

M.L. 201 4, Chp. 226, Sec. 2, Subd. 06d Project Abstract

For the Period Ending June 30, 2017

PROJECT TITLE: Northeast Minnesota White Cedar Restoration – Phase 2

PROJECT MANAGER: Dale Krystosek

AFFILIATION: Minnesota Board of Water and Soil Resources

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FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2014, Chp. 226, Sec. 2, Subd. 06d

APPROPRIATION AMOUNT: \$335,000

AMOUNT SPENT: \$248,216

AMOUNT REMAINING: \$86,784

Overall Project Outcomes and Results

Project Background: Northern white cedar (*Thuja occidentalis*) has been declining in Minnesota for decades. White cedar provides ecologically diverse plant communities and critical wildlife habitat and wetland functions. (Phase 2).

Project Goals:

- 1) Reverse decline of white cedar plant communities in Minnesota.
- 2) Complete two hydrologic restorations of white cedar plant communities and develop recommendations for restorations.

Methods: Board of Water and Soil Resources (BWSR) established 2 white cedar hydrologic restorations in Itasca and Lake Counties. Engineering designs were developed to restore natural groundwater flows where forest roads had impacted white cedar stands. A training video was developed for land managers. Dr. Rod Chimner evaluated the effectiveness of the hydrologic restorations plus the phase 1 vegetative restorations of northern white cedar plant communities.

Results:

1) Hydrologic Restoration:

Goal: Restore 2 sites where roads had impacted white cedar plant communities.

Results: Two experimental methods of hydrologic restoration were completed in Itasca and Lake Counties.

2) Monitor seven phase one white cedar restoration sites:

Results: 7 sites established in Beltrami, Koochiching, St. Louis and Lake County were monitored.

3) Develop recommendations for white cedar restoration and evaluate additional sites:

Results:

- Recommendations for white cedar restoration were developed.
- 75 additional restoration sites were evaluated by SWCDs.
- Northern white cedar has limited ability to replace black ash stands due to high water levels.
- White cedar restoration video developed and disseminated.

Project Findings:

- a) Many white cedar swamps are degraded and need restoration.
- b) Major disturbances were roads, ditches and herbivory.
- c) After two years, the largest single factor affecting northern white cedar survival was hydrology.

- d) Light levels (shading) plays a role in cedar regeneration.
- e) After one season, the hydrologic restoration of two forest roads were successful, restoring hydrologic flow conditions.

Project Significance:

Northern White cedar provides unique functions including:

- Thermal winter cover for white tailed deer
- Critical habitat for pine marten, bear, fish, songbirds
- Provides thermal buffering for cold water fisheries (brook trout streams)

Project Results Use and Dissemination

Presentations were given at a scientific conference, to other various interested organizations and project stakeholders (Voyageurs National Park, MN DNR, MN DOT, St. Louis County Highway Department, Superior National Forest, U of M, NRRI, Michigan Tech). A 30 minute radio interview was conducted at KTWH, Two Harbors. Scheduled to present project results to the Minnesota Forest Resources Council and Forestry Committee in International Falls.

Collaboration with the Itasca Community Television (ICTV) to capture video and photography of all stages of construction of hydrologic construction sites. Footage has been edited and training videos have been created. The videos have been distributed to multiple stakeholders, including BWSR, DNR, MPCA and County Forestry Offices, U of M and Federal Agencies. Videos will be made available on the BWSR web page (<https://spaces.hightail.com/space/wYWZBy450n>).

Work with staff from the Superior National Forest to set up field reviews of potential sites that the Forest Service would like to restore hydrology and white cedar plant communities, by utilizing this project's findings. Work is continuing in reaching out to foresters from County Land and Forestry Departments, DNR Foresters, U.S. Forest Service to build avenues for disseminating project findings and generate interest in for white cedar restoration.



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2014 Work Plan

Date of Report: August 10, 2017
Date of Next Status Update Report: August 30, 2017
Date of Work Plan Approval: June 4, 2014
Project Completion Date: June 30, 2017
Does this submission include an amendment request? No

PROJECT TITLE: Northeast Minnesota White Cedar Restoration – Phase 2

Project Manager: Dale Krystosek
Organization: Minnesota Board of Water and Soil Resources
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Location: Aitkin, Beltrami, St. Louis, Cass, Clearwater, Koochiching, Itasca, Lake, Cook, Carlton, Pine, Kanabec, Mille Lacs, Crow Wing, Wadena, Hubbard, Lake of the Woods Counties

Total ENRTF Project Budget:	ENRTF Appropriation:	\$335,000
	Amount Spent:	\$248,216
	Balance:	\$86,784

92617

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06d

Appropriation Language:

\$335,000 the second year is from the trust fund to the Board of Water and Soil Resources to continue an assessment of the decline of northern white cedar plant communities in northeast Minnesota, demonstrate restoration techniques, and provide cedar restoration training to local units of government. This appropriation is available until June 30, 2017, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Northeast Minnesota White Cedar Restoration - Phase 2 (ENRTF ID: 152-F)

II. PROJECT STATEMENT: White cedar swamps provide unique wetland functions including high value timber, long-term carbon storage, providing thermal cover for white tailed deer and other wildlife during winter, critical habitat for pine marten, fisher, and songbirds and providing thermal buffering for cold water fisheries (brook trout streams). Northern White (*Thuja occidentalis*) wetlands have been declining in Minnesota for decades. This project is a continuation of the Northeast Minnesota White Cedar Plant Community Restoration Project that received ENRTF funding in 2011. This project has established seven demonstration sites and has already identified significant impacts from modification of hydrology by roads, trails and ditches on the health and regeneration of white cedar plant communities. This initiative has ignited interest in reversing the decline of this important resource, but needs continued funding to ensure that additional progress can be achieved by demonstrating hydrologic restoration.

The goals of the project are:

1. To reverse the decline of northern white cedar wetland plant communities in Minnesota. The project will achieve its goals by evaluating and prioritizing additional white cedar stands for restoration and establishment of demonstration projects.
2. The second goal of the project is implementation of practical application of the research findings to improve the quantity and quality of white cedar plant communities in northeast and north central Minnesota. The project will accomplish this by continued development of a training program for local government resource managers regarding restoration techniques for white cedar plant communities regarding site preparation and revegetation techniques and protecting white cedar from damage by poorly designed wetland crossings for roads and trails.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 30, 2015:

During August through October, 2014, the Project Technical Team, including Dale Krystosek, Board of Water and Soil Resources (BWSR), Wetland Special Project Lead, Rick Dahlman, retired DNR Forestry Best Management Practice Coordinator, Dr. Rodney Chimner, project consultant from Michigan Tech University, and Jerry Stensing, BWSR White Cedar Project Technician completed field tours of potential hydrologic restoration sites. See additional information below.

PROJECT OUTREACH:

- ***On December 15, 2014, gave presentation at BWSR staff meeting on Phase 1 project results and overview of phase 2 activities.***
- ***On January 14, 2015, Dale Krystosek gave presentation on the Northeast White Cedar Plant Community Restoration Project at the Minnesota Wetland Conference at the University of Minnesota Landscape Arboretum. Approximately 170 people attended including wetland consultants, staff from Soil and Water Conservation Districts, Watershed Districts, and state and federal agency staff.***

Project Status as of September 30, 2015:

- ***On February 23, 2015 - Met with Itasca Community Television, Inc. and Project Technical Team to edit project training video that was developed during Phase One of the project. Video will be posted on the Minnesota Board of Water and Soil Resources website for use by local government staff and other interested individuals.***
- ***April 1, 2015 – Met at Voyageurs National Park with Park staff, Minnesota DNR, Minnesota Department of Transportation, St Louis County Highway Department and Superior National Forest staff regarding potential restoration of 400 acres of white cedar impacted by the Ash River Trail, a St. Louis County road on the south edge of Voyageurs National Park. There was some interest in evaluating this potential project. Developed follow up plans.***

- **April 15, 2015 – Participated in Legacy Amendment and Funding Workshop, sponsored by Northwest Minnesota Foundation in Bemidji, MN. Made presentation on Northeast Minnesota White Cedar Restoration – Phase 2. Workshop was attended by local government and non-profit organization staff.**
- **April 16, 2015 – Participated in Legacy Amendment and Funding Workshop, sponsored by Northwest Minnesota Foundation in Thief River Falls, MN. Made presentation on Northeast Minnesota White Cedar Restoration – Phase 2. Workshop was attended by local government and non-profit organization staff.**
- **April 20, 2015 - Held project stakeholders meeting in Duluth, MN. Meeting was attended by staff from BWSR, MnDOT, Aitkin Soil and Water Conservation District, Koochiching Soil and Water Conservation District, Superior National Forest, University of Minnesota, NRRI, Michigan Tech University, and Fond du Lac Reservation. Presented phase one results and discussed phase 2 work plan.**

Overall Project Status as of January 30, 2016:

- **Significant progress on the project was made since the last report on design of the two hydrologic restoration sites. Two sites have been selected for hydrologic restoration, one in Itasca County, near Wirt and the other north of Two Harbors in Lake County. Engineering and design for the Itasca County hydrologic near Wirt is being completed by North Central Minnesota Joint Powers Board Engineer, Bill Westerberg and Engineering Technician Brad Kennedy. Itasca SWCD Technician Matt Johnson and Natural Resource Conservation Service staff from Duluth completed soil borings and collected field data for engineering and design in September and October. Draft designs for hydrologic restoration to mimic natural groundwater flow through a forest road where white cedar and black ash have been flooded out on the up-gradient side of the road and hydrology has been reduced on the down gradient side of the road were completed in January.**
- **Design for the Lake County site located north of Two Harbors will be completed by Lake County Soil and Water Conservation District Engineer Derrick Passe and SWCD Manager Dan Schutte with review by North Central Minnesota Joint Powers Board Engineer, Bill Westerberg and Engineer Technician Brad Kennedy. Natural Resource Conservation Service staff from Duluth completed soil borings and collected field data for engineering and design in September and October. Engineering review of the hydrologic restoration will be provided by U.S. Forest Service Engineers Marty Rye (Superior National Forest) and Jon Hodgson (Chippewa National Forest). In January, Derrick Passe completed a preliminary design to restore natural groundwater flow through a forest road where white cedar and black ash have been flooded out on the up-gradient side of the road and hydrology has been reduced on the down gradient side of the road.**
- **Several project dissemination and trainings were also completed during the last several months (see Project Outreach, page 12 for details).**

Overall Project Status as of September 30, 2016:

- **Working with MnDOT and other agencies to develop standards for rock vein crossings to equalize hydrology along roads. Some additional progress has been made in discussions with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Meeting was held February 17th in Grand Rapids with all project participants to discuss alternative designs for hydraulic restoration of wetlands adjacent to roads where white cedar or other plant communities have been negatively impacted. Engineers from Lake County Soil and Water Conservation District, North Central Joint Powers Board, Minnesota Department of Transportation and the U.S. Forest Service attended the meeting as well as BWSR and LGU and DNR staff. Preliminary restoration designs were reviewed and recommended for final design.**
- **Lake County Soil and Water Conservation District Engineer Derrick Passe has developed a preliminary design for the Lake County hydrologic restoration site. Bill Westerberg, engineer for the North Central Joint Powers Board has developed several alternative designs for the Itasca County Design hydrologic restoration site. Preliminary design has commenced for 2 additional hydrologic restoration sites in St.**

Louis County on federal lands (cooperative effort with Superior National Forest and our project which will be funded by U.S. Forest Service).

- *An RFP was conducted by Bill Westerberg, engineer for the North Central Joint Powers Board during summer, 2016 for the Itasca County site. A contractor was selected in August, 2016 to complete the hydrologic restoration in Itasca County. The Lake County site was completed by the Lake County Highway Department under the supervision of the Lake County Engineer. Both hydrologic restorations were successfully completed in August and September, 2016.*

Overall Project Status as of January 30, 2017:

- *Post construction (as-built) drawings and specifications have been submitted for both hydrologic restoration sites in Itasca County and Lake County to update documentation to reflect project modifications to the initial design plans.*
- *Hydrologic data was been collected after restoration for the Itasca County site and Lake County site and hydrologic data has been analyzed to compare pre-restoration hydrologic conditions to post restoration hydrologic conditions. This analysis has shown that the restoration of hydrology at both sites appears to be functioning as designed.*
- *The remaining project activities are making progress and are expected to be included in the final project report.*

Overall Project Outcomes and Results:

Final field visits to all Phase I and II sites were completed and data was collected. The hydrologic restoration projects are functioning as anticipated. The final project report of results has been incorporated into the *Final Technical Report, Northeast Minnesota White Cedar Plant Community Restoration: Phases I & II (see attachment 2).*

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: *Implement two hydrologic restorations of white cedar plant communities*

Description:

- a) Design and implement two white cedar plant community hydrologic restoration projects where the sites have been degraded by roads, trails and ditches where hydrology needs to be restored to the natural hydrologic regime. A minimum of 40 potential sites will be evaluated. The restoration actions may include improving groundwater flows by installing culverts, trail and road modifications, etc. Project will design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff. The project goal will be to restore 200 acres of white cedar plant communities.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 185,000
Amount Spent: \$ 127,134
Balance: \$ 57,866

Activity Completion Date: 10/2015

Outcome	Completion Date	Budget
1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.	9/2014	\$20,000
2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.	3/2014	\$15,000
3. Implement 2 white cedar plant community hydrologic restorations	10/2015	\$141,000
4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads		\$9,000

Activity Status as of January 30, 2015:

1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.

