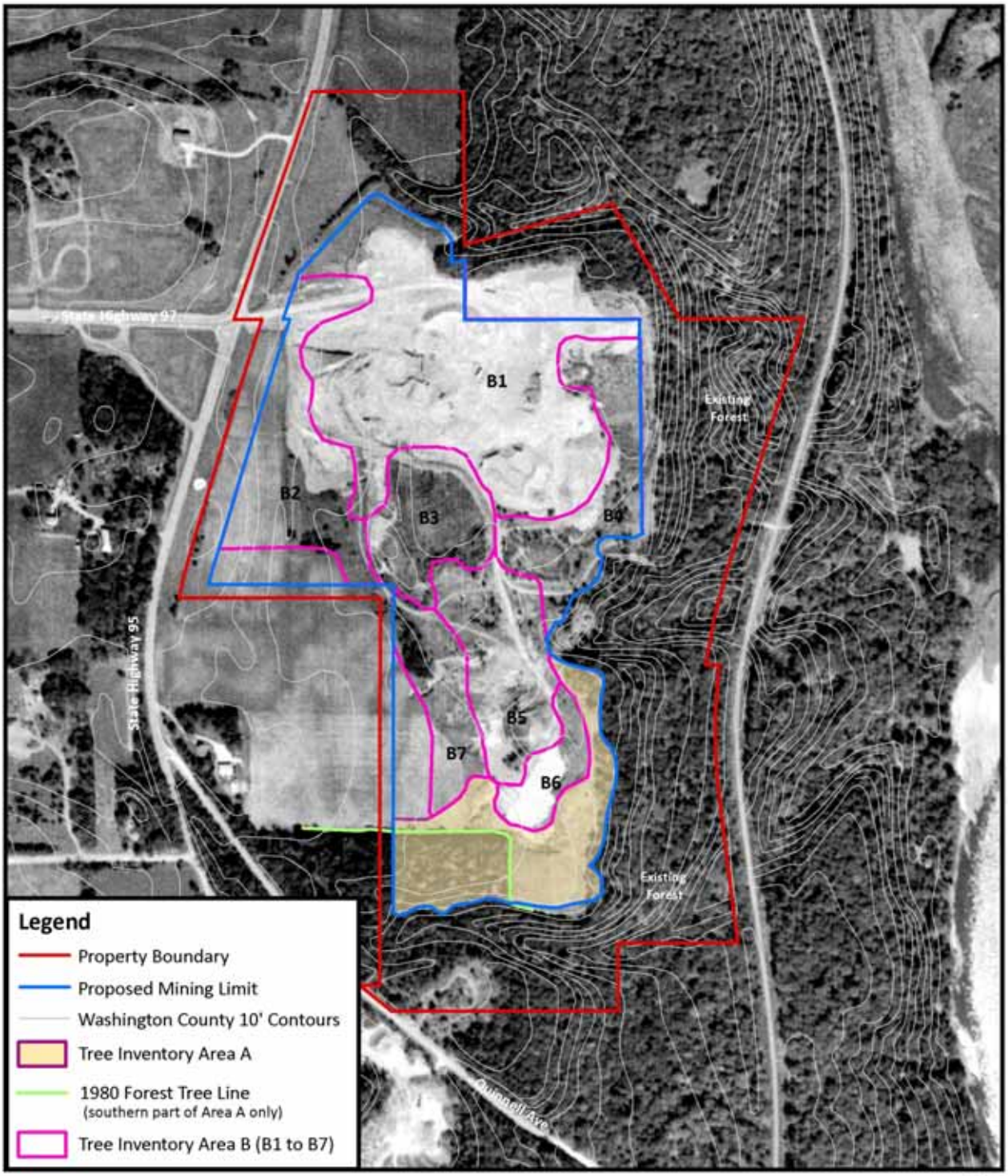
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1980



Zavoral Property

Historic Aerial Photo Forest Cover Map-1980

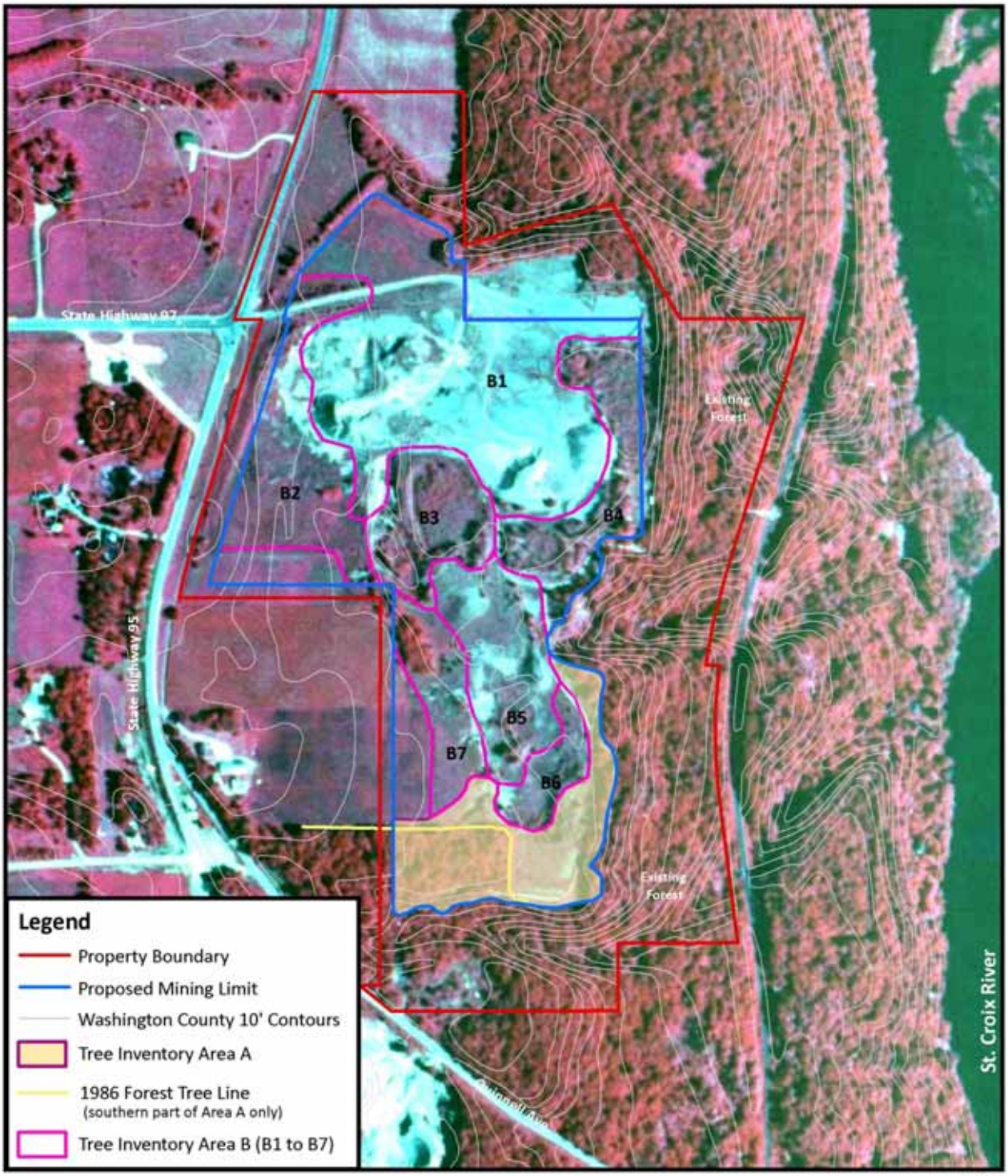
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

