



Critical Connections Ecological Services, Inc.

21150 Ozark Avenue North, PO Box 184, Scandia, Minnesota 55073

Natural
Resource
Consulting

August 5th, 2014

Landscape
Ecology

Ms. Sherri Buss
City Planner, City of Scandia
1500 Piper Jaffray Plaza

Botanical
Inventories

444 Cedar Street
St. Paul, MN 55101-2140

Threatened &
Endangered
Species Surveys

RE: Zavoral Reclamation Plan: Proposed Transition Area Development

Dear Ms. Buss:

Greenway &
Open Space
Planning

As discussed at our meeting held on May 19, 2014 we are providing you with our proposed plan for developing the transition area within the Phase 1 Reclamation area at the Zavoral Site (Site) in Scandia. This plan has been developed based on input provided by the City and other reviewing agencies after an on-site review of the proposed transition area as well as discussions regarding an appropriate approach to creating a transition area using the adaptive management strategy outlined in the approved Reclamation Plan (April 2013). Our proposed approach is described in detail below.

Natural
Community
Restoration

Wetland
Delineation &
Permitting

1.0 Background and Intent of Reclamation Plan for the Transition Area

Wetland
Banking &
Monitoring

The intent of developing a transition area at the Zavoral Site, as indicated in the approved Reclamation Plan, is to provide a transition area using existing, on-site trees along the established woodland/forested edges and the newly planted prairie areas. The original method selected for development of this transition area relied primarily on the transplantation of suitable on-site trees to areas along the existing forested edge within Phase 1 Reclamation. The transplantation was to occur after complete removal of vegetation, including existing trees, followed by final grading with engineered topsoil in an effort to minimize the spread and proliferation of invasive plant species within transplanted transition areas.

Minnesota
Land Cover
Classification

Geographic
Information
Systems

The *Zavoral Tree Transplanting Results* and the *Annual Reclamation Report 2013*, documents the extensive efforts undertaken to establish transition areas through transplantation. The report demonstrates the method selected for the development of the transition areas between the existing forest and the planted prairie areas is not an effective means to accomplish the intent of the Reclamation Plan. The method described in the Reclamation Plan indicates a tree spade between 65 inches to 90 inches will be used to transplant a minimum of 100 on-site white pine trees into the proposed transition area within Phase 1 Reclamation. Due to the rocky/stony on-site soils, including boulders and coarse material encountered throughout Phase 1 Reclamation, transplanting the specified number of trees proved to be unachievable. The majority of the suitable trees identified

Global
Positioning
Systems

Database
Management &
Development

Environmental
Education

as transplant candidates could not be successfully dug from the rocky and impenetrable parent soil. Furthermore, since the primary problem with transplantation was that due to rocky conditions, suitable receiving holes for potential transplant trees could not be dug. A tremendous effort was made in an attempt to develop the transition area using the implementation method selected in the Reclamation Plan. These efforts were unsuccessful. After several dozen chosen transplant trees were damaged beyond use as a result of unsuccessful transplant attempts, the transplanting was terminated in late October 2013.

1.1 Proposed Transition Area Development and Reclamation Plan Cost Comparison

The proposed transition area development using an alternative approach will not result in a cost savings for Tiller Corporation (Tiller). Based on the *Cost Estimate for Reclamation-Zavoral* submitted to the City in November 2012, the projected cost to reclaim the transition area (approximated at 1.4 acres) is estimated to be approximately \$9,700.00. As part of the submitted cost estimate, the transplantation of a minimum of 100 trees was estimated to cost approximately \$5,250.00. Extensive efforts were made to transplant the trees during the 2013 operating season, which is reflected in the nearly \$7,000.00 that was actually invested into efforts that resulted in the transplantation of 25 white pine trees. With the project over budget and the transplantation of on-site white pine trees proving to be nearly impossible, it was apparent that adaptive management techniques would need to be applied to accomplish the development of a transition area in Phase 1 Reclamation. After considering the costs outlined in Section 3 of this letter and adjusting the original *Cost Estimate for Reclamation-Zavoral*, it is projected that the proposed alternative detailed in this plan results in a total estimated cost of approximately \$9,120.00. Adding this to the nearly \$7,000.00 spent last year will bring the total estimated cost for the transition area to approximately \$16,000.00 which far exceeds the original \$9,700.00 cost estimate.