- *The team reviewed several sites in Beltrami County in coordination with DNR Forestry Staff, Ronald Rabe based in Kelleher. These sites had been impacted by roads and ditches and had some potential for hydrologic restoration.*
- *The team reviewed sites in Lake of the Woods County in cooperation with Lake of the Woods Environmental Services Director Josh Stromlund along with DNR Forestry and DNR Wildlife staff based in Baudette, MN. Several sites were reviewed which had been impacted by roads and ditches.*
- *The Team reviewed sites in Itasca County in cooperation with Jim Gustafson, Itasca Soil and Water Conservation District Manager. One site near Wirt, MN was reviewed, a township road which had affected a white cedar stand on both sides of the road. This site was determined to be ideal in terms of scale and well suited as a white cedar hydrologic restoration site.*
- *The Team reviewed sites in Aitkin County in coordination with Aitkin Soil and Water Conservation staff. These white cedar sites were impacted by roads and ditches but had complicating factors that made them less than ideal for hydrologic restoration sites.*
- *In September, BWSR project staff Dale Krystosek and Jerry Stensing toured several sites in northern St. Louis County with DNR Forester Dave Soposi. These sites had major hydrologic impacts from roads, where, in one case, hundreds of acres of white cedar had been killed by flooding due to improper cross drainage under a major road adjacent to Voyageurs National Park. This site was determined to be too costly for our project, but we will be setting up a meeting with St. Louis County Highway Department, Voyageurs National Park staff, MnDOT and DNR to determine whether other funding may be available to restore this site.*
- *In September, BWSR project staff Dale Krystosek and Jerry Stensing toured three sites in Lake County with Lake County Forester Bill Nixon. All 3 of the sites had significant hydrologic impacts due to roads blocking normal hydrologic flows within white cedar plant communities. One site was selected for hydrologic restoration due to its ideal size and scope which should fit within the scope of the phase 2 budget.*

2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.

- *Met with Peter Leete, MnDOT/DNR Liaison and several MnDOT engineers to explore opportunities for cooperation on the project. MnDOT appears to be interested in working jointly to develop designs that will minimize hydrologic impacts to white cedar plant communities and other plant communities along MnDOT roads.*

PROJECT CONTRACTS:

- ***Completed a contract with Itasca Soil and Water Conservation District to assist in evaluating and selecting white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands.***
- ***Completed a contract with Koochiching Soil and Water Conservation District to assist in evaluating and selecting white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands.***
- ***Completed a contract with the University of Minnesota Natural Resource Research Institute to assist in evaluating and selecting white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands.***

Activity Status as of September 30, 2015:

- **March 26, 2015 - Met with Itasca County Soil and Water Conservation District, Itasca County Highway Department to discuss white cedar hydrologic restoration site near Wirt, MN. Parties agreed to proceed with plans to use this site as a demonstration site.**
- **June 16, 2015 – met with Itasca County Board of Commissioners to discuss white cedar hydrologic restoration site near Wirt, MN. The County Board agreed to proceed with plans to use this site as a demonstration site.**
- **July 30, 2015 – Met with North Central Minnesota Joint Powers Board Engineer, Bill Westerberg and Engineer Technician Brad Kennedy and Itasca SWCD Technician Matt Johnson to discuss engineering and design for Itasca County white cedar hydrologic restoration site near Wirt. Bill and Brad expressed interest in providing engineering assistance for the project.**
- **August 10, 2015 - Met on site at Itasca County hydrologic site with North Central Minnesota Joint Powers Board Engineer, Bill Westerberg and Engineer Technician Brad Kennedy, Itasca SWCD Technician Matt Johnson and Natural Resource Conservation Service to do soil borings and collect field data for engineering and design for Itasca County white cedar hydrologic restoration site near Wirt. Set goal of completing design during winter, 2015-16 with construction set for summer, 2016.**
- **September 21, 2015 – Met with Lake County Soil and Water Conservation District Manager Dan Schutte and SWCD Engineer Derrick Passe and North Central Minnesota Joint Powers Board Engineer, Bill Westerberg and Engineer Technician Brad Kennedy along with Lake County Land Department staff to discuss design and engineering for Lake County white cedar hydrologic restoration site. Set goal of completing design during winter, 2015-16 with construction set for summer, 2016.**
- **Scheduled meeting for October 1, 2015 in Cook, Minnesota with U.S. Forest Service staff from the Superior National Forest along with Minnesota DNR and BWSR to view potential hydrologic restoration site on the Superior National Forest. This project will be funded by the Forest Service, but our project will consult with them to share technical data and recommendations.**

<p>1/30/16 Progress Report – Activity 1 Outcomes:</p>
<p>1. <u>Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.</u></p> <p><i>STATUS, 1/30/16: Completed - A total of 85 sites were evaluated, and over 20 were determined to be good candidates for hydrologic restoration</i></p>
<p>2. <u>Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.</u></p> <p><i>STATUS, 1/30/16: Lake County Soil and Water Conservation District Engineer Derrick Passe has developed a preliminary design for the Lake County hydrologic restoration site. Bill Westerberg, engineer for the North Central Joint Powers Board has developed several alternative designs for the Itasca County Design hydrologic restoration site. Preliminary design has commenced for 2 additional hydrologic restoration sites in St. Louis County on federal lands (cooperative effort with Superior National Forest and our project which will be funded by U.S. Forest Service).</i></p>
<p>3. <u>Implement 2 white cedar plant community hydrologic restorations.</u></p>

STATUS, 1/30/16: Hydrologic restorations are scheduled for summer, 2016 and the design efforts are on schedule to allow compliance with that timeline.

4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads.

STATUS, 1/30/16: Some additional progress has been made in discussions with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Meeting is scheduled for February 17th in Grand Rapids with all project participants to discuss alternative designs for hydraulic restoration of roads where white cedar or other plant communities have been negatively impacted.

Activity Status as of January 30, 2016:

- ***Lake County Soil and Water Conservation District Engineer Derrick Passe has developed a preliminary design for the Lake County hydrologic restoration site.***
- ***Bill Westerberg, engineer for the North Central Joint Powers Board has developed several alternative designs for the Itasca County Design hydrologic restoration site.***
- ***Preliminary design has commenced for 2 additional hydrologic restoration sites in St. Louis County on federal lands (cooperative effort with Northeast Minnesota White Cedar Restoration – Phase 2 and the Superior National Forest and which will be funded by U.S. Forest Service).***
- ***Working with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads. Some additional progress has been made in discussions with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Meeting is scheduled for February 17 in Grand Rapids with all project participants to discuss alternative designs for hydraulic restoration where roads have impacted hydrology.***
- ***Project technician Jerry Stensing retired from the project due to his wife’s medical condition. Rick Dahlman, retired Minnesota Department of Natural Resources Forestry BMP (Best Management Practice) Coordinator was selected to fill the position.***
- ***Hydrologic restorations are scheduled for summer, 2016 and the project design progress is on schedule to allow implementation within that timeline.***

1/30/16 Progress Report – Activity 1 Outcomes:

1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.

STATUS, 1/30/16: Completed - A total of 85 sites were evaluated, and over 20 were determined to be good candidates for hydrologic restoration

2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.

STATUS, 1/30/16: Lake County Soil and Water Conservation District Engineer Derrick Passe has developed a preliminary design for the Lake County hydrologic restoration site. Bill Westerberg, engineer for the North Central Joint Powers

Board has developed several alternative designs for the Itasca County Design hydrologic restoration site. Preliminary design has commenced for 2 additional hydrologic restoration sites in St. Louis County on federal lands (cooperative effort with Superior National Forest and our project which will be funded by U.S. Forest Service).

3. Implement 2 white cedar plant community hydrologic restorations.

STATUS, 1/30/16: Hydrologic restorations are scheduled for summer, 2016 and the design efforts are on schedule to allow compliance with that timeline.

4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads.

STATUS, 1/30/16: Some additional progress has been made in discussions with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Meeting is scheduled for February 17th in Grand Rapids with all project participants to discuss alternative designs for hydraulic restoration of roads where white cedar or other plant communities have been negatively impacted.

Activity Status as of September 30, 2016:

- *Maintained regular contact with cooperators involved with the Itasca County and Lake County project sites to keep everyone informed and identify and resolve issues holding back progress.*
- *Worked closely with Bill Westerberg and Matt Johnson to produce the RFP and award the bid for construction at the Itasca County site in Wirt. Attended pre-bid meeting with Bill and prospective bidders and reviewed modifications of RFP that resulted from that meeting.*
- *Bid process:*
 - *Quote tabulation with Engineers estimate= Received 3 Quotes*
 - *The process for receiving quotes was the following:*
 - *Prepare plans and specifications so contractor knows how each bid item is measured and what is included in the unit price for that item such as materials and construction requirements.*
 - *Posted Solicitation for Quotes on questcdn.com website*
 - *Website sends out notice to potential bidders and suppliers based on type of construction specified in solicitation.*
 - *By Pre-quote Meeting had 7 plan holders*
 - *Pre-quote Meeting on June 22, 2016*
 - *Explained Project to 4 contractors that attended pre-quote meeting*
 - *Answered questions*
 - *Issued Addendum to project summarizing pre-quote meeting and made some changes and clarifications to project based on contractors recommendations to keep cost down*
 - *Received quotes June 30, 2016*
 - *Received 3 quotes with Bid Bond of 5% of Contractors Bid. Bid Bond is given to Owner if Contractor decides not to enter into contract with owner.*
 - *Entered unit prices into quote tabulation spreadsheet to verify quotes and compare. Quotes were very close and lower than Engineers Estimate.*

- *Asked for references from low quote contractor*
 - *Contractor sent me references and list of projects he has worked on similar to this project.*
 - *Check references and recommended award to Contractor- RK Construction Services*
- *Contract Awarded to RK Construction Services on August 1, 2016.*
- *Held preconstruction meeting with contractor, Owner and Utilities to discuss how project would proceed the end of July.*
- *Construction began August 10, 2016 and was completed August 12, 2016.*
- *Monitored progress on both Itasca and Lake County construction by phone, e-mail, and field visits. Had to make design modifications to Lake County site due to wet conditions the created a safety issue that could have eliminated all work on the site for the project. Found storm damage to the erosion blanket at the Itasca site and arranged with Matt Johnson to get the damage repaired.*
- *White cedar hydrologic restorations were successfully completed in Itasca County and Lake County in September, 2016.*

<p>9/30/16 Progress Report – Activity 1 Outcomes:</p>
<p>1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.</p> <p><u>STATUS, 9/30/16:</u> A total of 85 sites were evaluated, with over 20 good candidates for hydrologic restoration. Additional field evaluations to be completed by Lake County SWCD and Koochiching County SWCD staff.</p>
<p>2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.</p> <p><u>STATUS, 9/30/16:</u> Designs were completed for 2 hydrologic restoration sites in Itasca and Lake County. Project is collaborating with U.S. Forest Service in St. Louis County on several sites. (Cooperative effort with Superior National Forest – project costs paid for by Forest Service). <i>Lake County Soil and Water Conservation District Engineer Derrick Passe developed a final design for the Lake County hydrologic restoration site. Bill Westerberg, engineer for the North Central Joint Powers Board has developed a final design for the Itasca County hydrologic restoration site. Preliminary design has commenced for 2 additional hydrologic restoration sites in St. Louis County on federal lands (cooperative effort with Superior National Forest and our project which will be funded by U.S. Forest Service).</i></p>
<p>3. Implement 2 white cedar plant community hydrologic restorations.</p> <p><u>STATUS, 9/30/16:</u> <i>An RFP was conducted by Bill Westerberg, engineer for the North Central Joint Powers Board during summer, 2016 for the Itasca County site. A contractor was selected in August, 2016 to complete the hydrologic restoration in Itasca County. The Lake County site was completed by the Lake County Highway Department under</i></p>

the supervision of the Lake County Engineer. Both hydrologic restorations were successfully completed in August and September, 2016.

See attachments 1 & 2 – Photo documentation of restoration of the sites in Itasca and Lake counties.

4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads.

STATUS, 9/30/16: Some additional progress has been made in discussions with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Meeting was held February 17th in Grand Rapids with all project participants to discuss alternative designs for hydraulic restoration of roads where white cedar or other plant communities have been negatively impacted. Engineers from Lake County Soil and Water Conservation District, North Central Joint Powers Board, Minnesota Department of Transportation and the U.S. Forest Service attended the meeting as well as BWSR and LGU and DNR staff. Preliminary restoration designs were reviewed and recommended for final design.

Project Status as of January 30, 2017:

- Post construction (as-built) drawings and specifications have been submitted for both hydrologic restoration sites in Itasca County and Lake County to update documentation to reflect project modifications to the initial design plans.***
- Hydrologic data was been collected after restoration for the Itasca County site and Lake County site and hydrologic data has been analyzed to compare pre-restoration hydrologic conditions to post restoration hydrologic conditions. This analysis has shown that the restoration of hydrology at both sites appears to be functioning as designed.***

1/30/17 Progress Report – Activity 1 Outcomes:

1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.

STATUS, 1/30/17: A total of 85 sites have been evaluated, with over 20 good candidates for hydrologic restoration. Additional field evaluations are being conducted by Lake County SWCD and Koochiching County SWCD staff and results will be included in the final report.

2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.

STATUS, 1/30/17: Designs were completed for 2 hydrologic restoration sites in Itasca and Lake County (see above).

3. Implement 2 white cedar plant community hydrologic restorations.

STATUS, 1/30/17: Restorations completed. Monitoring of effectiveness is occurring.

4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads.

STATUS, 1/30/17: Continue work with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Hydrologic restoration designs will be incorporated into final project report.

Final Report Summary:

Final field visits to all Phase I and II sites have been completed and data collected. The hydrologic restoration projects are functioning as anticipated. The final project report of results has been completed. See *Final Technical Report, Northeast Minnesota White Cedar Plant Community Restoration: Phases I & II (attachment 2)*.

6/30/17 Final Report – Activity 1 Outcomes:

1. Evaluate and select white cedar plant communities where hydrologic modifications such as roads, trails, ditches have degraded white cedar stands. A minimum of 40 sites will be evaluated.

STATUS, 6/30/17: A total of 85 sites have been evaluated, with over 20 good candidates for hydrologic restoration. Additional field evaluations were conducted by Lake County SWCD and Koochiching County SWCD staff and results are included in the final report (see attachment 6).

2. Design 2 white cedar plant community hydrologic restoration projects and work with MnDOT to develop recommendations for forested treatment wetlands to treat impervious area runoff.

STATUS, 6/30/17: Designs were completed for 2 hydrologic restoration sites in Itasca and Lake County (see above). The final technical report has been shared with MnDOT.

3. Implement 2 white cedar plant community hydrologic restorations.

STATUS, 6/30/17: Restorations have been completed. Monitoring of effectiveness was completed. The final project costs were considerably lower than anticipated, due in part to in-kind contributions from Lake County, Lake SWCD and Itasca SWCD.