1986



Zavoral Property

Historic Aerial Photo Forest Cover Map-1986

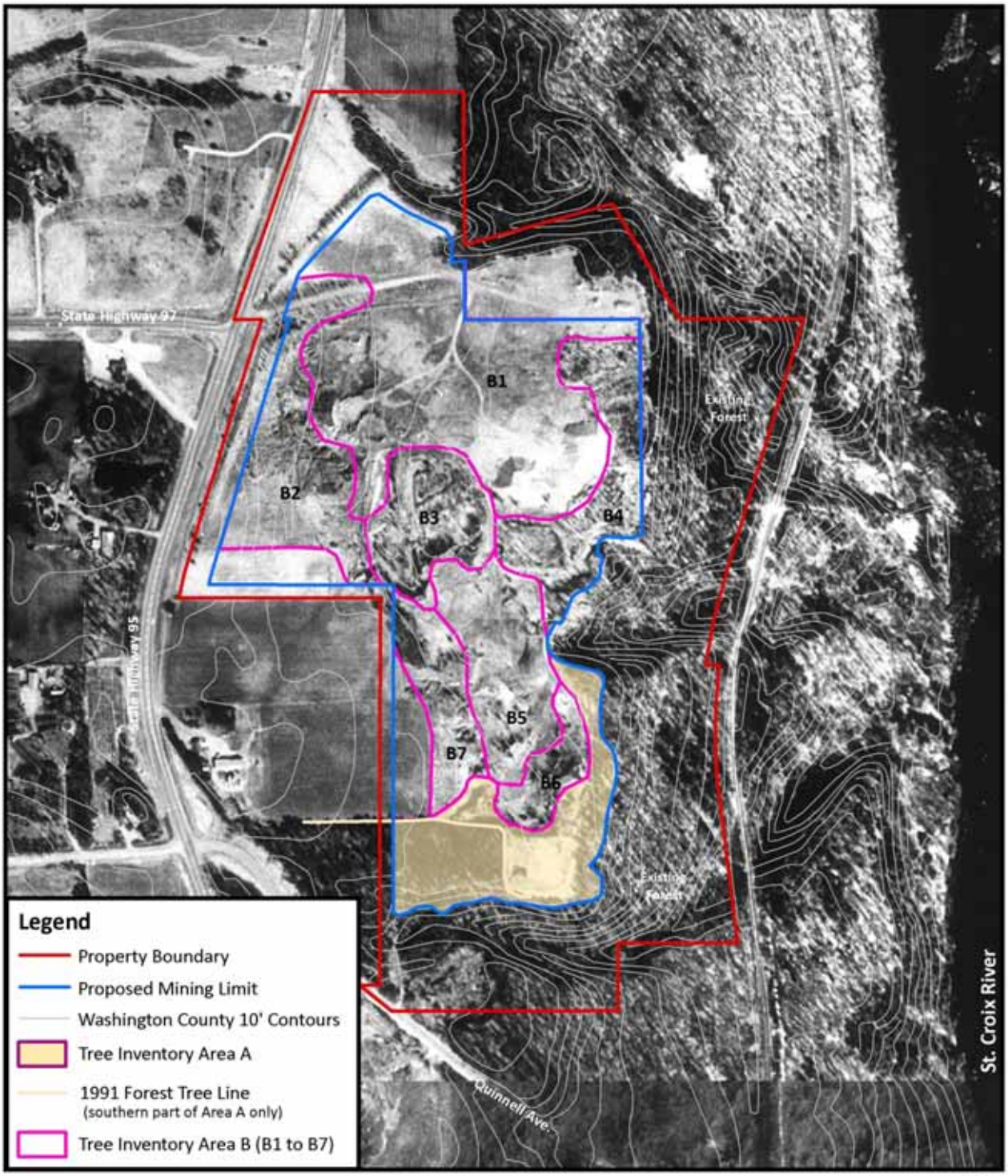
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections
Ecological Services, Inc.

Appendix A

1991



Zavoral Property

Historic Aerial Photo Forest Cover Map-1991

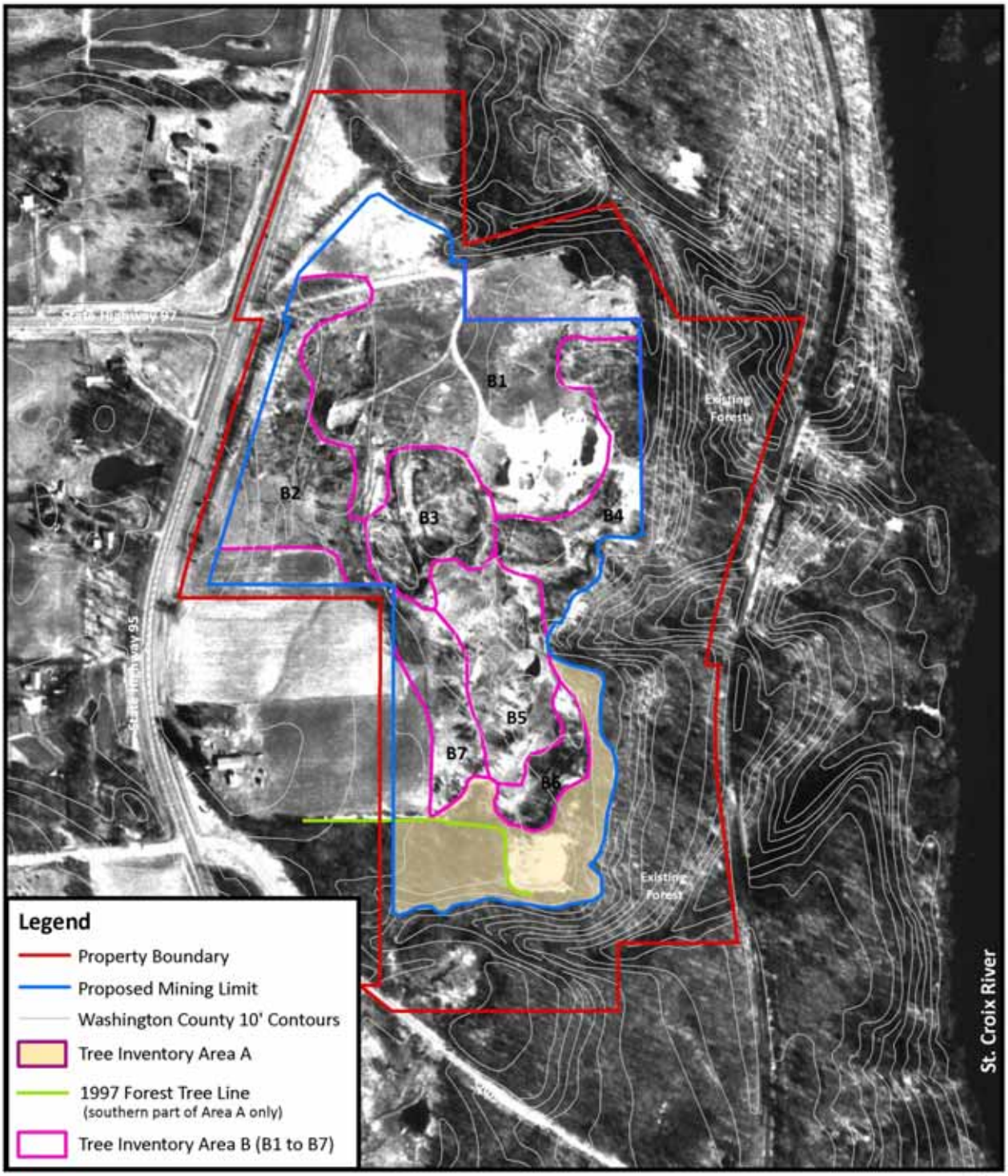
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections
Ecological Services, Inc.