2.0 Proposed Transition Area Development for Phase 1

The Reclamation Plan recognizes the possibility that Site conditions experienced in the field may require modifications to the Reclamation Plan. These modifications were termed “adaptive management” techniques. Among other things, adaptive management techniques allow for changing the selected implementation methods in order to accomplish the goals and intent of the Reclamation Plan. On May 19, 2014, Tiller and the project ecologists from Critical Connections Ecological Services, Inc. (CCES) met with representatives from the City of Scandia, the National Park Service and the Washington Conservation District to discuss acceptable options for alternative methods and actions which could be completed in an effort to develop a suitable transition area. At the May 19th meeting, which included a field review of the area in question, staff from the representative agencies agreed that Tiller’s proposal to avoid clearing existing trees and thereby developing a transition area through tree preservation and adaptive management activities would be a preferred alternative since transplanting could not be accomplished. The NPS agreed that preservation would be a preferred alternative for the transition area within the Federal Scenic Easement. An alternative approach detailed in this document, allows for up to 590, 2” to 14” diameter trees to remain in place while developing a soft and ecologically diverse transition area between the existing

forested areas and the reclaimed grassland areas (see Figure 1). The alternative approach to developing the transition area is outlined below.

2.1 Ecological Benefit of Proposed Transition Area Development

By definition, a transition zone (also known as an “ecotone”) is a transitional area of vegetation between two different plant communities, such as the area between a forest and grassland. It is an area where vegetation from one plant community type blends with vegetation from an adjacent plant community type. Sometimes this change in vegetation is abrupt with a sharp visual contrast, at other times it is more gradual and less visually distinct. Transition areas contain plant and animal species specifically adapted to the physical conditions imposed by a transition zone. A transition zone may exist along a broad belt or in a small pocket, such as a forest clearing, where two local communities blend together (Smith and Smith, 2012). It should be noted that a transition area is not simply a visual change or a gradation in plant height classes from one plant community to the next. Rather, transition areas serve an important ecological function and support edge adapted species that are dependent on the physical conditions that occur only in transitional areas. Our understanding of the ecology behind transition zones was used as the foundation for designing the alternative approach to develop the transition area.

The Reclamation Plan called for the complete clearing and grading of the transition area followed by reclamation activities including tree transplantation and native plantings to create a softened transition area between the existing forested area to the east and the reclaimed grassland to the west. The proposed alternative approach to developing the transition area involves both tree preservation and adaptive management activities since transplantation of trees could not be accomplished.

The proposed alternative approach to developing the transition area allows for the preservation of up to 590 trees between 2” in diameter and 14” in diameter and the creation of a transition area using existing material and vegetation native to the Site. To help shape the transition area, the next step would be to selectively thin the preserved trees focusing on removing the over abundant species or unhealthy trees while creating openings and pockets. By selectively thinning the existing trees, sub-canopy and shrub layer a multi-aged stand which grades into an area dominated by native shrubs and eventually into the reclaimed prairie grassland will be achieved. The openings and pockets provide an opportunity to integrate more shrub and herbaceous prairie species resulting in a more gradual transition that will be substantially more diverse and natural in appearance as compared to complete clear cutting and replanting.