4. Work with MnDOT to develop standards for rock vein crossings to equalize hydrology along roads.

STATUS, 6/30/17: Continued work with engineers from MnDOT, Lake County, North Central Joint Powers Board, Board of Water and Soil Resources and U.S. Forest Service. Hydrologic restoration designs were incorporated into final project technical report. (See Final Technical Report, Northeast

ACTIVITY 2: Monitor Seven Phase 1 white cedar demonstration projects

Description: Conduct continued monitoring of demonstration sites to a) determine regeneration success, b) evaluate effects of canopy shading on white cedar regeneration and evaluate the need for thinning to improve regeneration, c) identify previous white regeneration efforts and evaluate success, and d) maintain protective cages and evaluate timing of removal to ensure cedar is beyond critical stage for deer browsing damage.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 97,800
Amount Spent: \$ 97,800
Balance: \$ 0

Activity Completion Date: 10/2015

Outcome	Completion Date	Budget
1. Monitor seven demonstration sites from phase 1 to determine regeneration success	5/2016	\$30,000
2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration.	5/2016	\$15,800
3. Review previous white cedar regeneration efforts and perform site assessments.	5/2016	\$20,000
4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when white cedar is beyond critical stage for deer browsing damage.	5/2016	\$32,000

Activity Status as of January 30, 2015:

- *The seven white cedar demonstration sites from Phase 1 were monitored in fall of 2014 for hydrology and vegetative condition by Rose Schwartz, graduate assistant. This data is documented and will be incorporated into future scientific publications.*

Activity Status as of September 30, 2015:

- *The seven white cedar demonstration sites from Phase 1 are being monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant. This data is documented and will be incorporated into future scientific publications.*

9/30/15 Progress Report – Activity 2 Outcomes:
<p>1. Monitor seven demonstration sites from phase 1 to determine regeneration success. STATUS, 9/30/16: <i>Phase 1 sites are being monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant.</i></p>
<p>2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration. STATUS, 9/30/16: <i>Work Scheduled for summer, 2016.</i></p>
<p>3. Review previous white cedar regeneration efforts and perform site assessments. STATUS, 9/30/16: <i>Work Scheduled for winter, 2015-16.</i></p>
<p>4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when</p>

white cedar is beyond critical stage for deer browsing damage.

STATUS, 9/30/16: Ongoing.

Activity Status as of January 30, 2016:

1/30/16 Progress Report – Activity 2 Outcomes:

1. Monitor seven demonstration sites from phase 1 to determine regeneration success.

STATUS, 1/30/16: *Completed - Phase 1 sites were monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant.*

2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration.

STATUS, 1/30/16: *Work Scheduled for summer, 2016.*

3. Review previous white cedar regeneration efforts and perform site assessments.

STATUS, 1/30/16: *Work Scheduled for winter, 2016-17.*

4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when white cedar is beyond critical stage for deer browsing damage.

STATUS, 1/30/16: *Ongoing.*

Activity Status as of September 30, 2016:

- Ongoing (see table below)

9/30/16 Progress Report – Activity 2 Outcomes:

1. Monitor seven demonstration sites from phase 1 to determine regeneration success.

STATUS, 9/30/16: *Phase 1 sites were monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant and incorporated into her Graduate thesis which has been completed.*

2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration.

STATUS, 9/30/16: *Research to be reviewed, November - December, 2016.*

3. Review previous white cedar regeneration efforts and perform site assessments.

STATUS, 9/30/16: *Work Scheduled for winter, 2016-17.*

4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when white cedar is beyond critical stage for browsing damage.

STATUS, 9/30/16: *Ongoing.*

Project Status as of January 30, 2017:

- Ongoing (see table below)

<p>1/30/17 Progress Report – Activity 2 Outcomes:</p> <p>1. Monitor seven demonstration sites from phase 1 to determine regeneration success. <u>STATUS, 1/30/17:</u> Phase 1 sites were monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant and incorporated into her Graduate thesis which has been completed and will be included in final project report.</p>
<p>2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration. <u>STATUS, 1/30/17:</u> Rick Dahlman, retired DNR Forestry BMP Coordinator and Dr. Rodney Chimner, Michigan Tech University professor, (project consultants) have been reviewing data on shading for incorporation into final report.</p>
<p>3. Review previous white cedar regeneration efforts and perform site assessments. <u>STATUS, 1/30/17:</u> Rick Dahlman is currently working on this project component.</p>
<p>4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when white cedar is beyond critical stage for browsing damage. <u>STATUS, 1/30/17:</u> Analysis is ongoing and will be included in final report.</p>

Final Report Summary:

Rod Chimner has completed reviewing these sites and incorporated the results in the final technical report. (See Final Technical Report, Northeast Minnesota White Cedar Plant Community Restoration: Phases I & II, attachment 2).

<p>6/30/17 Final Report – Activity 2 Outcomes:</p> <p>1. Monitor seven demonstration sites from phase 1 to determine regeneration success. <u>STATUS, 6/30/17:</u> Phase 1 sites were monitored in fall of 2015 for hydrology and vegetative condition by Rose Schwartz, graduate assistant and incorporated into her Graduate thesis which has been completed and is included in final project report. See Attachment 3 - CARBON CYCLING AND RESTORATION IN TEMPERATE FORESTED PEATLANDS by Rose B. Schwartz, a THESIS submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE In Applied Ecology, MICHIGAN TECHNOLOGICAL UNIVERSITY 2016.</p>
<p>2. Evaluate effects of canopy shading on white cedar regeneration and evaluate need for thinning to improve regeneration. <u>STATUS, 6/30/17:</u> Light intensity (shading) was evaluated on the Phase 1 sites, each of which had different stand densities, from dense shade, medium shade, small patch cuts, strip thinning, and clear cut. Dr. Chimner determined cedar height</p>

<p>growth was influenced by the amount of light reaching the trees during the 2 year measurement period.</p>
<p>3. Review previous white cedar regeneration efforts and perform site assessments. STATUS, 6/30/17: Met with Itasca, St Louis, Lake, and Koochiching Counties, MN DNR Grand Rapids and Bemidji Regional, Superior National Forest, and Fond du Lac Reservation forestry offices, as well as the Bemidji BWSR office provided multiple sites where efforts to regenerate white cedar have been attempted over the past 30 plus years. A list of the sites identified is attached. See <i>Attachment 4 - Northern White Cedar Mineral Sites.</i></p>
<p>4. Maintenance of protective cages and evaluation of safe timing for removal of browsing protection and determine when white cedar is beyond critical stage for browsing damage. STATUS, 6/30/17: The report indicates that protected planted seedling and transplant survival is sufficiently better than unprotected to justify utilizing protection. Also, the wire cages stood up better than the tubes, which are easily knocked over by wildlife. How long the protection needs to be maintained is not discussed. Growth rates vary greatly between sites depending on light intensity and hydrologic conditions, and growth rates once the planting are a little older may increase over what has been observed to date.</p>

ACTIVITY 3: Develop recommendations for white cedar plant community restoration plan for Minnesota and evaluate and prioritize additional white cedar restoration projects.

Description:

Develop recommendations for white cedar plant community restoration recommendations and prioritize additional white cedar restoration projects. This will include:

- A) Identify and evaluate degraded black ash (from emerald ash borer) and tamarack sites to determine whether white cedar has potential to fill that niche for restoration
- B) Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities,
- C) Review historic timber sale and management records and interview current and retired forest managers to identify additional degraded or former white cedar stands to identify additional restoration opportunities,
- D) Utilize interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota, MnDOT, LGUs, Michigan Tech and federal agencies to develop white cedar plant community restoration recommendations.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 52,200
Amount Spent: \$ 23,282
Balance: \$ 28,918

Activity Completion Date: 10/2015

Outcome	Completion Date	Budget
1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche	10/2015	\$10,000
2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities	10/2015	\$12,000

3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations	10/2015	\$5,000
4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature	7/2016	\$25,200

Activity Status as of January 30, 2015:

1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche
 - Project team reviewed current research on this topic and had discussions with University of Minnesota Researchers and U.S. Forest Service staff to coordinate project activities.

Activity Status as of September 30, 2015:

- Project team continues review of current research on this topic and continues discussions with University of Minnesota Researchers and U.S. Forest Service staff to coordinate project activities.

9/30/15 Progress Report – Activity 3 Outcomes:
1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche <u>STATUS, 9/30/15:</u> Ongoing, to be included in final report.
2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities <u>STATUS, 9/30/15:</u> Work scheduled for 2016-17
3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations <u>STATUS, 9/30/15:</u> Work scheduled for 2016-17
4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature <u>STATUS, 9/30/15:</u> Work scheduled for 2016-17

Activity Status as of January 30, 2016:

- Project team continues review of current research on this topic and continues discussions with University of Minnesota Researchers and U.S. Forest Service staff to coordinate project activities.

1/30/16 Progress Report – Activity 3 Outcomes:
1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche. <u>STATUS, 1/30/16:</u> Ongoing, to be included in final report.
2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities. <u>STATUS, 1/30/16:</u> Work scheduled for 2016-17
3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to

develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations.

***STATUS, 1/30/16: Initiated discussions with DNR, University of Minnesota and local government units regarding this work item. Additional partners (U.S. Forest Service, etc.) will be engaged at February 17th meeting.
Work scheduled for 2016-17***

4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature.

STATUS, 1/30/16: Initiated discussions with DNR, University of Minnesota and local government units regarding this work item. Work scheduled for 2016-17

Activity Status as of September 30, 2016:

- Ongoing, work schedule for winter of 2016-2017 (see table below)

9/30/16 Progress Report – Activity 3 Outcomes:

1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche.

STATUS, 9/30/16: Ongoing, to be included in final report.

2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities.

STATUS, 9/30/16: Work scheduled for winter, 2016-17

3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations.

***STATUS, 9/30/16: Continue discussions with DNR, University of Minnesota and local government units regarding this work item. Additional partners (U.S. Forest Service, etc.) were engaged at February 17th meeting.
Work scheduled for winter 2016-17***

4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature.

STATUS, 9/30/16: Initiated discussions with DNR, University of Minnesota and local government units regarding this work item. Work scheduled for winter, 2016-17

Project Status as of January 30, 2017:

- Ongoing (see table below)

1/30/17 Progress Report – Activity 3 Outcomes:

1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche.

STATUS, 1/30/17: Ongoing, to be included in final report.

2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities.

STATUS, 1/30/17: Meetings with county and state foresters are occurring during winter, 2016-17

3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations.

STATUS, 1/30/17: Meetings with DNR, University of Minnesota local government units, U.S. Forest Service scheduled for March through May, 2017

4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature.

STATUS, 1/30/17: Initial discussions about recommendations have been initiated. Recommendations on track to be part of final report.

- ***Soil and Water Conservation Districts in Lake, St. Louis, Itasca and Koochiching County and state and county forestry offices have been contacted about identifying additional former white cedar stands on mineral soil seeps, as well as black ash and black spruce and tamarack stands with a cedar component that might be potential restoration sites. SWCD staff are reviewing and evaluating these sites.***

Final Report Summary:

Lake, St Louis, Itasca, and Koochiching County SWCDs, county and state forestry offices were contacted about identifying additional former white cedar stands, white cedar sites on mineral soil seeps, as well as black ash and black spruce and tamarack stands with a cedar component that might be good restoration opportunities. Itasca, Lake, Koochiching, and St Louis County SWCD staff have selected 20 to 30 sites each from these lists and have completed on-site evaluations of those sites.

Research review by Rod Chimner, the lead researcher for the project, has determined that black ash stands have limited potential for white cedar due to raised water levels caused by the death of ash due to emerald ash borer that would flood out cedar. The US Forest Service and the U of M are conducting research on numerous species that might be appropriate to replace black ash, including white cedar.

A meeting of multiple stakeholders was held March 17, 2017 to develop recommendations for white cedar restoration. These comments were incorporated into the final report.

6/30/17 Final Report – Activity 3 Outcomes:

1. Evaluate black ash sites to determine whether white cedar has potential to fill that niche.

STATUS, 6/30/17: The results of Phase I & II indicate that white cedar has limited potential to replace tamarack at lower pH sites. This is less of a problem for black ash, but the increased risk of flooding or inundation from higher water level after the ash dies or is removed significantly limits this opportunity. In addition, the University of Minnesota and USDA Forest Service have an extensive study underway on the Chippewa National Forest

evaluating multiple species as potential replacements for black ash wetlands.

2. Identify mineral soil wetland sites that historically were white cedar as potential wetland restoration opportunities.

STATUS, 6/30/17: MN DNR Forestry and the County forestry departments for Koochiching, Itasca, St Louis, and Lake Counties have provided lists of white cedar stands on mineral soils. The SWCD offices in those counties have completed 75 site evaluations utilizing the same evaluation system used to identify sites during Phase 1. A list of the sites identified is attached (see attachment 4, Northern White Cedar Mineral Sites).

3. Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations and develop white cedar plant community restoration recommendations.

STATUS, 6/30/17: Meetings were held with DNR, University of Minnesota, local government units, U.S. Forest Service March through May, 2017.

4. Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature.

STATUS, 6/30/17: Multiple meetings were held throughout the course of Phase I and II. The input obtained has been considered and incorporated into the recommendations developed by the project. For recommendations, see Final Technical Report, Northeast Minnesota White Cedar Plant Community Restoration: Phases I & II, attachment 2).

V. DISSEMINATION:

- **Project updates will be posted on BWSR Website**
- **Field tours of white cedar restoration sites**
- **Training Session**
- **Final Report to be posted on BWSR Website**
- **Final Report**

Description:

The project will disseminate information through the following methods:

- **Convene interagency team including BWSR, DNR, MPCA, Corps of Engineers, University of Minnesota and federal agencies to develop white cedar plant community restoration recommendations**
- **Develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature**

Status as of January 30, 2015:

PROJECT OUTREACH:

- ***On December 15, 2014, Dale Krystosek and Jerry Stensing gave presentation at BWSR staff meeting on Phase 1 project results and overview of phase 2 activities.***
- ***On January 14, 2015, Dale Krystosek gave presentation on the Northeast White Cedar Plant Community Restoration Project at the Minnesota Wetland Conference at the University of Minnesota***

Landscape Arboretum. Approximately 170 people attended including wetland consultants, Soil and Water Conservation Districts, Water shed Districts, and state and federal agency staff.