Appendix A

1997



Zavoral Property

Historic Aerial Photo Forest Cover Map-1997

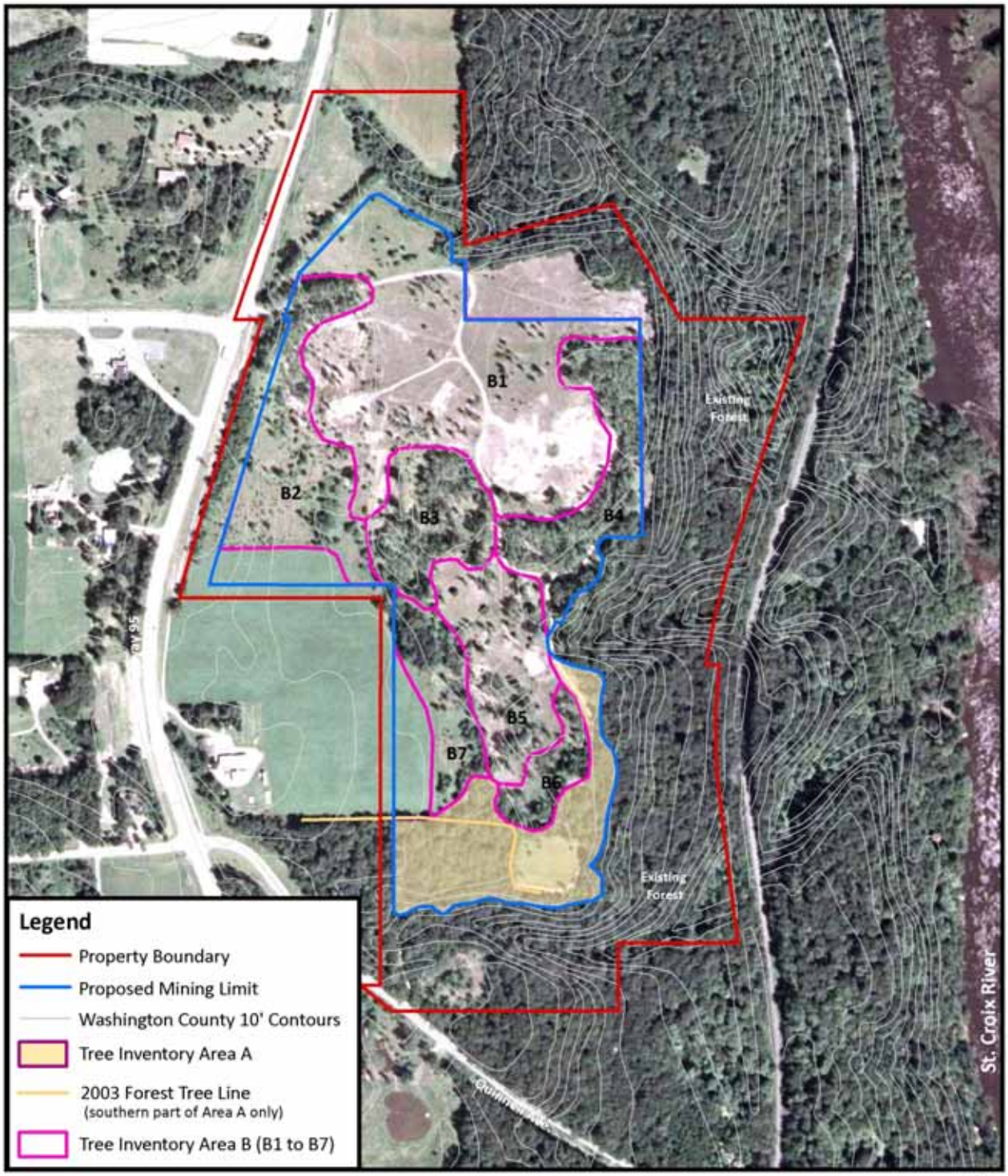
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections
Ecological Services, Inc.