2.2 Re-Assessment of Proposed Transition Area

During the peak of the growing season, late June 2014, CCES ecologists completed a follow-up visit to the proposed transition area to gather additional data regarding the condition and dominant cover of the existing forest/prairie transition area. A re-assessment of the Site revealed that the canopy area was dominated by white pine (*Pinus strobus*) and quaking aspen (*Populus tremuloides*), with small inclusions of white oak (*Quercus alba*), red oak (*Quercus rubus*), paper birch (*Betula papyrifera*), and cottonwood

(*Populus deltoides*). The sub-canopy included significantly sized trees of the species white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), red oak (*Quercus rubus*) and black cherry (*Prunus serotina*). The shrub layer was thickly dominated by immature white pine (*Pinus strobus*), prickly ash (*Zanthoxylum americanum*), box elder (*Acer negundo*), red raspberry (*Rubus idaeus*), ironwood (*Ostrya virginiana*) and red cedar (*Juniperus virginiana*). The herbaceous understory is dominated by *Equisetum* sp., seedlings of white pine (*Pinus strobus*), virginia creeper (*Parthenocissus quinquefolia*), wild grape (*Vitis riparia*), Pennsylvania sedge (*Carex pensylvanica*), poison ivy (*Toxicodendron radicans*), hog peanut (*Amphicarpaea bracteata*), Canada anemone (*Anemone canadensis*), pointed tick trefoil (*Desmodium canescens*), pussytoes (*Antennaria neglecta*) as well as others. Several pockets within the forested area are completing lacking in herbaceous cover. Non-native invasive species present within the existing transition area include common buckthorn, leafy spurge, hoary alyssum, spotted knapweed, and Tartarian honeysuckle.

3.0 Proposed Transition Area Development for Phase 1 – Description of Tasks

The goal of the Reclamation Plan for the transition area is to create a gradual ecological transition zone of change between the existing forested areas and the reclaimed grassland areas. Based on input from City staff and reviewing agencies, we are proposing to create this gradual and softened transition zone with an adaptive management approach and using the following steps:

Task 1: Selective Removal of Sub-Canopy and Shrub Species

Project ecologists will evaluate the forested area and tag select shrub and sub-canopy species for removal. Ecologists will first mark all invasive and/or weedy shrubs such as common buckthorn, Tartarian honeysuckle, and prickly ash for removal. Project ecologists will then evaluate areas where the shrub layer has become very dense and overgrown and select a portion of native shrubs for removal. Species that will be targeted for removal will be those which are over abundant in the transition zone and smothering herbaceous vegetation, most notably immature individuals of white pine (*Pinus strobus*) and quaking aspen (*Populus tremuloides*), which are dominate in the shrub layer.

Estimated Cost of Task 1:

Task or Material	Units	Number of Units	Cost per Unit	Total
Selective Shrub Removal (cut, stack, remove)	Acres	0.25	\$2,000.00	\$500.00
			TOTAL	\$500.00

Task 2: Selective Removal of Herbaceous Species

Following selective removal of shrubs, the project ecologists will begin efforts to restore the ground layer. Undesirable or non-native and invasive species will be targeted for removal. Targeted species will include sweet clover, hoary alyssum, leafy spurge, smooth brome and poison ivy all of which have been documented within the existing transition area. In September and October 2014, when plants are actively growing and prior to winter dormancy, a targeted herbicide application will be completed by a licensed, commercial

applicator. A follow-up application will be completed later in the growing season of 2015 to ensure undesirable species are controlled.

Estimated Cost of Task 2:

Task or Material	Units	Number of Units	Cost per Unit	Total
Herbaceous Herbicide Treatment	Acres	1.4	\$300.00	\$420.00
			TOTAL	\$420.00

Task 3: Reintroduction of Native Shrubs

After over-abundant shrub species are thinned and initial herbicide treatments in the transition area are complete, the project ecologists will begin reintroduction of the appropriate native shrub species in an effort to create a softened and more gradual transition zone between the existing forested area and the reclaimed grassland/prairie area on the Site. Project ecologists will install at least 75 and up to 100 shrub and sub-canopy tree species that are appropriate for the Site and would be found naturally in a transition zone between a native prairie and forest. Plantings will be focused in pockets currently lacking trees and shrubs. Species will be selected from the list below but will be dependent on availability at the time of planting. Newly installed woody material will be watered as needed during the first growing season to ensure a high level of survivability.