Status as of September 30, 2015:

PROJECT OUTREACH:

- *On February 23, 2015 - Met with Itasca Community Television, Inc. and Project Technical Team to edit project training video that was developed during Phase One of the project. Video will be posted on the Minnesota Board of Water and Soil Resources website for use by local government staff and other interested individuals.*
- *Dale Krystosek, Project Manager, gave presentation on April 1, 2015 at Voyageurs National Park to National Park staff, Minnesota DNR, Minnesota Department of Transportation, St Louis County Highway Department and Superior National Forest staff on project and potential restoration of 400 acres of white cedar impacted by the Ash River Trail*
- *Dale Krystosek, Project Manager, gave presentation on April 15, 2015 at Legacy Amendment and Funding Workshop, sponsored by Northwest Minnesota Foundation in Bemidji, MN. Made presentation on Northeast Minnesota White Cedar Restoration – Phase 2. Workshop was attended by local government and non-profit organization staff.*
- *Dale Krystosek, Project Manager, gave presentation on April 16, 2015 at Legacy Amendment and Funding Workshop, sponsored by Northwest Minnesota Foundation in Thief River Falls, MN. Made presentation on Northeast Minnesota White Cedar Restoration – Phase 2. Workshop was attended by local government and non-profit organization staff.*
- *Dr. Rodney Chimner, Michigan Tech University, Jerry Stensing, BWSR Technician and Dale Krystosek, Project Manager gave presentation on April 20, 2015 at project stakeholders meeting in Duluth. Meeting was attended by staff from BWSR, MnDOT, Aitkin Soil and Water Conservation District, Koochiching Soil and Water Conservation District, Superior National Forest, University of Minnesota, NRRI, Michigan Tech University, and Fond du Lac Reservation. Presented phase one results and discussed phase 2 work plan.*

Status as of January 30, 2016:

- *Dale Krystosek and Dr. Rodney Chimner (project consultant) conducted a program at the BWSR Academy on October 29th on the topic of peatland restoration which discussed the Northeast Minnesota White Cedar Restoration – Phase 2 project.*
- *In January, Dale Krystosek, project manager and Derrick Passe, Lake County Soil and Water Conservation District Engineer participated in a 30 minute radio interview regarding the Northeast Minnesota White Cedar Restoration – Phase 2 project with Emily Nelson. The program will air on KTWH Two Harbors Community Radio. It will also stream on their website www.ktwh.org. The Lake County SWCD will also be hosting it as a podcast on their website.*

Status as of September 30, 2016:

- *Held meeting on February 17th, 2016 with Itasca SWCD, Lake SWCD, Koochiching SWCD DNR Forestry, University of Minnesota, MnDOT, U.S. Forest Service to discuss hydrologic restoration techniques, and implementation of other phases of the program.*
- *Maintained regular contact with cooperators involved with the Itasca County and Lake County project sites to keep everyone informed and identify and resolve issues holding back progress.*
- *Worked closely with Bill Westerberg and Matt Johnson to produce the RFP and award the bid for construction at the Itasca County site in Wirt. Attended pre-bid meeting with Bill and prospective bidders and reviewed modifications of RFP that resulted from that meeting.*
- *Project staff monitored progress on both Itasca and Lake County construction sites by phone, e-mail, and field visits. Had to make design modifications to Lake County site due to wet conditions the created a safety issue that could have eliminated all work on the site for the project. Found storm*

damage to the erosion blanket at the Itasca site and arranged with Matt Johnson, Itasca SWCD to get the damage repaired.

- *Working with Itasca Community Television (ICTV)/Two Rivers Video to video record construction at both the Itasca and Lake County sites to document how the projects were installed to help communicate the project outcomes to multiple parties.*
- *Worked with Erica Hahn from the Superior National Forest and Rod Chimner to set up a field review of one or two sites the Forest would like to restore hydrology and white cedar plant communities, building on what the project is learning.*

Status as of January 30, 2017:

- *Itasca Community Television (ICTV, Grand Rapids, MN) completed capturing video and still photography of all stages of construction for both hydrologic construction sites. Rick Dahlman is working with ICTV to edit footage and create training videos for both construction techniques which will be used for training of local governments and other agencies on white cedar plant community restoration techniques.*
- *In October, project staff met with Erica Hahn and other personnel from the Superior National Forest and Dr. Rod Chimner to conduct a field review of sites the Forest Service would like to restore hydrology and white cedar plant communities, utilizing this project’s findings.*
- *Briefed other BWSR staff from Wetland Section regarding project findings and potential for use of restoration techniques in other state and local government wetland restoration initiatives.*
- *Rick Dahlman continues reaching out to foresters from County Land and Forestry Departments, DNR foresters, U.S. Forest Service personnel, and Voyageurs National Park to build avenues for disseminating project findings and generate interest for white cedar restoration.*

Final Report Summary:

ICTV completed capturing video and still photography of all stages of construction for both hydrologic construction sites. Rick Dahlman has completed work with ICTV to edit the footage and create training videos for both construction options. For video link, see attachment 6.

The video describing the 2 hydrologic restoration projects has been completed. The video has been distributed to multiple stakeholders, including BWSR, DNR, MPCA, County Forestry offices, Corps of Engineers, University of Minnesota and federal agencies as well as other states and Canada. It will be made available on the BWSR web page. Informational meetings will be held with several agencies, including the Minnesota Forest Resource Council. The project reports will also be posted on line and shared with numerous stakeholders in Minnesota and across the US and Canada.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Explanation
Personnel:	\$ 80,900	Unclassified (50% time) Wetland Specialist (Board of Water and Soil Resources for 2 years) Salary - 74% Benefits - 26%

Professional/Technical/Service Contracts:	\$122,000	<p>1) Natural Resource Research Institute - University of Minnesota, Duluth - Contract to provide technical expertise in designing white cedar hydrologic restoration projects. Work will include review and evaluation of techniques in other states, field data collection and project design. This contract will also include development of recommendations for white cedar restoration. <i>(\$45,000)</i></p> <p>2) Soil and Water Conservation Districts and County Land Departments - Up to 7 contracts with SWCDs and/or County Land Departments for additional staff based on criteria, priorities and targeted areas established by the interagency technical team. This field work would be to complete field investigations and prioritization of white cedar sites for hydrologic restoration and inspection and monitoring of phase 1 restoration sites. <i>(\$77,000)</i></p>
Equipment/Tools/Supplies:	\$124,100	<p>Equipment/Tools/Supplies - Construction costs and restoration costs and field supplies including costs for field demonstration of hydrologic restoration techniques (<i>culverts, restoration of natural hydrologic flows</i>). <i>(\$124,100)</i></p> <p>1) Earthwork and grading - Estimated costs = \$80,000</p> <p>2) Culverts and/or rock conveyance systems to restore and equalize hydrology on both sides of roads/trails within white cedar stand - estimated costs = \$44,100 - These are estimated costs for hydrologic restoration and the selection of restoration sites will be highly influenced by the scope of hydrologic restoration needs, and the earthwork and grading and restoration material costs at each restoration site that is evaluated. The project team has considered several restoration designs including:</p> <p><i>a) installation of culverts and redistribution channels at the appropriate density to adequately recharge groundwater downstream from the roads/trail that is impacting the white cedar stand or</i></p> <p><i>b) Installation of crushed rock veins within the road/trail to provide adequate cross groundwater flows to restore natural hydrologic</i></p>

		<i>conditions for white cedar plant community restoration.</i> c) Other potential designs will be considered, based on input from BWSR engineers, MnDOT staff, University of Minnesota, Michigan Tech University, and DNR Division of Forestry.
Travel Expenses in MN:	\$8,000	This budget item is to cover BWSR staff travel costs including mileage, meals, lodging costs for Interagency coordination meetings, field site visits and training. For example: a) travel from Bemidji BWSR office to Duluth for interagency technical team meetings, b) travel costs for BWSR Wetland Specialists from office (Duluth) to field and demonstration sites within project area, c) Travel for BWSR staff to training sessions (Grand Rapids, Duluth, International Falls, etc.)
TOTAL ENRTF BUDGET:	\$335,000	

Explanation of Use of Classified Staff: The only use of classified staff will be in-kind support by the BWSR Wetland Special Project Lead.

Explanation of Capital Expenditures Greater Than \$5,000: None planned.

Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation: 1.5

Number of Full-time Equivalent (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 1.0

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
	\$	\$	
State			
10% of BWSR Wetland Special Project Lead (In Kind Staff Time)	\$16,400	\$ 8,250	Project management, field work, site inspections, and meetings with partners.
TOTAL OTHER FUNDS:	\$16,400	\$8,250	

VII. PROJECT STRATEGY:

A. Project Partners: Interagency team including BWSR, DNR, MPCA, MnDOT, Corps of Engineers, University of Minnesota, Soil and Water Conservation Districts, County Land Departments and federal agencies will develop white cedar plant community restoration.

Partners receiving funding: University of Minnesota Duluth (NRRI), SWCDs and county land departments

B. Project Impact and Long-term Strategy: The long term strategy of the project is to develop recommendations for white cedar restoration in the state and present recommendations to BWSR, DNR Commissioner and Minnesota Legislature.

C. Spending History:

Funding Source	M.L. 2008 or FY09	M.L. 2009 or FY10	M.L. 2010 or FY11	M.L. 2011 or FY12-13	M.L. 2013 or FY14
ENRTF				\$250,000	\$335,000

VIII. ACQUISITION/RESTORATION LIST:

- Two hydrologic restoration sites will be restored by the project. These sites will be on public lands (either state or county) and will be selected based on suitability for restoration, costs of restoration, level of interest by land managers and other factors.

IX. VISUAL ELEMENT or MAP(S): (see attached map)

X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET:

XI. RESEARCH ADDENDUM:

XII. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than January 30, 2015, September 30, 2015, January 30, 2016, September 30, 2016, January 30, 2017. A final report and associated products will be submitted between June 30 and August 30, 2017.

Final Report Attachments:

Attachment 1 - Final Budget Report

Attachment 2 - Northeast Minnesota White Cedar Plant Community Restoration: Phases I & II Final Technical Report prepared for Environment and Natural Resources Trust Fund, Chimner, R.A., Schwartz, Michigan Technological University, School of Forest Resources and Environmental Science, Houghton, MI 49931 Stensing, J. Minnesota Board of Water and Soil Resources (Retired), Waskish, MN 56685 Dahlman, R. Minnesota Department of Natural Resources, Div. of Forestry (Retired), Elk River, MN 55330 and Krystosek, D. Board of Water and Soil Resources, St. Paul, MN 55155

Attachment 3 - CARBON CYCLING AND RESTORATION IN TEMPERATE FORESTED PEATLANDS by Rose B. Schwartz a THESIS submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE In Applied Ecology, MICHIGAN TECHNOLOGICAL UNIVERSITY 2016.

Attachment 4 - Northern White Cedar Mineral Sites

Attachment 5 - Restoration Site Evaluations

Attachment 6 - Restoration Video

Environment and Natural Resources Trust Fund											
M.L. 2014 Project Budget											
Project Title: Northeast Minnesota White Cedar Restoration, Phase 2											
Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06d											
Project Manager: Dale Krystosek											
Organization: Minnesota Board of Water and Soil Resources											
M.L. 2014 ENRTF Appropriation: \$ 335,000											
Project Length and Completion Date: 3 Years - June 30, 2017											
Date of Report: August 16, 2017											
											
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET											
BUDGET ITEM	Activity 1 Budget	Amount Spent	Activity 1 Balance	Revised Activity 2 Budget 04/14/2016	Amount Spent	Activity 2 Balance	Revised Activity 3 Budget 04/14/2016	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
ACTIVITY 1: Implement two hydrologic restorations of white cedar plant communities											
Personnel (Wages and Benefits) (\$80,900) BWSR Wetland Specialist (50% fulltime employment) 74% Salary, 26% for benefits - one person will fill this position through an unclassified position.	\$18,500	\$18,500	\$0	\$11,868	\$11,868	\$0	\$0	\$0	\$0	\$30,368	\$0
Professional/Technical Contracts - 1) Natural Resource Research Insitiute - University of Minnesota, Duluth - Contract to provide technical expertise in designing white cedar hydrologic restoration projects. Work will include review and evaluation of techniques in other states, field data collection and project design. This contract will also include development of recommendations for white cedar restoration. (\$45,000)	\$24,500	\$24,500	\$0	\$10,500	\$10,500	\$0	\$10,000	\$9,832	\$168	\$45,000	\$168
Professional/Technical/Service Contracts 2) Soil and Water Conservation Districts and County Land Departments - Up to 7 contracts with SWCDs and/or County Land Departments for additional staff based on criteria, priorities and targeted areas established by the interagency technical team. This field work would be to complete field investigations and prioritization of white cedar sites for hydrologic restoration and inspection and monitoring of phase 1 restoration sites. (\$69,000)	\$15,400	\$15,400	\$0	\$72,032	\$72,032	\$0	\$40,100	\$10,857	\$29,243	\$127,532	\$29,243
Equipment/Tools/Supplies - Construction costs and restoration costs and field supplies including costs for field demonstration of hydrologic restoration techniques (<i>culverts, restoration of natural hydrologic flows</i>). (\$124,100) 1) Earthwork and grading - Estimated costs = \$80,000 2) Culverts and/or rock conveyance systems to restore and equalize hydrology on both sides of roads/trails within white cedar stand - estimated costs = \$44,100 A. These are estimated costs for hydrologic restoration and the selection of restoration sites will be highly influenced by the scope of hydrologic restoration needs, and the earthwork and grading and restoration material costs at each restoration site that is evaluated. The project team has considered several restoration designs including a) installation of culverts and redistribution channels at the appropriate density to adequately recharge groundwater downstream from the roads/trail that is impacting the white cedar stand or b) installation of crushed rock veins within the road/trail to provide adequate cross groundwater flows to restore natural hydrologic conditions for white cedar plant community restoration.c) Other potential designs will be considered, based on input from BWSR engineers, MnDOT staff, University of Minnesota, Michigan Tech University, DNR Division of Forestry.	\$124,100	\$66,234	\$57,866							\$124,100	\$57,866

Travel expenses in Minnesota - This budget item is to cover BWSR staff costs for Interagency coordination meetings, field site visits and training. For example: a) travel from Bemidji BWSR office to Duluth for interagency technical team meetings, b) travel costs for BWSR Wetland Specialists from office (Duluth) to field and demonstration sites within project area, c) Travel for BWSR staff to training sessions (Grand Rapids, Duluth, International Falls, etc.) <i>(\$8,000)</i>	\$2,500	\$2,500	\$0	\$3,400	\$3,400	\$0	\$2,100	\$2,593	-\$493	\$8,000	-\$493
TOTALS	\$185,000	\$127,134	\$57,866	\$97,800	\$97,800	\$0	\$52,200	\$23,282	\$28,918	\$335,000	\$86,784



