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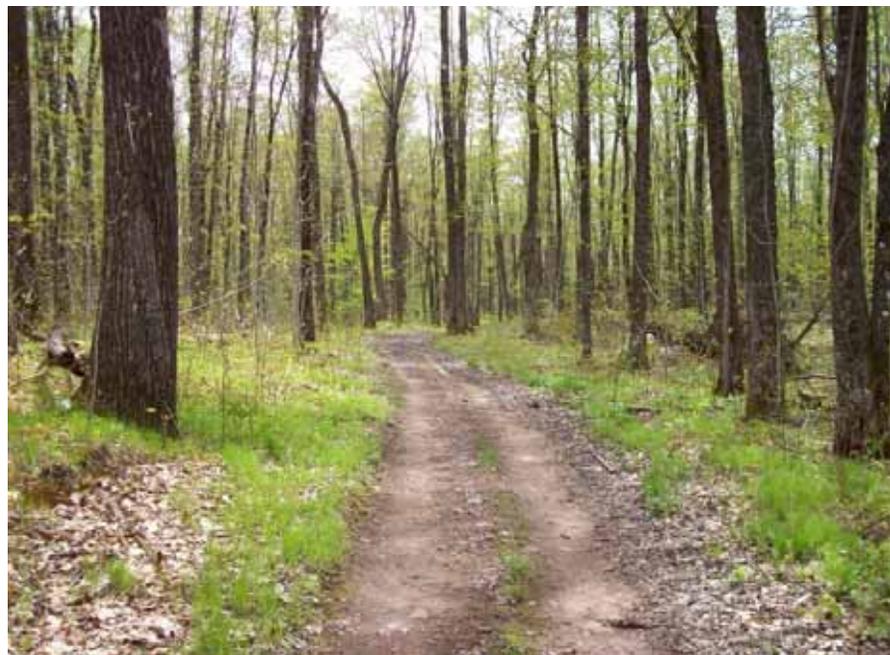
Forest
Service

July 2011



Motorized Trail Safety Audit Report

Chequamegon-Nicolet National Forest
Lakewood Laona Ranger District



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Table of Contents

Executive Summary	iii
Introduction	1
Background	1
Situation	1
Mandate for Safety	1
Objective	2
Assumptions.....	2
Measures.....	2
Methodology.....	3
Findings (Recommendations).....	4
General Findings and Recommendations	4
Site Specific Findings (by Trail Segment).....	5
FT 55540	5
FT 55546	5
FT 55547	6
FT 55548	6
FR 2922A	6
FR 2922B	7
FT 55554	7
FT 55558	7
FR 23598	7
Cost Estimates	9
Consistency with the Forest Plan.....	10
Consistency with Laws, Regulations, Handbooks	10
Monitoring.....	10
Literature cited	10
Appendix A – Detail Assessment Maps.....	11

EXECUTIVE SUMMARY

The following report addresses all motorized trails on the Chequamegon-Nicolet National Forests (CNNF) being considered for participation in the Wisconsin UTV pilot program

The report describes existing conditions relative to design parameters for four wheel drive vehicles greater than 50 inches and width (UTV) described in FSH 2309.18 Chapter 10. The report also identifies deficiencies and mitigation measures that would result in design parameters or standards meeting the requirements for UTV's as the managed vehicle on CNNF motorized trails.

Trail conditions have been described in summary with general recommendations, as well as with detailed segment by segment descriptions based on known map points or land marks.

Cost estimates for recommended work items have also been included that will provide important information for future trail planning and maintenance.

INTRODUCTION

This report discusses the analysis that was done to determine the existing condition of Forest Roads 2359, 2922A, 2922B and Forest Trails 55540, 55546, 55547, 55548, 55554, 55558, on the Lakewood Laona Ranger District of the Chequamegon-Nicolet National Forests (CNNF) in Wisconsin. Additionally this report will discuss and disclose findings and provide recommendations relative to design parameters, safety, and potential designation for other motorized uses on the Forest motorized trail system.