Selected Shrub Species for Reintroduction (dependent on availability of stock)

<u>Common Name</u>	<u>Botanical Name</u>	<u>Quantity, #2 Pots</u>
Low Serviceberry	<i>Amelanchier humilis</i>	5
Lead Plant	<i>Amorpha canescens</i>	15
New Jersey Tea	<i>Ceanothus americanus</i>	5
Dogwood	<i>Cornus alternifolia, Cornus racemosa, Cornus sericea</i>	15
American Hazelnut	<i>Corylus americana</i>	5
Ninebark	<i>Physocarpus opulifolius</i>	5
American Wild Plum	<i>Prunus americana</i>	10
Chokecherry	<i>Prunus virginiana</i>	5
Prairie Rose	<i>Rosa arkansana</i>	5
Smooth Wild Rose	<i>Rosa blanda</i>	5
Nannyberry	<i>Viburnum lentago</i>	5

Selected Sub-Canopy/Canopy Species for Reintroduction (dependent on availability of stock)

<u>Common Name</u>	<u>Botanical Name</u>	<u>Quantity, #2 Pots</u>
Ironwood	<i>Ostrya virginiana</i>	7
Pin Cherry	<i>Prunus pensylvanica</i>	5

White Oak	<i>Quercus alba</i>	8
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Estimated Cost of Task 3:

Task or Material	Units	Number of Units	Cost per Unit	Total
Installation	Each	100	10.00	\$ 1,000.00
Native Material (#2 pots)	Each	100	30.00	\$ 3,000.00
Mulch	Each	100	2.50	\$ 250.00
Establishment watering	LS	10	25.00	\$ 250.00
			TOTAL	\$4,500.00

Task 4: Reintroduction of Native Herbaceous Species

Following effective treatment of undesirable or non-native and invasive herbaceous species, native herbaceous species will be seeded into the transition zone area. A custom designed native seed mix will be developed which will be tailored specifically for the site’s location, aspect, light availability, soil conditions, and other biotic and abiotic factors. The seed mix will be installed using a broadcast method and will likely be completed in the late Fall 2015 or in Spring 2016. Seeding rate will be 10-15 PLS pounds per acre of native seed. A proposed seed mix is provided below.

Grasses, Sedges & Rushes			
<u>Common Name</u>	<u>Botanical Name</u>	<u>Seeds/oz.</u>	<u>Amount/Acre (oz)</u>
Big bluestem	<i>Andropogon gerardii</i>	10000	24
Sideoats grama	<i>Bouteloua curtipendula</i>	6000	32
Plains oval sedge	<i>Carex brevior</i>	29000	1
Graceful sedge	<i>Carex gracillima</i>	102000	1
Straight-styled wood sedge	<i>Carex radiata</i>	41000	1
Long-beaked sedge	<i>Carex sprengeii</i>	10000	1
Canada wildrye	<i>Elymus canadensis</i>	5200	32
Bottle-brush grass	<i>Elymus hystrix</i>	7600	32
Little bluestem	<i>Schizachyrium scoparium</i>	15000	24
Indian grass	<i>Sorghastrum nutans</i>	12000	24
Porcupine grass	<i>Stipa spartea</i>	680	12
Subtotal			184
Forbs (Wildflowers)			
<u>Common Name</u>	<u>Botanical Name</u>	<u>Seeds/oz.</u>	<u>Amount/Acre (oz)</u>
Butterfly milkweed	<i>Asclepias tuberosa</i>	4300	1.5
Smooth leaved aster	<i>Aster laevis</i>	55000	2
Coreopsis	<i>Coreopsis palmata</i>	10000	1.5
Purple prairie clover	<i>Dalea purpurea</i>	15000	1.5
Showy Tick Trefoil	<i>Desmodium canadense</i>	5500	1
Narrow leaved coneflower	<i>Echinacea angustifolia</i>	7000	2
Early sunflower	<i>Heliopsis helianthoides</i>	6300	2