Appendix A

2003



Zavoral Property

Historic Aerial Photo Forest Cover Map-2003

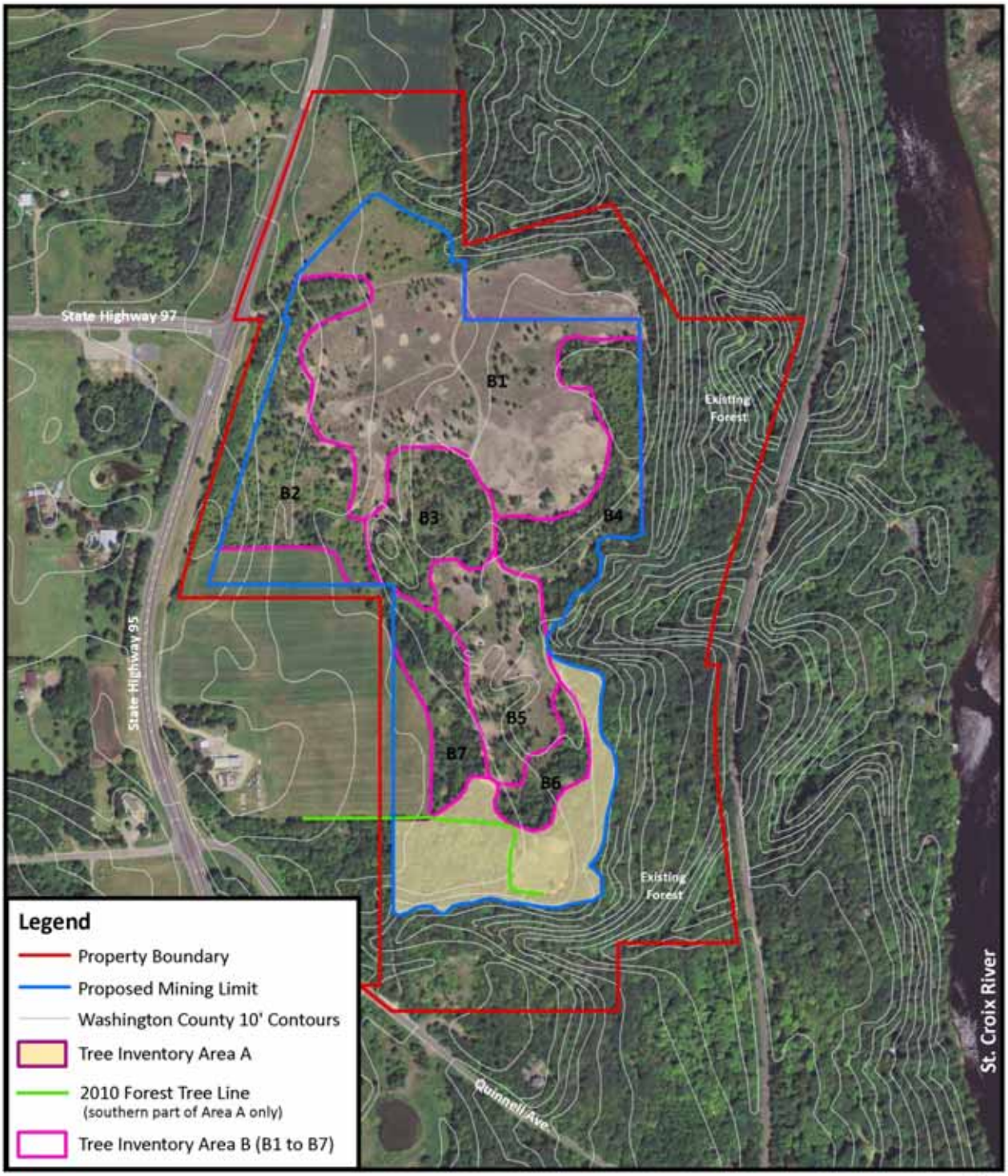
0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

2010



Zavoral Property

Historic Aerial Photo Forest Cover Map-2010

0 125 250 500 750 1,000 Feet

NORTH

Critical Connections Ecological Services, Inc.

Appendix A

Appendix B

Tagged Tree Area

Significant Tree List

Tag #	DBH						Tree Type	Notes
1501	8						Paper Birch	dead
1502	12						White Oak	
1503	11						Ironwood	
1504	21						Red Oak	
1505	14						White Oak	
1506	13						White Oak	
1507	6						Ironwood	
1508	18						Red Oak	
1509	14						White Oak	
1510	29						Red Oak	
1511	12						White Pine	
1512	14						White Oak	
1513	25						Red Oak	
1514	31						White Pine	
1515	8	6					Basswood	two main trunks
1516	10						Basswood	
1517	13						Red Oak	
1518	11	8					Red Oak	two main trunks
1519	9						Red Oak	
1520	10						Red Oak	
1521	12	8					Red Oak	two main trunks
1522	13						Red Oak	
1523	7						Red Oak	
1524	8						Red Oak	
1525	13	13					Red Oak	two main trunks
1526	7						Red Oak	
1527	10						Red Oak	
1528	13						Red Oak	
1529	9						Red Oak	
1530	10						Red Oak	
1531	16						Red Oak	
1532	17						Red Oak	
1533	7						Black Cherry	
1534	7						Red Oak	
1535	14						Red Oak	
1536	14						Red Oak	
1537	16						Red Oak	
1538	6						Red Oak	
1539	20						White Oak	
1540	6						Ironwood	
1541	16						Red Oak	
1542	12						Red Oak	
1543	7						Red Oak	
1544	16						Red Oak	
1545	7						Red Oak	
1546	13						Red Oak	
1547	35						Cottonwood	
1548	7						Paper Birch	
1549	8						Red Oak	
1550	13						Red Oak	

Tag #	DBH						Tree Type	Notes
1551	9						Red Oak	
1552	6						Red Oak	
1553	9						Red Oak	
1554	7						Red Oak	
1555	11						Red Oak	
1556	8						Red Oak	
1557	11	10	9				Basswood	three main trunks
1558	10						Green Ash	
1559	6						Ironwood	
1560	6						Ironwood	
1561	9	6					Red Oak	two main trunks
1562	10						Red Oak	
1563	10						Red Oak	
1564	10						Red Oak	
1565	12	8					Red Oak	two main trunks
1566	16	11	10				Red Oak	three main trunks
1567	6						Ironwood	
1568	12						Red Oak	
1569	9						Red Oak	
1570	6						Red Oak	
1571	8						Red Oak	
1572	7						Red Oak	
1573	13						Red Oak	
1574	11						Red Oak	
1575	20						Cottonwood	
1576	11						Red Oak	
1577	6						Red Oak	
1578	6						White Pine	
1579	13						White Pine	white pine blister rust at base of tree
1580	10						White Pine	white pine blister rust at base of tree
1581	6						White Pine	
1582	10						White Pine	
1583	5						White Pine	
1584	4						White Pine	
1585	3						White Pine	
1586	5						White Pine	
1587	5						White Pine	
1588	8						Basswood	
1589	9						Basswood	
1590	7						Bitternut Hickory	
1591	10						Bitternut Hickory	
1592	9						Bitternut Hickory	
1593	9						Bitternut Hickory	
1594	6						Bitternut Hickory	
1595	7						Bitternut Hickory	
1596	9						Bitternut Hickory	
1597	11						Bitternut Hickory	
1598	6						Sugar Maple	
1599	7						Bitternut Hickory	
1600	11						Bitternut Hickory	