BACKGROUND

With the increase in motorized recreation on National Forest lands in recent years, the need to provide adequate trail systems opportunities has also increased. The 2004 CNNF Forest Plan revision addressed the issue relative to miles of motorized trails that would be made available, as well as type of motorized uses allowed. The 2005 Travel Management Rule (TMR) expanded on and included additional requirements for motorized access to National Forest lands, resulting in a motorized vehicle use map (MVUM).

Although TMR addresses all types of motorized vehicles by generalized class, the Forest plan does not. Specifically a new class of off road vehicle has been developed and become quite popular in recent years. The vehicles are commonly referred to as utility terrain vehicles (UTVs).

Prior to 2009 the State of Wisconsin did not address UTVs by Statute, therefore their use was not allowed, other than for animal husbandry, or on private property. Beginning in 2010, the State of Wisconsin initiated a UTV pilot project, whereby UTVs would be allowed on specifically identified roads and trails within the State. The Forest has since made the decision to consider allowing UTV use on certain motorized Forest trails as well.

SITUATION

TMR requires mixed use analysis on roads where new mixed uses are introduced that deviate from current State law. In other words, a mixed use analysis is required when UTVs or ATVs (non-highway legal) are introduced on roads that allow highway legal vehicles. Although the requirement for mixed use analysis covers roads, it does not require the same consideration for expanded use or changes in use on Forest trail systems.

At this point one must consider FSH 2309.18 Chapter 10 – Trail Planning. Section 14.4 addresses “Designed Use”. Designed Use is the Managed Use of a trail that requires the most demanding design, construction, and maintenance parameters and that, in conjunction with the applicable Trail Class, determines which Design Parameters apply to a trail. Motorized trails on the CNNF currently have a designed use and managed use for ATVs. By introducing UTVs, the trail designed use and managed use would now become 4WD vehicle >50”. That is to say that UTVs are physically the largest vehicle allowed, therefore the new design vehicle for the trail.

In other words, design parameters for ATV managed use are different than design parameters for 4WD vehicle <50” (UTV). As a result the Forest should consider the results of safety audits/condition surveys of all motorized trails identified for consideration for UTV allowed use. The results identify trail segments that meet design parameters for the change in designed and managed use, as well as deficiencies. The results also provide recommendations for mitigation where deficiencies are identified; and ultimately the results provide decision makers with adequate information relative to trail geometry, in order to make an informed decision based on trail geometric adequacy and safety.

MANDATE FOR SAFETY

Based on FSH 2309.18 Chapter 10, the National Quality Standards for Trails apply to NFS trails and associated trail structures. Item number one under safety and security key measures is: Hazards do not exist on or along

the trail. This is a critical National Quality Standard, and goes on to state that “if it cannot be met, action must be taken as soon as practicable to correct or mitigate the problem”.

OBJECTIVE

As already discussed in describing the current situation, the objective of this exercise is to provide decision makers with adequate information relative to design parameters and safety, based on existing conditions. By providing results of field design and safety audits, recommendations for mitigation of geometrically deficient trail segments, and recommendations for designating use, decision makers will be able to make informed decisions about participation in the Wisconsin UTV pilot program (Wisconsin Statute 23.33(11p)).

Assumptions

All motorized trails on the CNNF are currently trail class 3 or 4; and all motorized trails on the CNNF are single lane (two-way traffic allowed).

Note: The assumption that trails are single lane should make existing trail tread widths acceptable for single lane 4WD vehicles >50” design parameters for tread width. Double lane would require 16 feet tread width.

With the exception of specifically noted trails in the “Findings” section of this report, all motorized trails receive a high level of traffic volume on weekends between Memorial Day and Labor Day.