Northeast Minnesota White Cedar Restoration - Phase II

Restoration Site Evaluations:

Beltrami County (14 stands)

Cook County (12 stands)

Itasca County (7 stands)

Hubbard County (2 stands)

Lake of the Woods County (17 stands)

Lake County (12 stands)

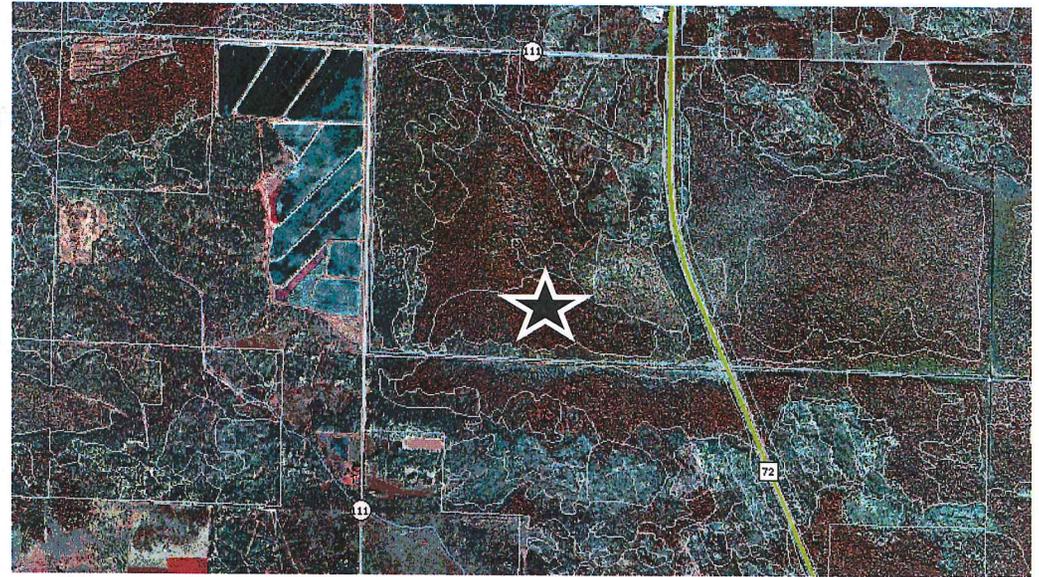
St. Louis County (23 stands)

Located in Beltrami County
S5 T155 R30

Hydrologic Restoration Indicator Stand 1050072

Vegetation

Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1-low 3-good	Stand Condition 1-low 3-good	Assessment Ranking 1-low 3-good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	



Stand ID t15330w1050072

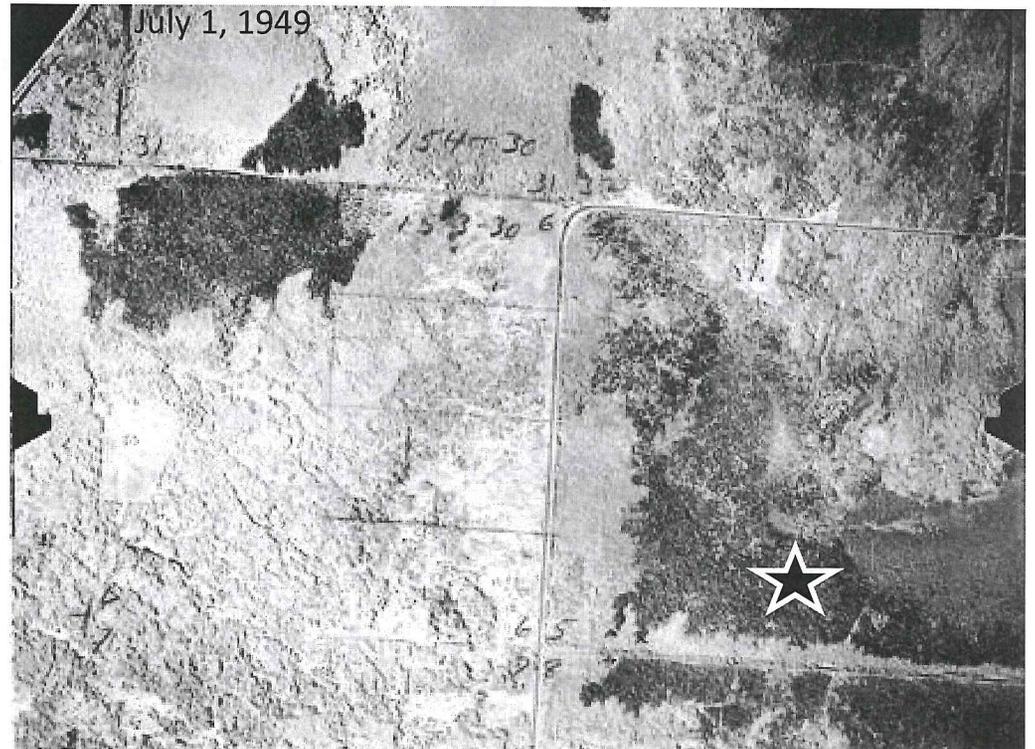
(No NPC)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	23
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	77.4
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1982
Age at Inventory	117 years
Average Diameter Class	5 to 8.9 inches
Density Class	7.5-12.5 cords per acre
Basal Area	85 square feet per acre
Volume	11.0 cords per acre
Condition Class	Mature
Understory Type - White Cedar	
Average Diameter Class	1 to 2.9 inches
Density class	750-1250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	7 inches	6.2 cords	35 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Spruce	8 inches	4.6 cords	Well distributed



Located in Beltrami County
S21 T153 R30

Hydrologic Restoration Indicator Stand 1210321

Vegetation

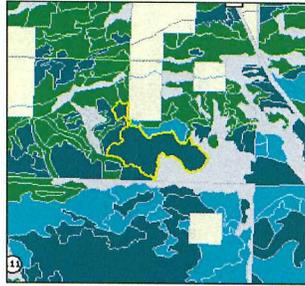
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	DA	SI	SPECIES		
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	



Stand ID t15330w1210321

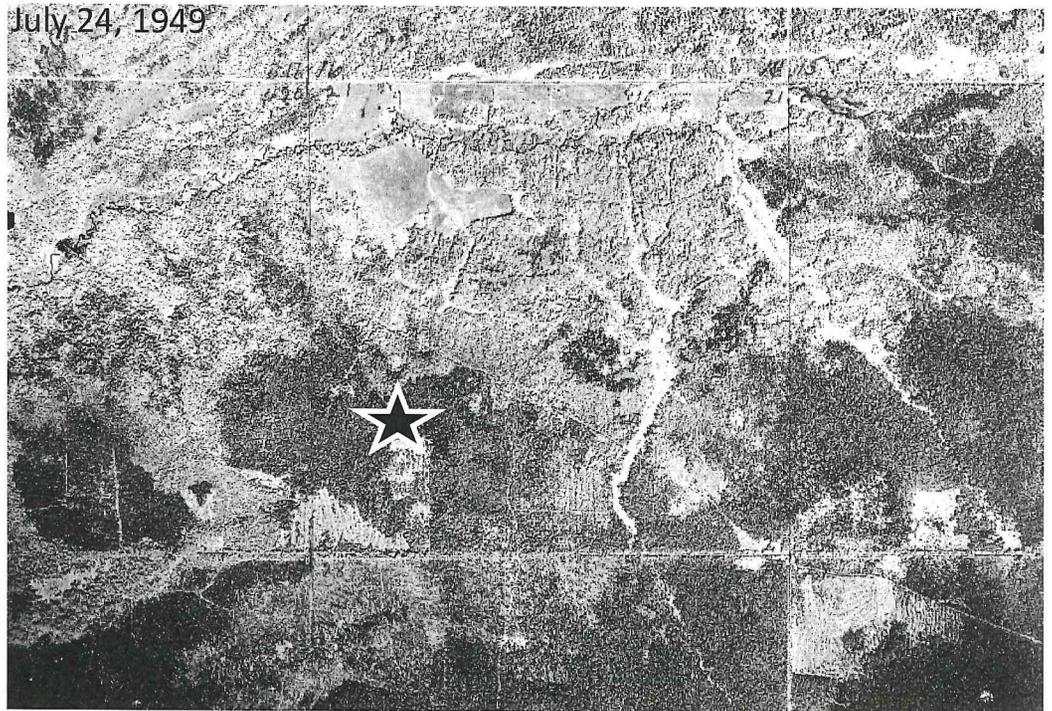
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Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	24
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	121.8
Management Status	Restricted timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1982
Age at Inventory	111 years
Average Diameter Class	5 to 8.9 inches
Density Class	22.5-27.5 cords per acre
Basal Area	145 square feet per acre
Volume	24.0 cords per acre
Condition Class	Mature
Understory Type - Balsam Fir	
Average Diameter Class	0 to 0.9 inches
Density class	2,250-2,750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	20.6 cords	36 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Balsam Fir	8 inches	2.8 cords	Well distributed
Black Spruce	9 inches	1.1 cords	Well distributed



Located in Beltrami County
S11 T152 R30

Hydrologic Restoration Indicator Stand 1110261

Vegetation

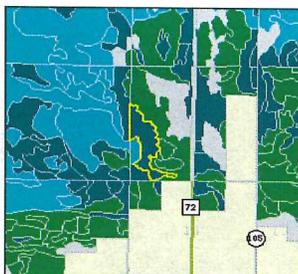
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1-low 3-good	Stand Condition 1-low 3-good	Assessment Ranking 1-low 3-good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
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Stand ID t15230w1110261

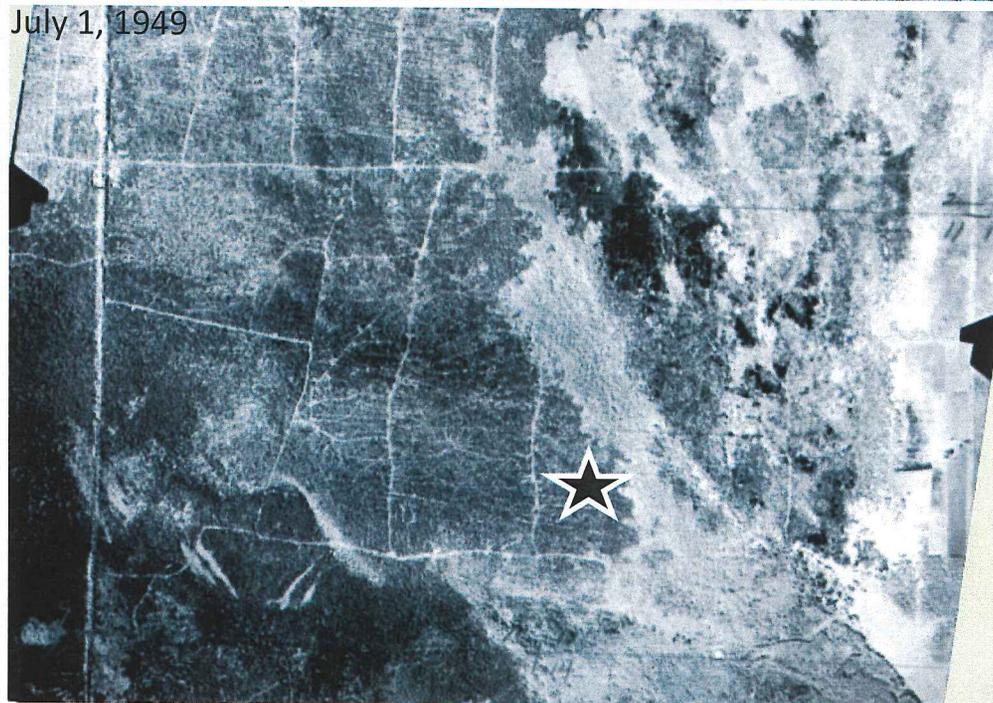
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Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	24
Physiographic Class	Hydic Site
Topography	Level
Stand Acres	54.2
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	2000
Age at Inventory	93 years
Average Diameter Class	5 to 8.9 inches
Density Class	17.5-22.5 cords per acre
Basal Area	153 square feet per acre
Volume	19.0 cords per acre
Condition Class	Immature
Understory Type - White Cedar	
Average Diameter Class	3 to 4.9 inches
Density class	250-750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	17.7 cords	32 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Ash	9 inches	0.3 cords	Mod. well distributed
Paper Birch	6 inches	0.6 cords	Well distributed
Balm of Gilead	9 inches	0.3 cords	Mod. well distributed
Balsam Fir	6 inches	0.3 cords	Well distributed