Tag #	DBH						Tree Type	Notes
1601	16	16					Red Oak	two main trunks
1602	14						Red Oak	
1603	16	15					Red Oak	two main trunks
1604	7						Ironwood	
1605	6						Bitternut Hickory	
1606	9						Hackberry	
1607	10						Hackberry	
1608	7						Black Cherry	
1609	20						White Oak	
1610	14	10					Red Oak	two main trunks
1611	20						White Oak	
1612	9						Black Cherry	
1613	8						Black Cherry	
1614	NA						NA	double tagged with #1613
1615	7						Basswood	
1616	7						Sugar Maple	
1617	23						Red Oak	
1618	19						White Oak	
1619	6						Basswood	
1620	17						White Oak	
1621	19						White Oak	
1622	23						White Oak	
1623	17						White Oak	
1624	24						Red Oak	
1625	14						White Oak	
1626	6						American Elm	
1627	9						American Elm	
1628	7						Bitternut Hickory	
1629	7						Bitternut Hickory	
1630	6						American Elm	
1631	8						Bitternut Hickory	
1632	20						Red Oak	
1633	6						Sugar Maple	
1634	15						American Elm	
1635	6						Basswood	
1636	NA						NA	double tagged with #1635
1637	6						Ironwood	top missing
1638	11						Basswood	
1639	6						Basswood	
1640	7						Black Cherry	
1641	18						Basswood	
1642	8						Basswood	
1643	6						Basswood	
1644	18						Red Oak	
1645	17						White Oak	
1646	20						White Oak	
1647	22	15					Red Oak	two main trunks
1648	18	13					White Oak	two main trunks
1649	7						Ironwood	
1650	20						Red Oak	

Tag #	DBH						Tree Type	Notes
1651	7						Red Maple	
1652	17						White Oak	
1653	18						White Oak	
1654	20						White Oak	
1655	23						White Oak	
1656	6						Red Maple	
1657	6						Red Maple	
1658	7						Basswood	
1659	14						Red Oak	
1660	12						Basswood	
1661	11						Red Oak	
1662	8						Bitternut Hickory	
1663	8						Red Oak	
1664	13						Red Oak	
1665	6						Red Oak	
1666	22						Red Oak	
1667	7						Red Oak	
1668	6						Red Oak	
1669	6						Bitternut Hickory	
1670	16						Red Oak	
1671	NA						NA	double tagged with #1670
1672	7						Bitternut Hickory	40% dead
1673	10	10					Red Oak	two main trunks
1674	8						Paper Birch	
1675	6						Butternut	60% dead, cankers present
1676	6						Butternut	100% dead
1677	27						Cottonwood	
1678	8						Butternut	cankers present
1679	21						Cottonwood	
1680	6						Black Cherry	
1681	7	7					Paper Birch	two main trunks
1682	8						Paper Birch	
1683	14						Red Oak	
1684	8						Butternut	cankers present
1685	17						Red Oak	
1686	8						Butternut	cankers present
1687	8						Red Oak	
1688	6						Paper Birch	
1689	6						Paper Birch	
1690	8						Paper Birch	
1691	6						Paper Birch	
1692	6						Paper Birch	
1693	6						Paper Birch	
1694	7						Paper Birch	
1695	6						Paper Birch	
1696	8						Paper Birch	
1697	6						White Pine	
1698	8						Paper Birch	
1699	14						White Pine	
1700	13						Red Oak	

Tag #	DBH						Tree Type	Notes
1701	7						Paper Birch	
1702	7	7					Paper Birch	two main trunks
1703	9						Paper Birch	
1704	8						White Pine	
1705	20	9					Cottonwood	two main trunks
1706	12						White Pine	
1707	11						White Pine	white pine blister rust @ base
1708	16						White Pine	
1709	14						White Pine	
1710	6						Paper Birch	
1711	10						White Pine	
1712	4						Red Cedar	
1713	8						Paper Birch	
1714	9						White Pine	
1715	9						Paper Birch	
1716	6						White Pine	
1717	13						White Pine	
1718	9						Paper Birch	
1719	20						Cottonwood	
1720	16						White Pine	
1721	6						Red Cedar	
1722	4						White Pine	
1723	15						White Pine	
1724	18						White Pine	
1725	16						White Pine	
1726	20						White Pine	
1727	17						White Pine	
1728	16						White Pine	
1729	18						White Pine	
1730	4						White Pine	
1731	7						Paper Birch	
1732	6						Paper Birch	
1733	6						Paper Birch	
3301	16						Red Oak	
3302	16						Red Oak	
3303	8						Red Oak	
3304	8						Red Oak	
3305	9						Red Oak	
3306	12						Basswood	
3307	8						Red Oak	
3308	8						Red Oak	
3309	12						Red Oak	
3310	9						Paper Birch	
3311	7						Butternut	cankers present
3312	14						White Pine	
3313	11						Paper Birch	
3314	11						Red Oak	
3315	11						Black Cherry	
3316	8						Black Cherry	leaning
3317	8						Bitternut Hickory	

Tag #	DBH						Tree Type	Notes
3318	13	11					Paper Birch	two main trunks
3319	10						Black Cherry	
3320	12						Bitternut Hickory	
3321	14						Paper Birch	
3322	12						Black Cherry	
3323	12						Black Cherry	
3324	13						Basswood	
3325	8						Bitternut Hickory	
3326	15						Butternut	cankers present
3327	6						Paper Birch	
3328	6						Paper Birch	
3329	8						Red Oak	
3330	5						White Pine	
3331	11						Bitternut Hickory	
3332	10						Bitternut Hickory	
3333	10						Bitternut Hickory	
3334	12						White Oak	
3335	6						Bitternut Hickory	
3336	7						Red Oak	
3337	11						Bitternut Hickory	
3338	10						Black Cherry	
3339	8						Bitternut Hickory	
3340	6						Bitternut Hickory	
3341	8						Black Cherry	
3342	12						Ironwood	
3343	13						Basswood	
3344	11						Bitternut Hickory	
3345	11						Basswood	
3346	6						Bitternut Hickory	
3347	6						Butternut	cankers present
3348	11						Butternut	cankers present, 30% dead
3349	7						Butternut	cankers present
3350	7						Bitternut Hickory	
3351	6						Paper Birch	
3352	6						Paper Birch	
3353	6						Paper Birch	
3354	6						Paper Birch	
3355	7						Paper Birch	
3356	11						Red Oak	
3357	20	13					Red Oak	two main trunks
3358	12						Black Cherry	
3359	14						Red Oak	
3360	28						Red Oak	co-dominant leaders split at 7' up from base
3361	13						Black Cherry	internal decay in main trunk
3362	19						Red Oak	
3363	8						Basswood	
3364	15						Sugar Maple	
3365	6	6	6				Ironwood	three main trunks
3366	6						Bitternut Hickory	
3367	6						Ironwood	