Measures

The important measure for determining the results of the objective are illustrated in the following table:

Table 1

**DESIGN PARAMETERS (Measures) FOR FOUR-WHEEL DRIVE VEHICLES
GREATER THAN 50 INCHES IN WIDTH**

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent¹. Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use FOUR-WHEEL DRIVE VEHICLE > 50"		Trail Class 3	Trail Class 4
Design Tread Width	Single Lane	72" – 96"	96" – 120"
	Double Lane	16'	16'
	Structures (Minimum Width)	96"	96"
Design Surface ²	Type	Native, with some on-site borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present	Native, with imported materials for tread stabilization likely and routine grading Minor roughness Sections of soft tread uncommon
	Protrusions	≤ 8" May be common and continuous	≤ 4" May be common and continuous

Designed Use FOUR-WHEEL DRIVE VEHICLE > 50"		Trail Class 3	Trail Class 4
	Obstacles (Maximum Height)	24" Common and left for increased challenge	12" Uncommon
Design Grade ²	Target Grade	5% – 18%	5% – 12%
	Short Pitch Maximum	20%	15%
	Maximum Pitch Density	10% – 20% of trail	5% – 10% of trail
Design Cross Slope	Target Cross Slope	5% – 12%	5% – 8%
	Maximum Cross Slope	12%	8%
Design Clearing	Height	6' – 8'	8' – 10'
	Width	72" – 96"	96" - 144"
	Shoulder Clearance	6" – 12"	12" – 18"
Design Turn	Radius	15' – 20'	20' – 30'

¹ For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum), see FSH 2309.18, section 05.

² The determination of the trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Methodology

The methodologies employed in determining the existing measures and whether they comply with design parameters listed in Table 1 are:

- Tread Width** - measures average tread width along random segments of trail; in the event tread width changes noticeably, additional measurements were taken to reflect changes; measures minimum tread width at all trail structures (bridges and culverts).
Measures: See Table 1, page 6
- Design Surface;** design surfaces are expressed in terms of surface type, protrusions, and obstacles.
Measures: See Table 1, page 6
- Design Grade;** measures design grades in terms of target grade, short pitch, maximum grade, and or maximum pitch density.
Measures: See Table 1, page 7
- Design Cross Slope;** measures design cross slope, if any, in terms of target cross slope and maximum cross slope.
Measures: See Table 1, page 7
- Design Clearing;** measures design clearing in terms of width, estimated height, and shoulder clearance.
Measures: See Table 1, page 7
- Design Turns;** measures curves in terms of turn radius where based on site investigation radius is noticeably small (use judgment in combination with site distance)
Measures: See Table 1, page 7

- **Crash History;** research of documented crash history and observation for evidence of crash sites during field review.
- **Traffic Volume;** existing traffic volume data, if available, combined with generalized estimates based on field observations.
- **Report;** report all findings as well as recommendation for designation of use; report all deficiencies; report options for mitigation of deficiencies.

Each of the design parameters listed in Table 1, and described in this section was incorporated in a GPS data dictionary which was then used to collect field data. Deficiencies as well as trail conditions were collected as electronic point file features or line features with associative attribute information. All data collected in the field was then transferred to GIS and used to determine a generalized ranking or rating for each trail segment. Additionally, the data was used to identify specific mitigation required at deficient locations along each trail.

Generalized ranking for individual trail segments was ultimately determined based on the number of deficiencies, the interrelation between deficiencies, and professional judgment. In other words a single set of deficiencies such as sight distance may have been given less weight on a segment of trail with a wide tread width, versus sight distance deficiencies on a segment of trail with narrow tread width.

Ultimately maps were created displaying the trail system in a color coded pattern that distinguishes between three general categories. Individual categories are: High – trail segments with evidence or documentation of crash sites, a high number of identified deficiencies, or a combination of both; Moderate – trail segments where a moderate level of deficiencies have been identified; and Low – few if any deficiencies identified, and suitable for UTV.

FINDINGS (RECOMMENDATIONS)

General Findings and Recommendations

Generally, findings relative to geometric and safety deficiencies have been attributed to a lack of horizontal sight distance, lack of vertical sight distance, narrow tread width, and/or narrow clearing limits. Individually and collectively, deficiencies have resulted in the following findings and recommendations.