Wild bergamot	<i>Monarda fistulosa</i>	70000	1.5
Foxglove beardtongue	<i>Penstemon digitalis</i>	130000	1
Mountain mint	<i>Pycnanthemum virginianum</i>	220000	0.25
Black eyed susan	<i>Rudbeckia hirta</i>	92000	2
Golden alexanders	<i>Zizia aurea</i>	11000	1
Subtotal			17.25
Mix Totals			201.25
Pounds Per Acre			12.58

Estimated Cost of Task 4:

Task or Material	Units	Number of Units	Cost per Unit	Total
Install Native Seed Mixes, Includes Seed and Labor	Acres	1.0	\$2,200.00	\$2,200.00
			TOTAL	\$2,200.00

Task 5: Maintenance and Management

When tasks 1-4 are complete, Tiller will continue to manage and maintain the area as a reclaimed transition area along with management and maintenance activities associated with the remainder of the Site as described in the Reclamation Plan. Newly planted trees and shrubs will be watered and mulched as needed to ensure high levels of survivability. Brush mowing and targeted herbicide application will be used to control weed species during the establishment phase. It should be noted that prescribed fire will not be used to manage the transition area as fire will set back or potentially kill newly planted shrubs and trees. Figure 2 depicts the location of the proposed fire break.

4.0 Performance Measures

The preserved and reclaimed transition area as described above will be managed and monitored annually for five years following initiation of reclamation activities in accordance with the Reclamation Plan. Management and maintenance activities will be adjusted to ensure the following performance goals are met for the Site as per the CUP, Conditions #63 & #65:

- 90% areal coverage of vegetation for each reclaimed area, within 3 years post seed installation.
- Non-native and invasive plant species (as defined and listed by the MNDNR) and potentially-aggressive native plant species (*Rhus* spp. And *Juniperus virginiana*) shall account for no more than 20% cover of the reclaimed areas at the end of the 5th growing season, post seed installation.
- The reclaimed areas shall contain at least 50% of the species for both grasses and forbs contained in the specified seed mixes at the end of the 5th growing season, post seed installation.
- The City shall monitor the transplantation of trees (and shrubs) to ensure a survival rate of at least 80% for all transplanted trees (and shrubs). The Applicant shall provide the City with the quantity, location, species and proposed maintenance plan for all trees (and shrubs) transplanted as part of

Tiller Corporation – Zavoral Property
Proposed Transition Area Development
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the reclamation. Survival rates of less than 80% will require replacement of the dead trees (and shrubs) by the applicant. Replacement tree (and shrub) species will be selected in consultation with the City and its consultant and approved by the City.

Thank you for your consideration of this proposed transition area development plan. Should you have questions or need additional information, please contact us at 651-433-4410.

Respectfully Submitted,

Critical Connections Ecological Services, Inc.



Jason Husveth
President, Principal Ecologist



Photo 1: Current condition of future transition area – shrub and sub-canopy dominated by quaking aspen (*Populus tremuloides*) and other species which will be thinned to create a more diverse transition area between the forested area and reclaimed prairie area.