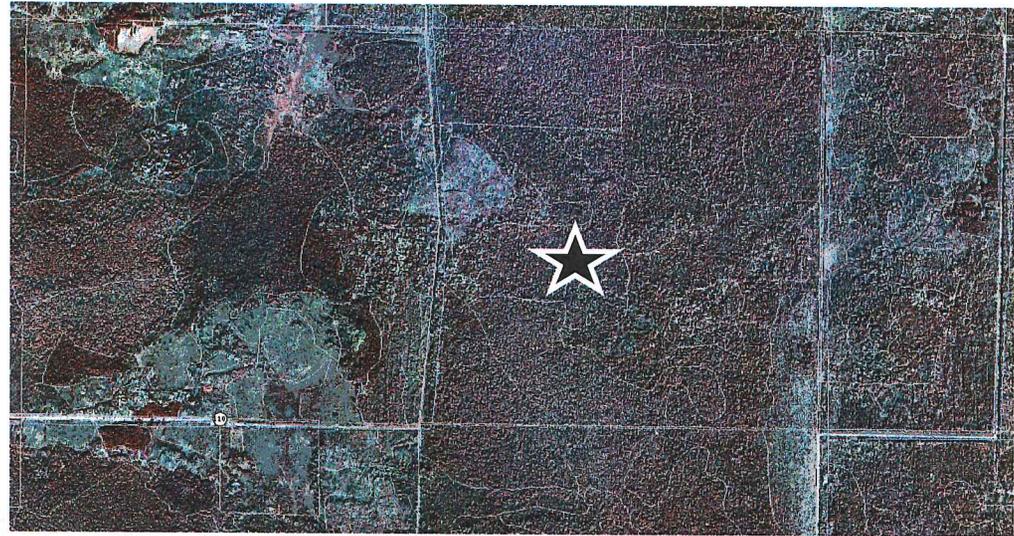


Located in Beltrami County
S36 T154 R30

Hydrologic Restoration Indicator Stand 1360550

Vegetation

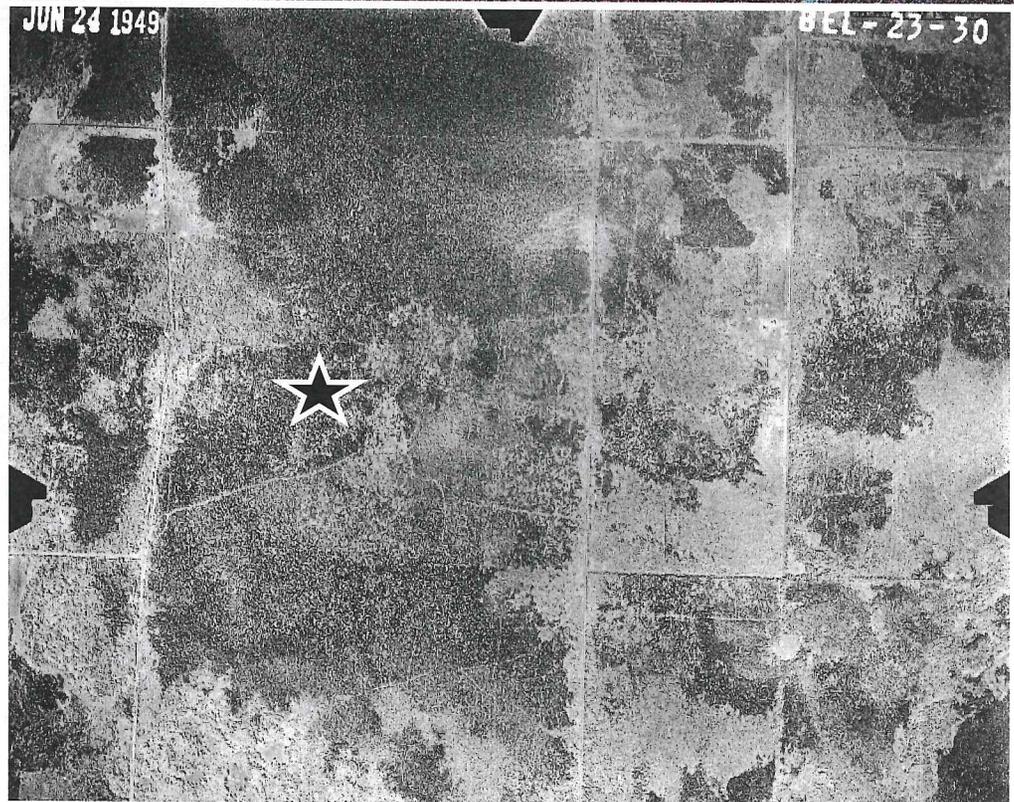
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)													
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#													
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES			
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73		
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73		
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73		
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73		
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73		
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73		
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73		
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73		
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73		
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73		
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73		
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73		



Stand ID t15430w1360550

FPn63 (Anez)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	26
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	58.9
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	2007
Age at Inventory	73 years
Average Diameter Class	5 to 8.9 inches
Density Class	17.5-22.5 cords per acre
Basal Area	133 square feet per acre
Volume	21.0 cords per acre
Condition Class	Mature
Understory Type - White Cedar	
Average Diameter Class	0 to 0.9 inches
Density class	250-750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	15.6 cords	37 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Paper Birch	7 inches	0.7 cords	Patchy
Balsam Fir	7 inches	0.7 cords	Patchy
Black Spruce	8 inches	1.3 cords	Well distributed
Tamarack	10 inches	2.7 cords	Well distributed

Located in Beltrami County
S8 T153 R30

Hydrologic Restoration Indicator Stand 1080080

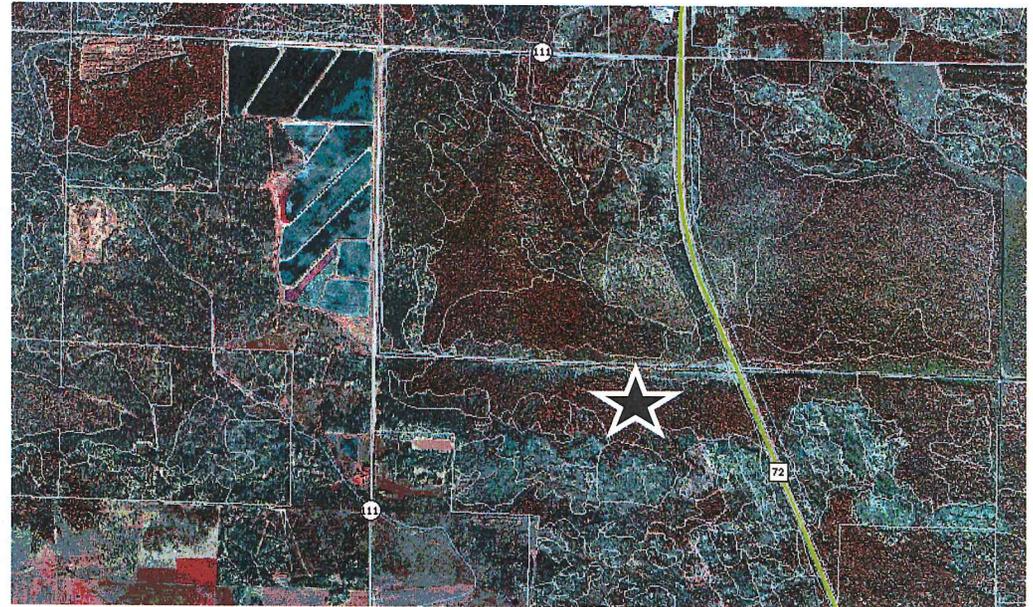
Vegetation

Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)													
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION # and STAND ID#													
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES			
Ditch	LV=3	5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73		
		3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73		
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73		
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73		
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		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73		
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73		
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73		
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73		
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73		
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73		
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73		

Beltrami County

Stand ID t15330w1080080

FPn63 (Tjader)

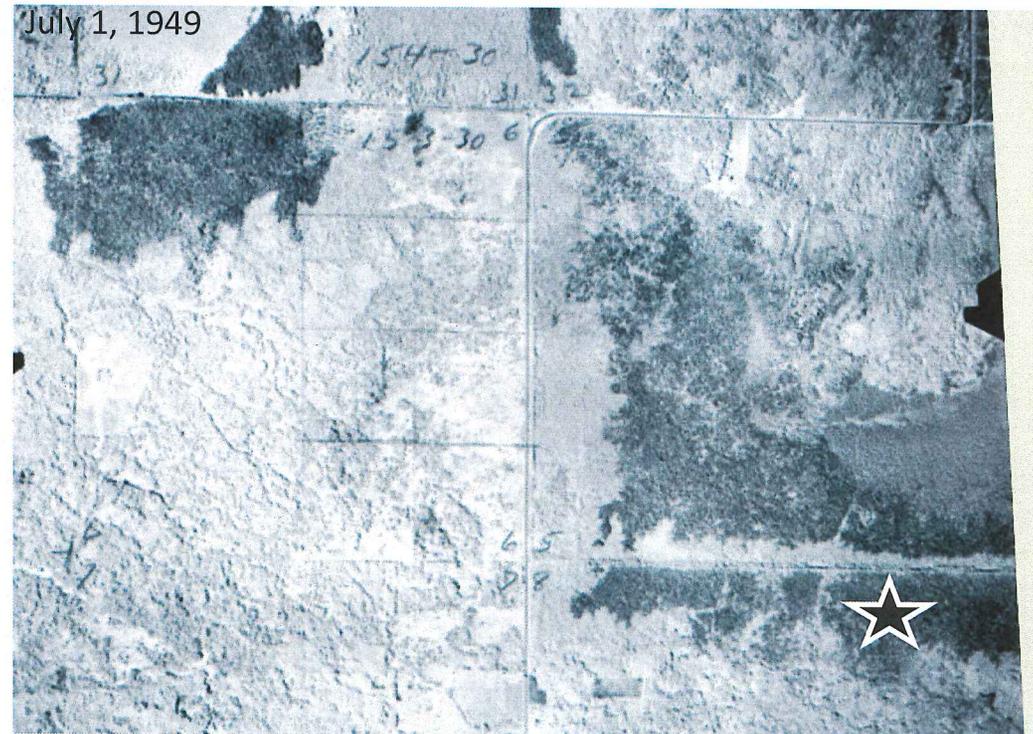


Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	24
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	108.4
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1982
Age at Inventory	144 years
Average Diameter Class	5 to 8.9 inches
Density Class	17.5-22.5 cords per acre
Basal Area	126 square feet per acre
Volume	20.0 cords per acre
Condition Class	Mature
Understory Type - White Cedar	
Average Diameter Class	1 to 2.9 inches
Density class	750-1250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	15.0 cords	37 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Paper Birch	8 inches	0.3 cords	Mod. well distributed
Black Spruce	7 inches	4.5 cords	Well distributed
Black Spruce	7 inches	0.4 cords	Patchy
Northern White Cedar	8 inches	0.3 cords	Patchy



Located in Beltrami County
S2 T153 R30

Hydrologic Restoration Indicator Stand 1020071

Vegetation

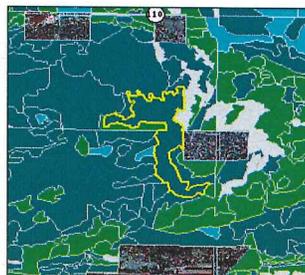
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)													
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#													
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES			
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73		
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73		
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73		
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		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73		
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73		
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73		
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73		
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73		
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73		
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73		
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73		



Stand ID t15330w1020071

FPn63 (Bates)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	23
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	139.9
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1982
Age at Inventory	111 years
Average Diameter Class	5 to 8.9 inches
Density Class	17.5-22.5 cords per acre
Basal Area	161 square feet per acre
Volume	21.0 cords per acre
Condition Class	Mature
Understory Type - White Cedar	
Average Diameter Class	0 to 0.9 inches
Density class	750-1250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	17.9 cords	33 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Paper Birch	8 inches	0.2 cords	Well distributed
Balsam Fir	6 inches	1.4 cords	Well distributed
Black Spruce	8 inches	1.2 cords	Well distributed
Tamarack	6 inches	0.4 cords	Well distributed



Located in Beltrami County
S6 T153 R30

Hydrologic Restoration Indicator Stand 106002

Vegetation

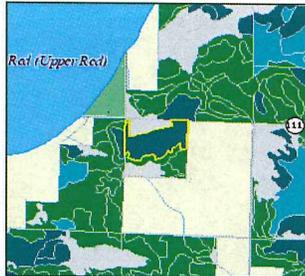
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#	SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES	
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	



Stand ID t15330w1060002

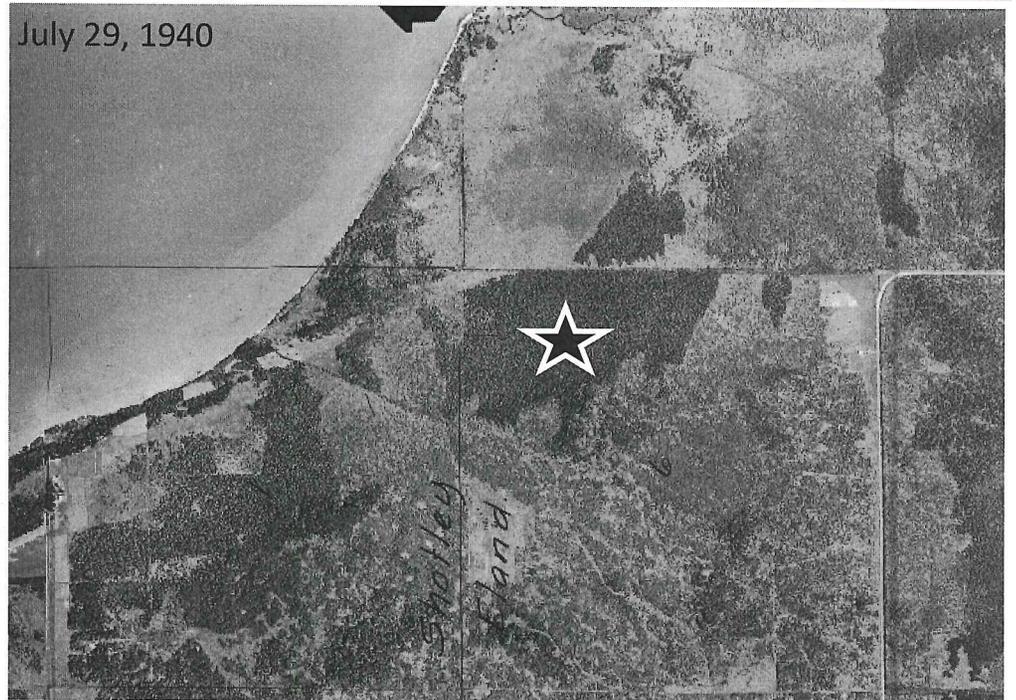
(No NPC)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	28
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	73.0
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1982
Age at Inventory	121 years
Average Diameter Class	9 to 14.9 inches
Density Class	22.5-27.5 cords per acre
Basal Area	163 square feet per acre
Volume	25.0 cords per acre
Condition Class	Mature
Understory Type - Balsam Fir	
Average Diameter Class	0 to 0.9 inches
Density class	1,250-1,750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	9 inches	23.0 cords	41 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Balm of Gilead	6 inches	0.2 cords	Patchy
Balm of Gilead	7 inches	0.4 cords	Patchy
Balsam Fir	7 inches	1.0 cords	Well distributed