There were three roads and six trails on the Lakewood\Laona District reviewed during the safety assessment. Each one was assigned a rating of high, moderate, or low. As described above, these segments are rated on the number of deficiencies that were identified during the safety assessment to improve the trail and make it suitable for UTV use. The areas rated as low may not have as many deficiencies identified, but many of these areas may have work recommended that is needed prior to UTV use.

There is no specific use data (traffic count) for these trails, but based on observations the trail system receives a moderate level of ATV traffic. Observations showed a well worn tread with no vegetation within the travelway. Most of the trails that were reviewed were identified to connect portions of the Nicolet State Trail to existing town roads or to connect a portion of the old railroad grade that was wiped out during the reconstruction of State Highway 32. The Nicolet State Trail runs through three counties and numerous communities; it was opened in 2008 to ATVs. The Nicolet State Trail is currently open to UTVs under the Pilot Program except for the connection that was reviewed. All sections of trail have been surfaced with crushed gravel; the routes were previously constructed with improved pit run and were not improved any further when ATV use was added. All of the routes that were reviewed are on single lane logging roads. These roads were typically built with a 12' wide tread width with turnouts. All of the routes reviewed are also used as snowmobile trails in the winter and have been brushed and maintained by the trail clubs.

In order to mitigate deficiencies that would reduce segment ratings to low throughout the trail system, varying levels of maintenance would be needed. Some of the work items recommended during the trail assessment include curve widening which may include clearing and excavation, slope work to improve sight distances and

increase tread widths, and clearing or brushing. During the trail assessment approximately 12 areas were mapped and recommended for work to improve sight distance and/or trail widths.

The remainder of this report describes work areas that are recommended to mitigate poor sight distances or widen tread widths for improved UTV passage.

More detailed site specific information is provided in the Site Specific Findings section of this report.

Site Specific Findings (by Trail Segment)

Site specific findings and recommendations in this section of the report discuss existing conditions based on specifically identified trail segments. This allows for a better description of the range of deficiencies encountered, as well as recommendations for mitigation. See Appendix A for maps by road and trail segment.

FT 55540

FT 55540 is 0.1 miles long and ranks as low. This short section of trail connects Robenhorst Road, FR 3322, with Oconto County Forest Land ATV trail system. This section of trail has a tread width of 11' and an average clearing width of 14', and provides good sight distance along most of the trail. There is one corner near the entrance at mp 0.02, that would be improve if a 10" white pine were removed. This trail is constructed with a native sand surface and looks the same as it continues on to county land. For a map of 55540, see Appendix A, Figure A-1.

FT 55546

FT 55546 is 0.23 miles long and ranks as low. This section of trail is currently part of the Nicolet State Trail. It lies along State Highway 32 and was reconstructed for ATV use during the previous highway improvement project. It was reconstructed with aggregate surfacing, 14' tread width and clearing width of over 22', there is a fence between the trail and the highway. The trail lies within the highway right-away so the sight distance is excellent with more than adequate areas to pass safely as seen in Photo 1. For a map of FT 55546, see Appendix A, Figure A-2.



Photo 1: FT 55546, Excellent sight distance with adequate room to pass.

FT 55547

FT 55547 is 0.14 miles long and ranked as moderate. This section of trail was developed to connect the abandoned railroad grade to the south with the section to the north, which is now the Nicolet State Trail. State Highway 32 was relocated on the missing section of abandoned railroad grade in the late 80s, disconnecting the grade. FT 55547 was resurfaced with gravel, the tread width is 10' and the average clearing width is 14'. FT 55547 connects FT 55546, along the right of way of State Highway 32 with FR 2922B, both of these are wider and could potentially provide higher speeds, although FR 2922B is posted at 10 mph. There is one corner with poor sight distance approximately 350' from the State Highway 32. Because of the close location with the highway and the stop ahead sign prior to the corner slowing the south bound traffic, speeds should be reduced at this corner, as well as heightened awareness because of the signage. This corner could be improved by laying the slope back and widening the tread width, further reducing the risk. ATVs are currently driving on the cleared slope now as seen from in Photo 2. For a map of FT 55547, see Appendix A, Figure A-2.