Tag #	DBH						Tree Type	Notes
3368	10						Bitternut Hickory	
3369	7						Bitternut Hickory	
3370	10						Bitternut Hickory	
3371	8						Bitternut Hickory	
3372	18						Hackberry	
3373	6						Bitternut Hickory	
3374	15						Bitternut Hickory	
3375	13						Black Cherry	
3376	8						Bitternut Hickory	
3377	8						Bitternut Hickory	
3378	11						Bitternut Hickory	
3379	11						Red Oak	
3380	7						Bitternut Hickory	
3381	7						Bitternut Hickory	
3382	12						Black Cherry	
3383	6						Black Cherry	
3384	10						American Elm	
3385	14						Ironwood	
3386	12						Ironwood	
3387	12						Red Oak	
3388	7						Bitternut Hickory	
3389	11						American Elm	
3390	6						Ironwood	
3391	17						Red Oak	30% top missing from storm damage
3392	9						Ironwood	
3393	7/6						Ironwood	
3394	14						Ironwood	
3395	10						Ironwood	
3396	8						Ironwood	40% top missing
3397	6						Paper Birch	
3398	7	6	6				Ironwood	three main trunks
3399	7	6					Ironwood	two main trunks
3400	6						Ironwood	
3423	12						Black Cherry	
3424	6						Red Maple	
3425	7						Red Maple	
3426	12						Ironwood	
3427	10						Black Cherry	
3428	9						Black Cherry	
3429	13						Red Maple	co-dominant leaders split at 25' from base
3430	13						Paper Birch	
3431	7	6					Ironwood	two main trunks
3432	6						Ironwood	
3433	7						Ironwood	
3434	6						Ironwood	
3435	6						Ironwood	
3436	13						Ironwood	
3437	13						Black Cherry	
3438	7						Black Cherry	internal decay in main trunk, 50% top missing
3439	6						Ironwood	

Tag #	DBH						Tree Type	Notes
3440	8						Ironwood	
3441	6	6					Ironwood	two main trunks
3442	14						Black Cherry	
3443	12						Black Cherry	
3444	11						Black Cherry	
3445	12						Black Cherry	
3446	6						Ironwood	
3447	6						Ironwood	
3448	6						Ironwood	
3449	6						Ironwood	
3450	6						Ironwood	
3451	11						Basswood	
3452	7						Ironwood	
3453	7						Ironwood	
3454	6						Ironwood	
3455	7						Ironwood	
3456	7						Ironwood	
3457	6						Ironwood	
3458	10	7					Black Cherry	two main trunks
3459	6						Ironwood	
3460	6						Bitternut Hickory	
3461	10						Bitternut Hickory	
3462	6						Bitternut Hickory	
3463	14						Basswood	
3464	15						Butternut	few cankers present
3465	6						Bitternut Hickory	
3466	6						Bitternut Hickory	
3467	6						Bitternut Hickory	
3468	7						Bitternut Hickory	
3469	6						Bitternut Hickory	
3470	13						Bitternut Hickory	
3471	6						Bitternut Hickory	
3472	7						Bitternut Hickory	
3473	8						Bitternut Hickory	
3474	6						Bitternut Hickory	
3475	10	8					Basswood	two main trunks
3476	6						Bitternut Hickory	
3477	12						Basswood	
3478	6						Bitternut Hickory	
3479	7						Basswood	
3480	11						Red Oak	
3481	6	6					Ironwood	two main trunks
3482	6	6					Ironwood	two main trunks
3483	6						Ironwood	
3484	14						Red Oak	
3485	9	7					Ironwood	two main trunks
3486	7						Ironwood	
3487	14						Black Cherry	
3488	12						Black Cherry	
3489	8						Basswood	

Tag #	DBH						Tree Type	Notes
3490	17						Red Maple	20% top missing from storm damage
3491	11						Basswood	
3492	11						Paper Birch	
3493	13						Black Cherry	
3494	6						Red Maple	
3495	7						Ironwood	
3496	7						Ironwood	
3497	6						Ironwood	
3498	7						Ironwood	
3499	9						Red Maple	
3500	6						Ironwood	
3501	12	11					Paper Birch	two main trunks
3502	11	11					Paper Birch	two main trunks
3503	10						Paper Birch	
3504	6						Ironwood	
3505	7	6					Ironwood	two main trunks
3506	7						Ironwood	
3507	6						Ironwood	
3508	7						Ironwood	
3509	8						Ironwood	
3510	7	6					Ironwood	two main trunks
3511	12						Red Maple	
3512	14	13					American Elm	two main trunks
3513	8						American Elm	
3514	24						White Oak	
3515	6						Red Maple	
3516	10						Bitternut Hickory	
3517	11						Black Cherry	
3518	6						Red Maple	
3519	10						Black Cherry	
3520	6						Bitternut Hickory	
3521	6						Basswood	
3522	13						Red Oak	
3523	14						Red Oak	
3524	11						Red Oak	
3525	17						Red Oak	
3526	8						Hackberry	
3527	11						American Elm	
3528	7						Bitternut Hickory	
3529	7						Bitternut Hickory	
3530	7						Bitternut Hickory	
3531	9						Ironwood	
3532	9						Black Cherry	50% dead
3533	20						White Oak	
3534	7	7					Ironwood	two main trunks
3535	6						Sugar Maple	
3536	8						American Elm	
3537	18						White Oak	
3538	18						White Oak	
3539	6						Paper Birch	

Tag #	DBH						Tree Type	Notes
3540	6						Ironwood	
3541	8						Paper Birch	
3542	8						Paper Birch	
3543	6						Red Maple	
3544	6	6					Ironwood	two main trunks
3545	6						Ironwood	
3546	6						Ironwood	
3547	17						White Oak	
3548	8						Paper Birch	
3549	6						Ironwood	
3550	6						Ironwood	
3551	12						White Pine	
3552	6						Red Maple	
3553	8						Ironwood	
3554	6	6					Ironwood	two main trunks
3555	10	8					Ironwood	two main trunks
3556	20						White Oak	
3557	15						White Oak	
3558	6						Hackberry	
3559	16						White Oak	
3560	9						Red Maple	
3561	7						Ironwood	
3562	6						Red Maple	
3563	6						Ironwood	
3564	6						Ironwood	located off-site
3565	7						Red Maple	located off-site
3566	7	6					Ironwood	two main trunks, located off-site
3567	7						Red Maple	
3568	9						Ironwood	
3569	6						Red Maple	
3570	6						Red Maple	
3571	11						Ironwood	
3572	6						Ironwood	
3573	11						Black Cherry	
3574	11						Black Cherry	
3575	6						Ironwood	
3576	20						Red Maple	located off-site
3577	6						Ironwood	located off-site
3578	12						Bitternut Hickory	located off-site
3579	6						Basswood	
3580	14						Red Oak	
3581	8						Red Oak	
3582	20						Red Oak	
3583	6						American Elm	infected with Dutch Elm Disease, water sprouting
3584	13						Bitternut Hickory	
3585	11						Red Oak	
3586	17						Red Maple	35% top missing from storm damage
3587	9	7					Ironwood	two main trunks
3588	12						Red Maple	
3589	20						White Oak	