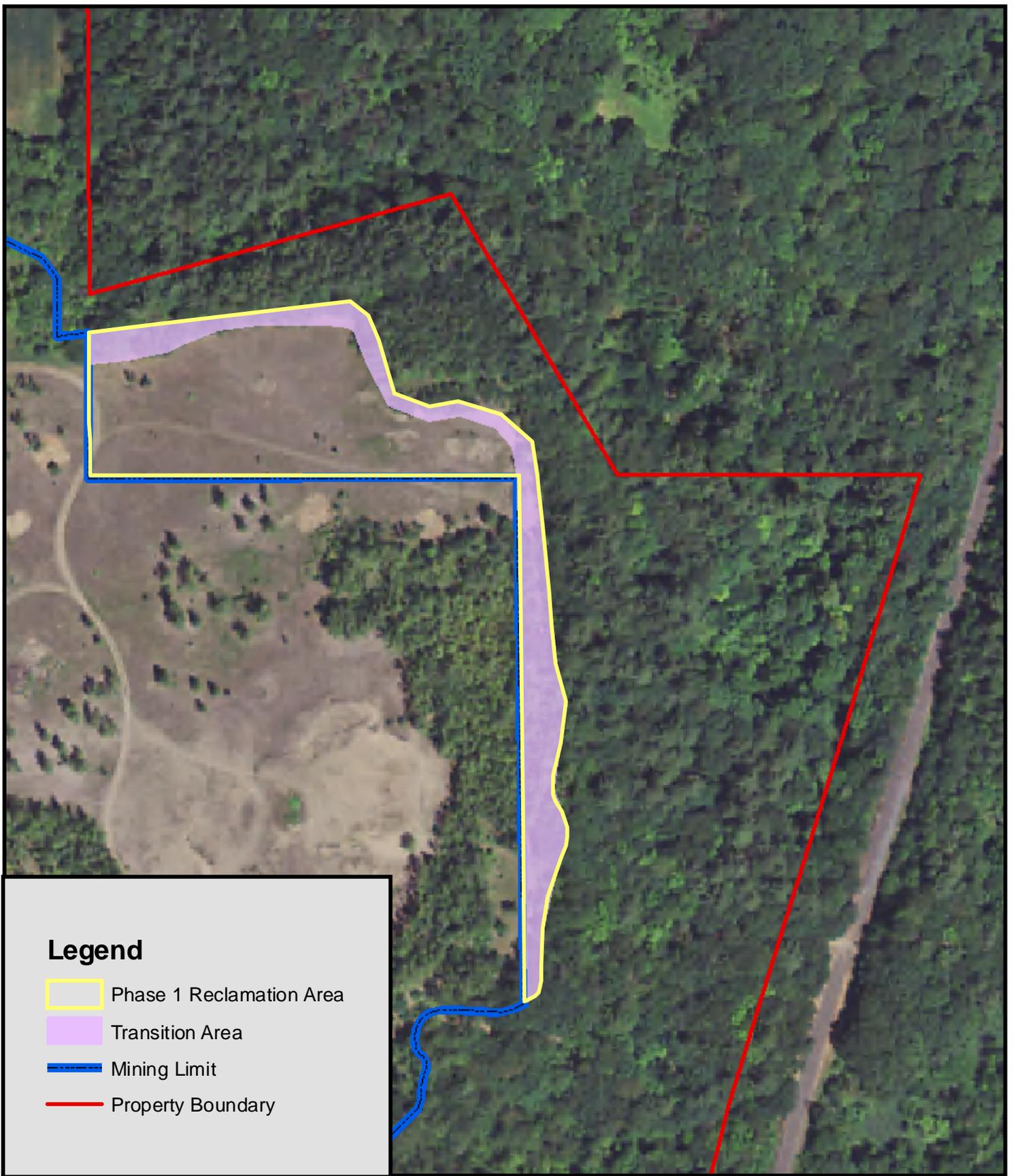


Photo 2: View of existing transition area just inside of the wood line. White Pine (*Pinus strobus*) saplings will be thinned to create a more diverse transition area and allow for the establishment of an herbaceous & shrub layer.

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LITERATURE CITED

Smith T and Smith R, 2012. Elements of Ecology (8th Edition). Benjamin Cummings Publishing Company, San Francisco, California, United States.