Photo 2: FT 55547, ATVs currently driving on the cleared slope.

FT 55548

FT 55548 is 0.15 miles long and ranked as moderate. This section of trail was also developed to connect the abandoned railroad grade, as above. This section of trail is surfaced with aggregate material with a tread width of 12' and a clearing width of 16'. Because of the smooth driving surface and wide tread width the potential for traveling at higher speeds is greater on FT 55548 and is ranked at moderate because of two corners that have poor sight distance. These corners are recommended for brushing to improve sight distance and reduce the potential for a collision. For a map of FT 55548, see Appendix A, Figure A-2.

FR 2922A

FR 2922A is 2.96 miles long and ranked as low. This road was previously developed to provide timber sale access to this area. The first segment, from mp 0.0 to 0.37, is part of the connection of the railroad grade described above. This segment has a 12' tread width with an average clearing width of 20', with some areas narrower because of exposed bedrock. It has an improved surface which could potentially increase speed. The posted speed, on FR 2922A and FR 2922B, is 10 mph. This road was reviewed previously for mixed use and documented with an engineering judgment. As documented in the engineering judgment this road has good sight distances with adequate clear zones for passing oncoming traffic.

The next segment, from mp 0.37 to mp 2.96, connects the Nicolet State Trail to town roads west of the Pickerel Lake area. This segment was also developed to provide timber sale access. The road has a 12' tread width with an average clearing width of 20' and surfaced with gravel. This segment of trail did have a snowmobile fatality. The trail has good sight distance and trail width at the incident location. Sight distances would improve in many areas if this road were brushed. For a map of FR 2922A, see Appendix A, Figure A-2.

FR 2922B

FR 2922B is 1.82 miles long, but only mp 0.0 to mp 0.72 miles is currently open to ATVs, this section is ranked as low. FR 2922B was developed to provide timber sale access, with a tread width of 12' and an average clearing width of 22', and good sight distance. It has an improved surfacing which could potentially increase travel speeds, the posted speed limit is 10 mph. This road was also reviewed previously for mixed use and documented with an engineering judgment. Also as stated in the engineering judgment, the road alignment is straight with gradual corners with adequate clearzones to pass oncoming traffic. This road would also benefit from brushing. I believe the speed on this road, and FR 2922A, could safely be posted at 20 mph. For a map of FR 2922B, see Appendix A, Figure A-2.

FT 55554

FT 55554 is 0.29 miles long and ranked as low. This trail runs through an open flat red pine plantation. The sight distance is good down the straight rows, except where the trail enters the highway right of way. This area would benefit from brushing as seen in Photo 3 below. The tread width is 9' and the average clearing width is 14'. This trail is narrow but the sight distance is good, there is little undergrowth in the red pine plantation, except at the highway. See Appendix A, Figure A-3 for a map of Trail 55554.



Photo 3: FT 55554, Example of trail where brushing would improve sight distance.

FT 55558

FT 55558 is 0.1 miles long and ranked as low. This connection was recently constructed to provide a link from Bushafer Road to the Nicolet State Trail. The tread width is 10' and the clearing limit is 12'. The Nicolet State Trail can almost be seen from the beginning of this trail, so sight distance is good. Even though this trail is somewhat narrow, the good sight distances ranks this road as low. There is one corner near the entrance that has a small wide area with tall ferns hiding a stump from the construction. The removal of this stump would

provide an open safe area to pass vehicles at this corner. Photo 4 is taken from the Nicolet State Trail back to the corner near Highway 32. For a map of FT 55558, see Appendix A, Figure A-4.



Photo 4: FT 55558, Nicolet State Trail back to corner near Highway 32.