Tag #	DBH						Tree Type	Notes
3590	8						Paper Birch	
3591	9						Paper Birch	
3592	10						Red Maple	
3593	7						Ironwood	
3594	9						Ironwood	
3595	6						Ironwood	
3596	6						Ironwood	
3597	21						Red Oak	
3598	10						Red Maple	
3599	6						Ironwood	
3600	19						Red Oak	
3601	12						Red Maple	
3602	6						Black Cherry	
3603	6						Red Maple	
3604	11						Red Maple	located off-site
3605	6						Red Maple	
3606	13						Red Maple	located off-site
3607	6						Ironwood	located off-site
3608	6						Red Oak	located off-site
3609	9						Black Cherry	70% dead
3610	6						Bitternut Hickory	located off-site
3611	10						Red Maple	located off-site
3612	11						Red Maple	located off-site
3613	13						Red Maple	located off-site
3614	11						Bitternut Hickory	
3615	7						Basswood	
3616	13	11					Basswood	two main trunks
3617	6						Bitternut Hickory	
3618	6						Red Oak	
3619	13						Paper Birch	
3620	12						Paper Birch	
3621	10						Black Cherry	
3622	7						Basswood	
3623	7						Black Ash	
3624	11	9					Black Cherry	two main trunks
3625	6						Bitternut Hickory	
3626	7						Bitternut Hickory	
3627	7						Bitternut Hickory	
3628	14						Basswood	leaning on tree #3627
3629	11						White Oak	
3630	11						Red Maple	
3631	6						Black Ash	
3632	8						Bitternut Hickory	
3633	12						American Elm	
3634	7	7					Ironwood	two main trunks
3635	20						Bur Oak	
3636	6						Bitternut Hickory	
3637	7						Ironwood	
3638	7						Ironwood	
3639	11						Ironwood	

Tag #	DBH						Tree Type	Notes
3640	13	10					Basswood	two main trunks
3641	7						Basswood	
3642	7						Bitternut Hickory	
3643	11						Paper Birch	
3644	20	17	17	17			Basswood	four main trunks
3645	20	9					Basswood	two main trunks
3646	12						Green Ash	
3647	8						Basswood	
3648	14						Black Cherry	50% dead
3649	17						Basswood	
3650	8						American Elm	
3651	11						Red Maple	
3652	15						Red Maple	
3653	11						Basswood	
3654	40						White Pine	
3655	13						Black Cherry	
3656	9	7					Ironwood	two main trunks
3657	7						Black Ash	
3658	13						Black Cherry	
3659	8						Bitternut Hickory	
3660	8						American Elm	
3661	6						American Elm	
3662	12						American Elm	
3663	12						American Elm	
3664	7						Bitternut Hickory	
3665	12						Hackberry	
3666	9						Hackberry	
3667	6						Hackberry	
3668	8						Hackberry	
3669	9						Hackberry	
3670	6						Hackberry	
3671	7						Bitternut Hickory	
3672	7						Hackberry	
3673	12						Hackberry	
3674	8						Hackberry	
3675	6						Hackberry	
3676	8						Bitternut Hickory	
3677	9						Bitternut Hickory	
3678	8						Basswood	
3679	6						Bitternut Hickory	
3680	14						Red Oak	internal decay at base of tree
3681	13						Bitternut Hickory	
3682	7						Basswood	
3683	6						Basswood	
3684	7						Hackberry	
3685	6						Paper Birch	
3686	6						Paper Birch	
3687	6						Paper Birch	
3688	6						Paper Birch	
3689	6						Paper Birch	

Tag #	DBH						Tree Type	Notes
3690	6						Paper Birch	
3691	6						Paper Birch	
3692	10						White Pine	
3693	4						White Pine	
3694	4						White Pine	
3695	6						Paper Birch	
3696	9	9					Paper Birch	two main trunks
3697	4						Red Cedar	
3698	15						White Pine	
3699	13						White Pine	
3700	15						White Pine	
3701	6						Paper Birch	
3702	7						White Pine	
3703	6						Paper Birch	
3704	8						Butternut	many cankers present
3705	12						White Pine	infected with white pine blister rust
3706	8	7					Paper Birch	two main trunks
3707	6						Paper Birch	
3708	7						Paper Birch	
3709	6						Paper Birch	
3710	6						Paper Birch	
3711	6						Paper Birch	
3712	7						Paper Birch	
3713	6						Paper Birch	
3714	6						Paper Birch	
3715	6						Paper Birch	
3716	6						Paper Birch	
3717	6						Green Ash	
3718	9						American Elm	
3719	9						Red Oak	
3720	7						Paper Birch	
3721	7						White Pine	
3722	6						White Pine	
3723	4						White Pine	
3724	5						White Pine	
3725	5						White Pine	
3726	6						Ironwood	
3727	7	7					Basswood	two main trunks
3728	14	12					Paper Birch	two main trunks
3729	6						Ironwood	
3730	6						Ironwood	
3731	6						Ironwood	
3732	6						Ironwood	
3733	7	6					Paper Birch	two main trunks
3734	27						Red Oak	
3735	7						Ironwood	
3736	7	6					Ironwood	two main trunks
3737	11	9					Paper Birch	two main trunks
3738	10						Paper Birch	
3739	6						Paper Birch	

Tag #	DBH						Tree Type	Notes
3740	10						Ironwood	
3741	25						Red Oak	
3742	20						Red Oak	
3743	16						Red Oak	
3744	23						White Pine	
3745	19						Red Oak	
3746	6						Red Maple	
3747	8						Paper Birch	
3748	31						White Pine	
3749	14						Bitternut Hickory	
3750	8						Basswood	
3751	13						Red Oak	
3752	8	8	6	6			Paper Birch	four main trunks
3753	10						Basswood	
3754	6						Ironwood	
3755	6						Ironwood	
3756	8	7					Paper Birch	two main trunks
3757	6						Paper Birch	
3758	11						Black Cherry	
3759	8						Black Cherry	
3760	6						Red Maple	
3761	6						Basswood	
3762	6						Ironwood	
3763	7						Paper Birch	
3764	6						Ironwood	
3765	18						Red Maple	
3766	20						Red Oak	
3767	12						Paper Birch	
3768	15						White Oak	
3769	7						Ironwood	
3770	20						White Oak	
3771	18						White Oak	
3772	6						Red Oak	
3773	23						Red Oak	70% top missing from storm damage
3774	15	14	8				Paper Birch	three main trunks
3775	6						Bitternut Hickory	
3776	8						Paper Birch	
3777	13						Bitternut Hickory	
3778	10						Ironwood	
3779	10	8	7	6			Paper Birch	four main trunks
3780	6						Red Oak	
3781	7						Red Maple	
3782	16						White Oak	
3783	16						Red Oak	
3784	29						Red Oak	
3785	14	14	12				Red Maple	one of three main trunks has top missing
3786	7						Bitternut Hickory	
3787	6						Black Cherry	50% dead
3788	26						Red Oak	
3789	11						Black Cherry	