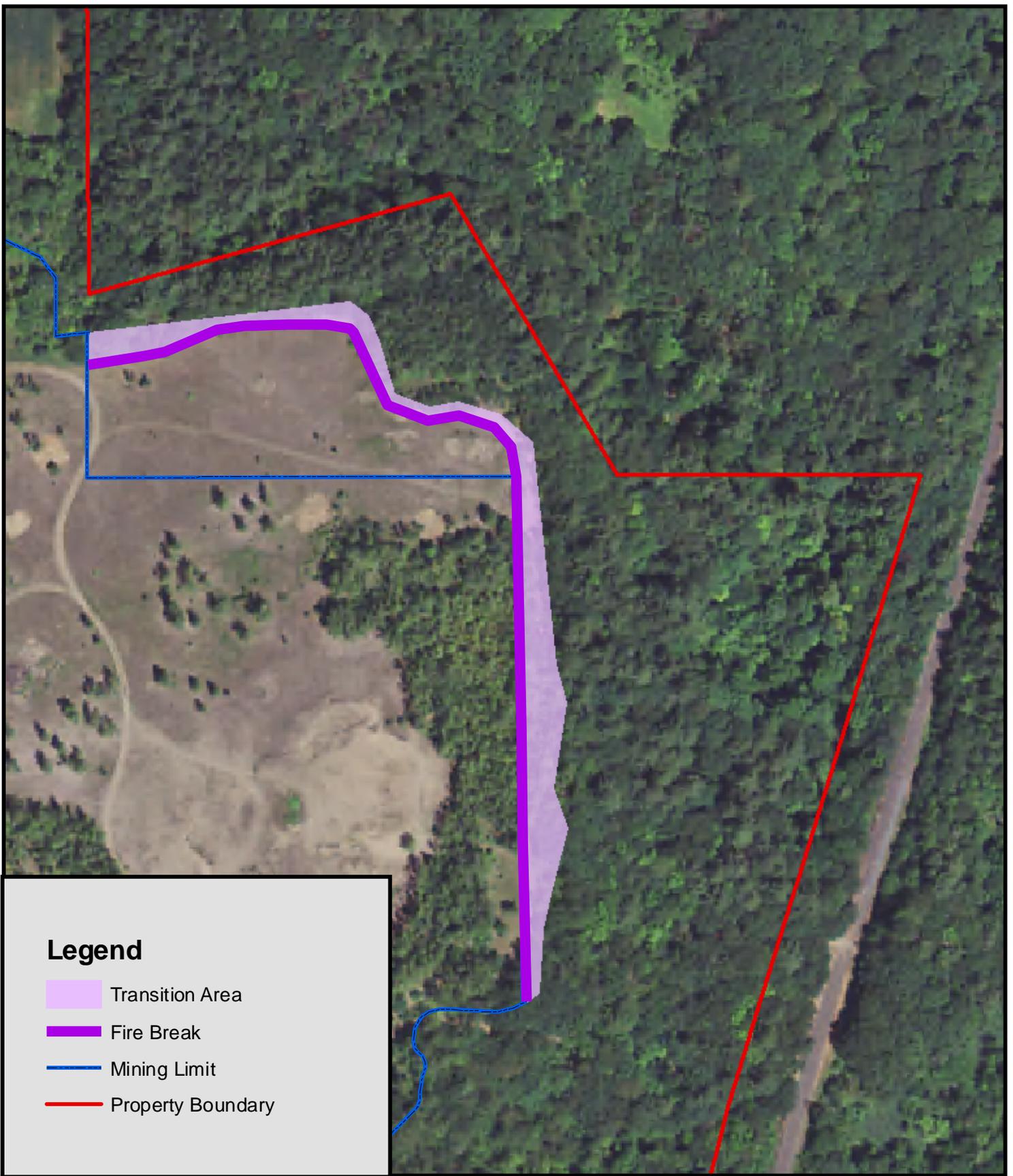


Aerial Photo Source: 2010 USDA NAIP Color Aerial Photograph

Zavoral Property
Transition Area



Figure 1



Aerial Photo Source: 2010 USDA NAIP Color Aerial Photograph

Zavoral Property

Transition Area - Fire Break