Located in Beltrami County
S22 T153 R30

Hydrologic Restoration Indicator Stand 1220534

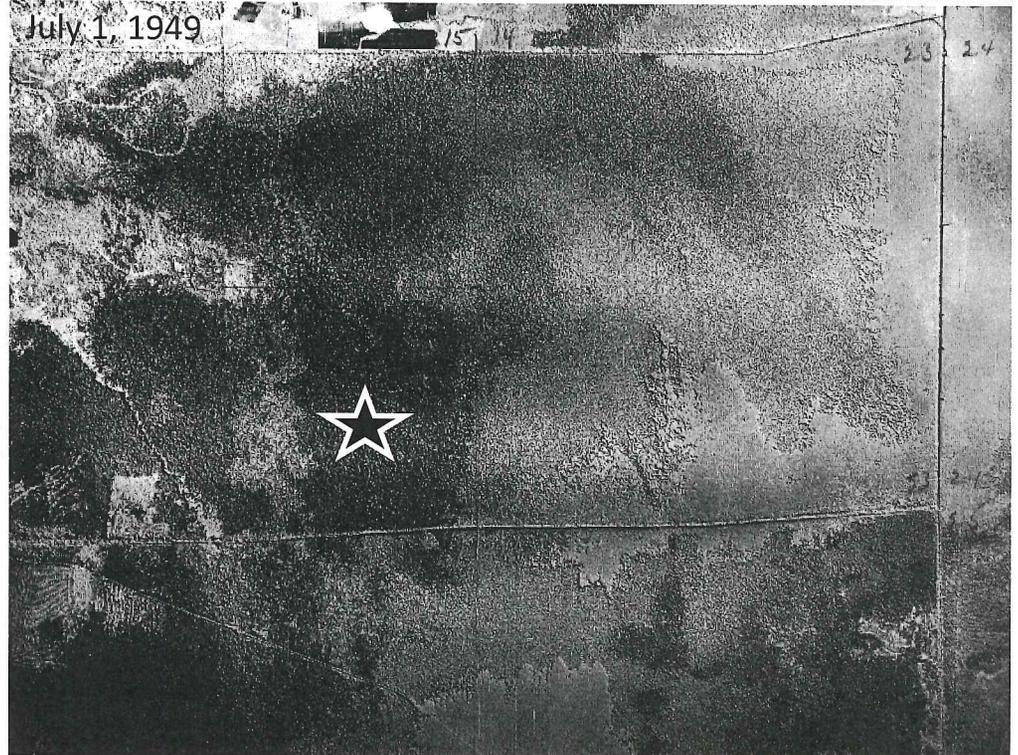
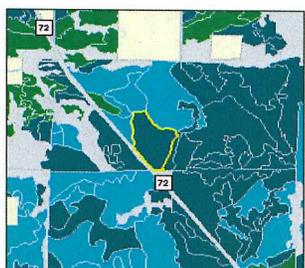
Vegetation

Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1-low 3-good	Stand Condition 1-low 3-good	Assessment Ranking 1-low 3-good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15333w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	

Stand ID t15330w1220534

FPn63 (Tjader)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	24
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	73.1
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1998
Age at Inventory	91 years
Average Diameter Class	5 to 8.9 inches
Density Class	7.5-12.5 cords per acre
Basal Area	138 square feet per acre
Volume	11.0 cords per acre
Condition Class	Mature
Understory Type - Tamarack	
Average Diameter Class	0 to 0.9 inches
Density class	4,250+ stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	6 inches	5.9 cords	35 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Spruce	6 inches	3.2 cords	Well distributed
Tamarack	9 inches	1.7 cords	Well distributed

Located in Beltrami County
S32 T156 R30

Hydrologic Restoration Indicator Stand 1320045

Vegetation

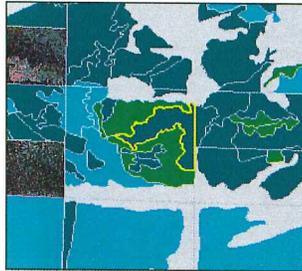
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
Ditch	LV=3	5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
		3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
		3	1+1+1	t15230w110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
Road	LV=2	5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
		3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
		3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	

Stand ID t15630w1320045

(No NPC)



Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	30
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	89.6
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	2007
Age at Inventory	41 years
Average Diameter Class	5 to 8.9 inches
Density Class	12.5-17.5 cords per acre
Basal Area	80 square feet per acre
Volume	17.0 cords per acre
Condition Class	Immature
Understory Type - Balsam Fir	
Average Diameter Class	0 to 0.9 inches
Density class	250-750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	7 inches	6.2 cords	41 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Ash	8 inches	3.7 cords	Mod. well distributed
Trembling Aspen	6 inches	3.0 cords	Well distributed
Paper Birch	8 inches	1.1 cords	N/A
Balm of Gilead	6 inches	0.6 cords	Well distributed
Balsam Fir	6 inches	1.9 cords	Mod. well distributed
Black Spruce	6 inches	0.5 cords	Patchy

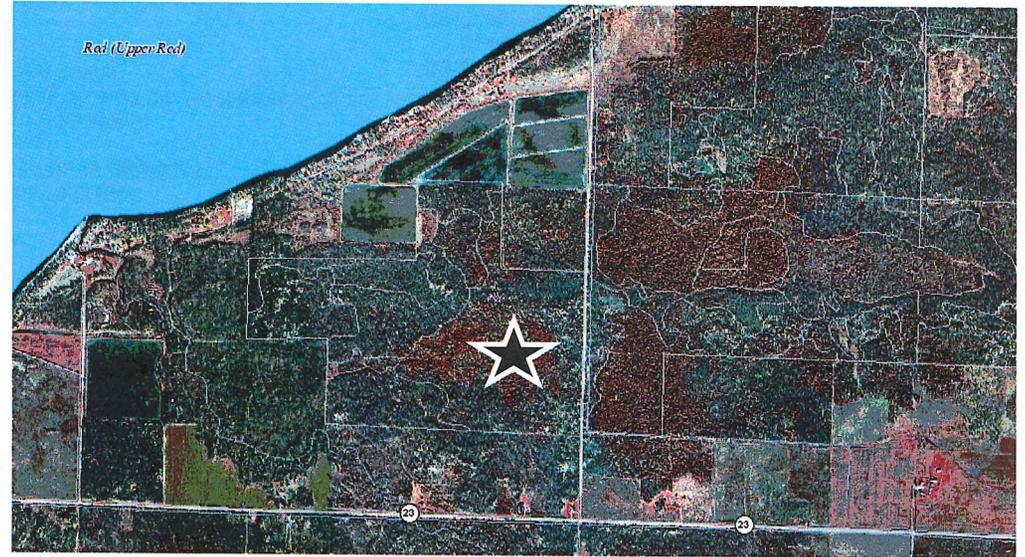
Located in Beltrami County
S11 T153 R31

Hydrologic Restoration Indicator Stand 1110322

Vegetation

40

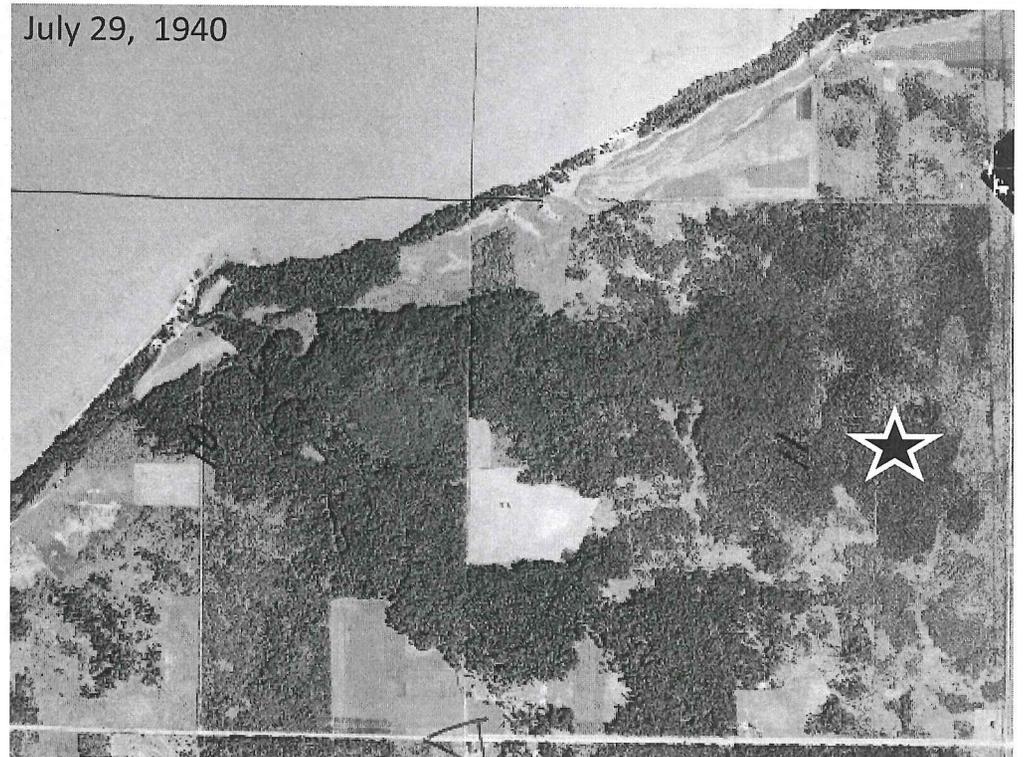
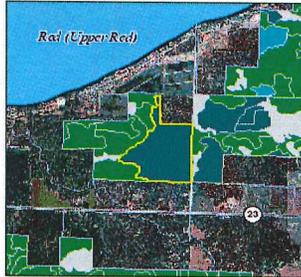
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#	SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES	
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Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	



Stand ID t15331w1110322

(No NPC)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	37
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	141.7
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1999
Age at Inventory	84 years
Average Diameter Class	5 to 8.9 inches
Density Class	27.5-32.5 cords per acre
Basal Area	140 square feet per acre
Volume	32.0 cords per acre
Condition Class	Immature
Understory Type - Black Ash	
Average Diameter Class	0 to 0.9 inches
Density class	2,750-3,250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	18.8 cords	51 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Ash	9 inches	1.3 cords	Mod. well distributed
Trembling Aspen	10 inches	2.5 cords	Mod. well distributed
Paper Birch	8 inches	5.3 cords	Well distributed
Green Ash	6 inches	1.4 cords	Well distributed

Located in Beltrami County
S19 T153 R31

Hydrologic Restoration Indicator Stand 1190171

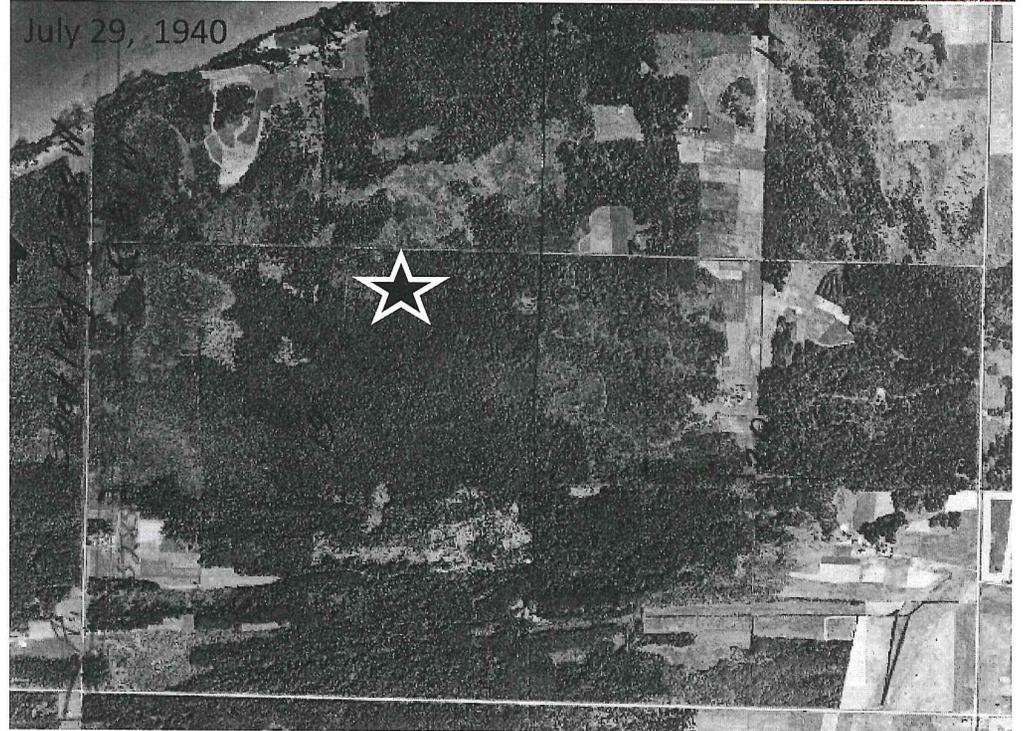
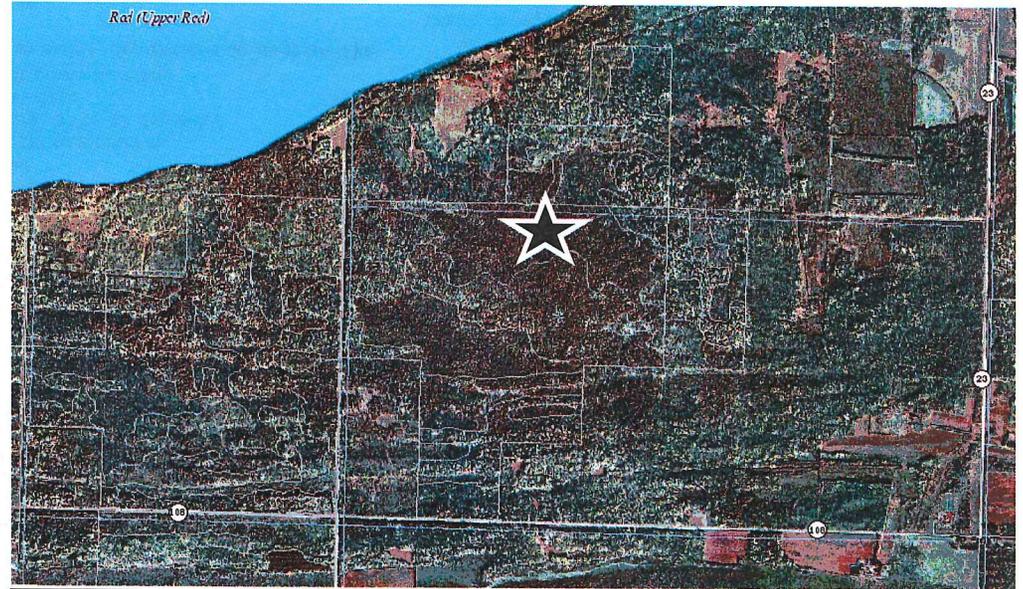
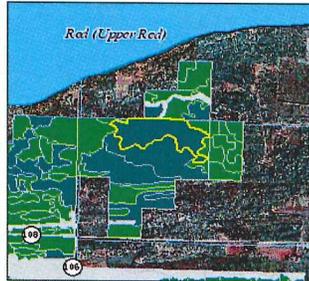
Vegetation

Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#												
				SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
Ditch	LV=3	5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Road	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
		3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	

Stand ID t15331w1190171

(No NPC)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	30
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	93.0
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1999
Age at Inventory	67 years
Average Diameter Class	9 to 14.9 inches
Density Class	17.5-22.5 cords per acre
Basal Area	148 square feet per acre
Volume	22.0 cords per acre
Condition Class	High Risk
Understory Type - Balsam Fir	
Average Diameter Class	0 to 0.9 inches
Density class	2,250-2,750 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	9 inches	16.0 cords	37 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Trembling Aspen	8 inches	1.5 cords	Mod. well distributed
Balm of Gilead	7 inches	0.5 cords	Mod. well distributed
Balsam Fir	7 inches	1.9 cords	Well distributed
Black Spruce	10 inches	1.1 cords	Mod. well distributed

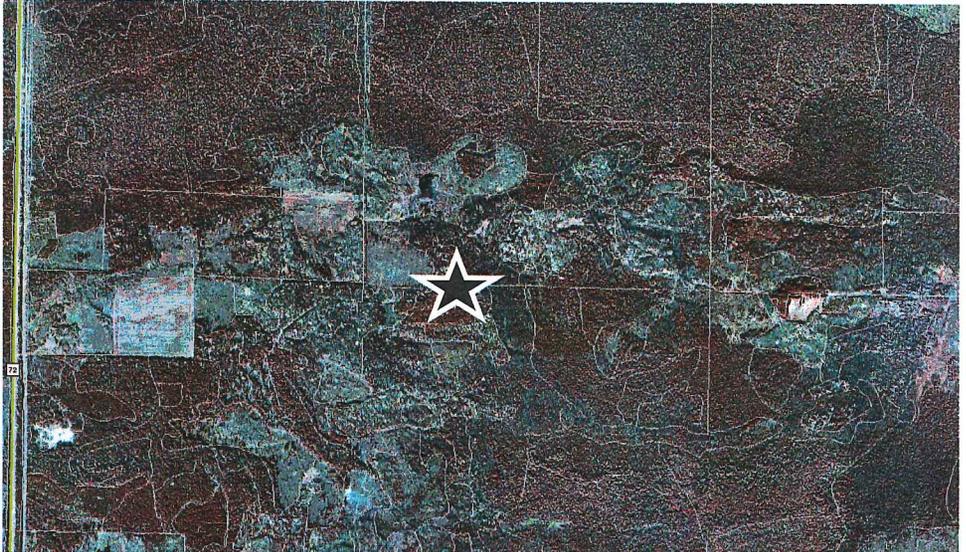
Located in Beltrami County
S34 T154 R30

Hydrologic Restoration Indicator Stand 1340530

"Nyberg Trail" Site

Vegetation

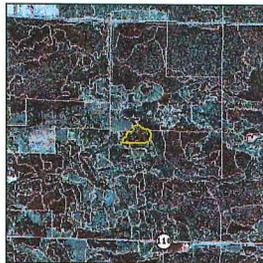
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)												
Drainage Impediment	Feasibility and Landscape Value 1-low 3-good	Stand Condition 1-low 3-good	Assessment Ranking 1-low 3-good	STAND LOCATION and STAND ID#												
				STAND ID#	SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES	
		5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73	
Ditch	LV=3	3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73	
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73	
		4	1+1+2	t15430w1360550	550 C44	58.9	73	1	1	73	4	2	133	26	73	
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73	
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73	
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73	
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73	
		4	2+0+2	t15630w1320045	45 C43	179.2	62	1	1	41	4	3	80	30	73	
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73	
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73	
Trail				t15430w1340530	530 C47	17.8	73	3	3	74	4	2	218	33	73	
		8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73	



Stand ID t15430w1340530

MHn44 (Tjader)

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	33
Physiographic Class	Mesic Site
Topography	Level
Stand Acres	17.8
Management Status	Normal timber harvest allowed



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	2004
Age at Inventory	74 years
Average Diameter Class	5 to 8.9 inches
Density Class	32.5-37.5 cords per acre
Basal Area	218 square feet per acre
Volume	32.7 cords per acre
Condition Class	Immature
Understory Type - White Cedar	
Average Diameter Class	3 to 4.9 inches
Density class	1,250-1,750 stems per acre

Stand Composition by Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	7 inches	21.0 cords	44 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Trembling Aspen	12 inches	0.8 cords	Patchy
Paper Birch	8 inches	2.2 cords	Well distributed
Balm of Gilead	12 inches	7.5 cords	Well distributed
Balsam Fir	7 inches	1.2 cords	Mod. well distributed



Located in Beltrami County
S24 T153 R32

Hydrologic Restoration Indicator Stand 1240108

“Nyberg Trail” Comparison Site

Vegetation

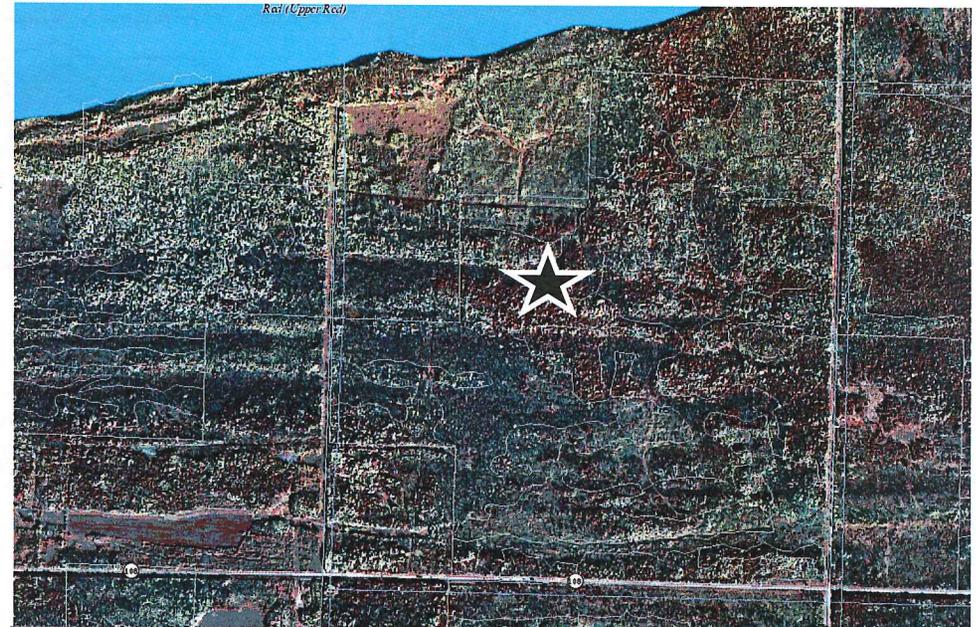
Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)																							
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#	SEABL	AC	UTYPE	USIZ	UDEN	AGE	PHYS	COND	BA	SI	SPECIES												
		5	1+2+2	t15330w1050072	72	C42	77.4	73	2	2	117	4	2	85	23	73											
Ditch	LV=3	3	1+0+2	t15330w1210321	321	C45	121.8	62	1	5	111	4	2	145	24	73											
Road	LV=3	3	1+1+1	t15230w1110261	261	C44	54.3	73	3	1	93	5	3	153	24	73											
		4	1+1+2	t15430w1360550	550	C44	58.9	73	1	1	73	4	2	133	26	73											
		5	1+2+2	t15330w1080080	80	C44	108.4	73	2	2	144	4	2	126	24	73											
		5	1+2+2	t15330w1020071	71	C44	139.7	73	1	2	111	4	2	161	23	73											
Road	LV=2	3	1+0+2	t15330w1060002	2	C55	72.9	62	1	3	121	4	2	163	28	73											
Road	LV=3	3	1+0+2	t15330w1220534	534	C42	73.1	72	1	9	91	4	2	138	24	73											
		4	2+0+2	t15630w1320045	45	C43	179.2	62	1	1	41	4	3	80	30	73											
		4	2+0+2	t15331w1110322	322	C46	140.4	1	1	6	84	4	3	140	37	73											
		4	2+0+2	t15331w1190171	171	C54	92.9	62	1	5	67	4	1	148	30	73											
				t15332w1240108	108	C59	11.6	12	1	2	97	4	3	238	41	73											
Trail				t15430w1340530	530	C47	17.8	73	3	3	74	4	2	218	33	73											
		8	3+3+2	t14831w1100036	36	C41	57.2	73	1	4	71	4	3	80	47	73											

Beltrami County
Stand ID t15332w1240108

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	41
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	11.6
Management Status	Normal timber harvest allowed



MHn44 (Bates)



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	2008
Age at Inventory	97 years
Average Diameter Class	9 to 14.9 inches
Density Class	42.5+ cords per acre
Basal Area	238 square feet per acre
Volume	2800 board feet plus 39.8 cords per acre
Condition Class	Immature
Understory Type - Aspen	
Average Diameter Class	0 to 0.9 inches
Density class	750-1250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	10 inches	34.5 cords	63 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Ash	10 inches	0.5 cords	Patchy
Trembling Aspen	19 inches	2400 board feet	Well distributed
Paper Birch	8 inches	4.3 cords	Well distributed
Balm of Gilead	18 inches	200 board feet	N/A
White Spruce	17 inches	300 board feet	N/A
Black Spruce	7 inches	0.5 cords	Patchy

Located in Beltrami County
S10 T148 R31

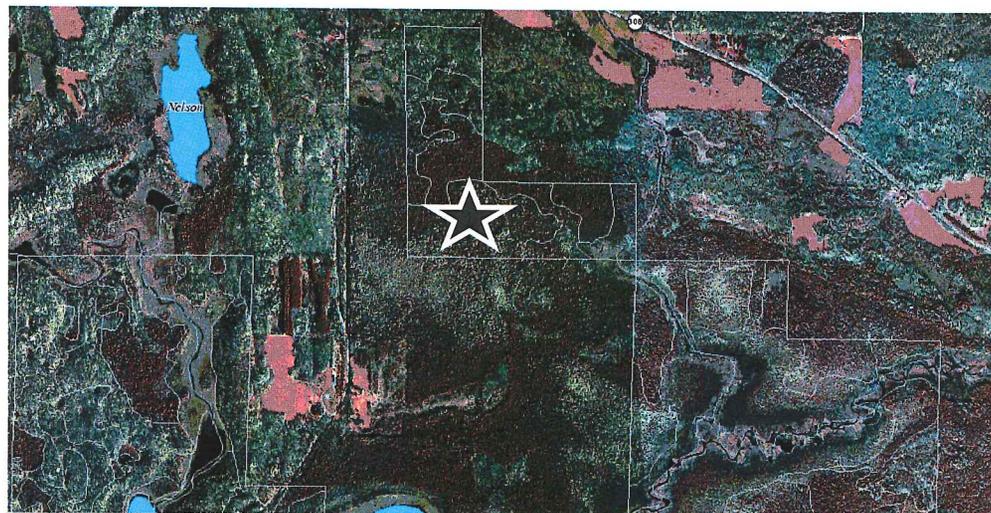
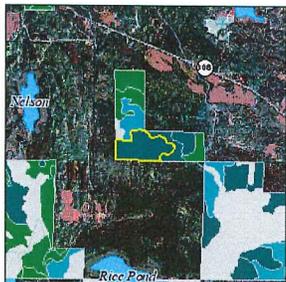
Hydrologic Restoration Indicator Stand 1100036

Vegetation

Restoration Potentials Level 1 Assessments				MnDNR/Forestry Cooperative Stand Assessment Data (consolidated)													
Drainage Impediment	Feasibility and Landscape Value 1=low 3=good	Stand Condition 1=low 3=good	Assessment Ranking 1=low 3=good	STAND LOCATION and STAND ID#													
				STAND LOCATION and STAND ID#	SLABEL	AC	UTYPE	USIZE	UDEN	AGE	PHYS	COND	BA	SI	SPECIES		
Ditch	LV=3	5	1+2+2	t15330w1050072	72 C42	77.4	73	2	2	117	4	2	85	23	73		
		3	1+0+2	t15330w1210321	321 C45	121.8	62	1	5	111	4	2	145	24	73		
Road	LV=3	3	1+1+1	t15230w1110261	261 C44	54.3	73	3	1	93	5	3	153	24	73		
		4	1+1+2	t15430w1360550	550 C 44	58.9	73	1	1	73	4	2	133	26	73		
		5	1+2+2	t15330w1080080	80 C44	108.4	73	2	2	144	4	2	126	24	73		
		5	1+2+2	t15330w1020071	71 C44	139.7	73	1	2	111	4	2	161	23	73		
Road	LV=2	3	1+0+2	t15330w1060002	2 C55	72.9	62	1	3	121	4	2	163	28	73		
Road	LV=3	3	1+0+2	t15330w1220534	534 C42	73.1	72	1	9	91	4	2	138	24	73		
		4	2+0+2	t15630w1320045	45 C 43	179.2	62	1	1	41	4	3	80	30	73		
		4	2+0+2	t15331w1110322	322 C46	140.4	1	1	6	84	4	3	140	37	73		
		4	2+0+2	t15331w1190171	171 C54	92.9	62	1	5	67	4	1	148	30	73		
				8	3+3+2	t14831w1100036	36 C41	57.2	73	1	4	71	4	3	80	47	73

Stand ID t14831w1100036

Site Attributes	
County	Beltrami
DNR Forestry Area	Blackduck Area
Site Index	47
Physiographic Class	Hydromesic Site
Topography	Level
Stand Acres	57.5
Management Status	Normal timber harvest allowed



June 20, 1947



Stand Attributes	
Cover Type - White Cedar	
Year of Inventory	1999
Age at Inventory	71 years
Average Diameter Class	5 to 8.9 inches
Density Class	3-7.5 cords per acre
Basal Area	80 square feet per acre
Volume	7.0 cords per acre
Condition Class	Immature
Understory Type - White Cedar	
Average Diameter Class	0 to 0.9 inches
Density Class	1,750-2,250 stems per acre

Stand Composition By Major Tree Species			
Main Species			
Species	Average DBH	Volume per acre	Height
Northern White Cedar	8 inches	4.5 cords	40 feet
Other Species			
Species	Average DBH	Volume per acre	Distribution
Black Spruce	7 inches	0.7 cords	Mod. well distributed
Tamarack	8 inches	1.7 cords	Mod. well distributed