Tag #	DBH						Tree Type	Notes
3790	13						White Oak	
3791	6						Red Maple	
3792	15						White Oak	
3793	16						Red Oak	
3794	22						Red Oak	
3795	6						Red Oak	
3796	10						Sugar Maple	
3797	6						Red Oak	
3798	14						Red Oak	
3799	18						Red Oak	internal decay in main trunk
3800	6						Ironwood	
3801	6						Paper Birch	
3802	15						Red Oak	
3803	6						Paper Birch	
3804	10						Red Oak	
3805	7						Paper Birch	
3806	21						Red Oak	
3807	10						Red Oak	
3808	11						Red Oak	
3809	12						White Oak	
3810	16						White Oak	
3811	12						Paper Birch	
3812	10						Red Oak	
3813	7						Basswood	
3814	6						Paper Birch	
3815	11						White Pine	
3816	6						Red Oak	
3817	9						Sugar Maple	
3818	19	19					Red Oak	two main trunks
3819	7						Paper Birch	
3820	7						Red Oak	
3821	17	17	12				Red Oak	three main trunks
3822	6						Red Oak	
3823	19						Red Oak	
3824	18						White Oak	
3825	18						Red Oak	
3826	6						Ironwood	
3827	7						Ironwood	
3828	8	8	7	7	6	6	Paper Birch	six main trunks
3829	7						Paper Birch	
3830	12						Ironwood	
3831	17						White Oak	
3832	22						White Oak	
3833	30						White Oak	
3834	10						Red Maple	
3835	7						Basswood	
3836	20	19					White Pine	two main trunks
3837	6						Paper Birch	
3838	7						Paper Birch	
3839	8						Paper Birch	

Tag #	DBH						Tree Type	Notes
3840	6						Paper Birch	
3841	7						Paper Birch	
3842	7	7					Paper Birch	two main trunks
3843	7						Paper Birch	
3844	6						Red Oak	
3845	11						Red Oak	
3846	8						Basswood	
3847	8						American Elm	
3848	9						Basswood	
3849	10						Basswood	
3850	20	16	16				Basswood	16" trunk is alive, other two are dead
3851	14						Red Oak	
3852	6						Red Oak	
3853	21						Red Oak	
3854	16						Red Oak	
3855	6						Basswood	
3856	17	15					Paper Birch	17" trunk is dead, two main trunks
3857	6						Ironwood	
3858	17						Red Oak	
3859	8						Red Oak	
3860	7						Red Oak	
3861	24						Red Oak	
3862	14						White Oak	
3863	7						Ironwood	
3864	14						Black Cherry	
3865	15						Red Oak	
3866	10						Red Oak	
3867	10						Red Oak	
3868	10						Red Oak	
3869	15						Red Oak	
3870	11						Red Oak	
3871	6						Red Oak	
3872	16	9					Basswood	two main trunks
3873	22						Red Oak	
3874	10						Red Oak	
3875	12						Red Oak	
3876	16						Red Oak	
3877	7						Red Oak	
3878	12						Red Oak	
3879	6						Bitternut Hickory	
3880	18						White Oak	
3881	13						Red Oak	
3882	25						Red Oak	
3883	12						White Oak	
3884	19						White Oak	
3885	7						Basswood	
3886	7						White Oak	
3887	14						White Oak	
3888	15						White Oak	
3889	15						Red Oak	

Tag #	DBH						Tree Type	Notes
3890	17						White Oak	
3891	14						Red Oak	
3892	20						Basswood	
3893	8						White Oak	
3894	18						Red Oak	
3895	13	13					Basswood	two main trunks
3896	29						Red Oak	
3897	11						White Oak	
3898	7						Ironwood	
3899	16	14					Basswood	two main trunks
3900	7						Ironwood	
3901	15	14					Basswood	two main trunks
3902	11						White Oak	some damage from tree that fell on it
3903	16						White Oak	
3904	6						Ironwood	
3905	6						Ironwood	
3906	17						White Oak	
3907	8						American Elm	
3908	6						Ironwood	
3909	24						Red Oak	
3910	16						White Pine	60% top missing, internal decay at base
3911	26						White Oak	
3912	6						Basswood	
3913	9						Basswood	
3914	12						Basswood	
3915	20						Basswood	
3916	17						Basswood	
3917	11						Paper Birch	
3918	15						White Oak	
3919	17						White Oak	
3920	8						Ironwood	
3921	11						American Elm	
3922	12						Paper Birch	
3923	27						White Oak	
3924	12						Bitternut Hickory	
3925	6						American Elm	
3926	17						White Oak	
3927	14						White Oak	
3928	8	7					Ironwood	two main trunks
3929	8						Sugar Maple	
3930	10	8					Basswood	two main trunks
3931	9						Ironwood	
3932	6						Ironwood	
3933	7						Ironwood	
3934	10						Ironwood	
3935	16						Paper Birch	
3936	7						Ironwood	
3937	8						Ironwood	
3938	10						Ironwood	
3939	6						Ironwood	

Tag #	DBH						Tree Type	Notes
3940	7						Ironwood	
3941	10						Bitternut Hickory	
3942	12						Basswood	
3943	6						Sugar Maple	
3944	6						American Elm	
3945	7						Bitternut Hickory	
3946	20						Red Oak	
3947	15						Basswood	
3948	6						Bitternut Hickory	
3949	8						Bitternut Hickory	
3950	11						Bitternut Hickory	
3951	6						Black Cherry	
3952	10						Bitternut Hickory	
3953	7						Basswood	
3954	20						Red Oak	
3955	11						Bitternut Hickory	
3956	7						Bitternut Hickory	
3957	8						Bitternut Hickory	
3958	10						American Elm	
3959	11						Basswood	
3960	6						Basswood	
3961	7						Ironwood	
3962	6						Ironwood	
3963	7						Basswood	
3964	10						Bitternut Hickory	
3965	6						Ironwood	
3966	7						Basswood	
3967	11						Basswood	
3968	8						Bitternut Hickory	
3969	6						Basswood	
3970	8						Basswood	
3971	17	15					White Oak	two main trunks
3972	21						Red Oak	internal decay in main trunk
3973	20						Hackberry	
3974	18						White Oak	
3975	10						Ironwood	
3976	7						Ironwood	
3977	6						Ironwood	
3978	12						Red Oak	
3979	12						Basswood	
3980	18						White Oak	co-dominant split to base from 10' up in tree
3981	7						Basswood	
3982	10	9					Basswood	two main trunks
3983	16						Red Oak	
3984	13						Red Oak	
3985	16						Red Oak	
3986	12						Red Oak	
3987	15						Basswood	
3988	10						Ironwood	
3989	7						Ironwood	40% top dead, internal decay at base of tree

Tag #	DBH						Tree Type	Notes
3990	6						Ironwood	
3991	7	6					Ironwood	two main trunks
3992	6						Ironwood	
3993	8						Bitternut Hickory	
3994	6						Ironwood	
3995	7	6					Ironwood	two main trunks
3996	14						Red Oak	
3997	6						Red Oak	
3998	9						Red Oak	
3999	10						Red Oak	
4000	21						Red Oak	