FR 2359

FR 2359 is 4.14 miles long and ranked as low. This road connects the Town of Wabeno to the Town of Freedom. The condition and surfacing of this road vary from asphalt at mp 0.0 to 0.12 miles, to aggregate from mp 0.12 to 1.53 miles, to improved native from mp 1.53 to 2.54 miles, and finally native from mp 2.54 to 4.14, requiring a high clearance vehicle. FR 2359 is a town road from mp 0.0 to 1.53. This road provides access to a large part of the National Forest but has limited use and low traffic volumes from highway legal vehicles at less than 40 vehicles a day. This road does connect the two towns but the rough nature of the middle section discourages normal passenger vehicles. This road provides two way snowmobile traffic in the winter. It is a 12' single lane road and has good sight distance and good clear limits to provide slow vehicle passage. The tall ferns along the road should be mowed to expose the entire road template to reduce the possibility of an ATV accidentally driving off into the ditch while passing another highway legal vehicle or UTV. Photo 5 shows the tall vegetation along the native surfaced roadway. For a map of FR 2359, see Appendix A, Figure A-5.



Photo 5: FR2359, Brushing tall vegetation would expose the entire road template.

Cost Estimates

Cost estimates for heavy equipment have been derived from previously completed reconstruction, reconditioning, and/or maintenance projects completed on various motorized trails on the Chequamegon landbase of the CNNF. Individual estimates for handwork with chain saws were derived from personal experience with chainsaw work by the authors.

Reconstruction, Reconditioning, and Maintenance (Heavy Equipment)

Trail reconstruction includes brushing and clearing, widening, reconditioning or reshaping the trail tread, and placing surfacing.

Reconstruction cost per mile (well drained soils and/or dry conditions): \$10,000 - \$12,000 per mile*

*Haul distance for surfacing creates variable

Reconstruction cost per mile (poorly drained soils): \$20,000 - \$22,000 per mile*

*Haul distance for surfacing creates variable

Trail reconditioning and maintenance are so similar in fashion when utilizing heavy equipment that both categories have been combined below.

Recondition and maintenance cost per mile (sands and gravels): \$200 per mile

Recondition and maintenance cost per mile (poorly drained soils): \$300 per mile

Site specific mitigation such as laying back cut slopes or cutting vertical curves:

Site specific with dozer: \$65 per station (100 feet)*

*No mobilization

Site specific with dozer: \$150 per station (100 feet)*

*With mobilization

Mechanized brushing: \$480 per mile

Maintenance (Hand Work)

Hand work consists of a two person crew with chainsaws. Most work is limited to increasing clearing on horizontal curves, and includes removal of understory and brush. Work does not involve the removal of merchantable timber.

Site specific corner (curve) clearing: \$80.00 per station (deciduous setting)

Site specific corner (curve) clearing: \$110.00 per station (coniferous setting)

CONSISTENCY WITH THE FOREST PLAN

All information provided in this report complies with Guidelines for use of motorized trails on the CNNF found on page 2-28 of the 2004 Land and Resource management Plan. Specifically this report has been limited to identification of suitable existing corridors for other off-road vehicles (Guideline 3); and the identification of suitable trails segments for UTV's that could provide multiple motorized recreation uses on motorized trails (Guideline 4).

CONSISTENCY WITH LAWS, REGULATIONS, HANDBOOKS

The information provided in this report appears to be consistent with the following applicable laws, rules, regulations and handbooks:

- Travel Management Rule (including 36 CFR 212, 251, 261, and 295)
- All Authorities listed in FSH 2309.18, Chapter 10
- Wisconsin Statute 23.33(11p)

MONITORING

It is the recommendation that the CNNF develop a specific monitoring plan for trail segments allowing UTVs that provides information for future designation, as well as trail safety and impact. Monitoring could include traffic counts for UTVs, accident and/or crash data, noted changes in tread width and use pattern, or any combination of measurable statistics that could benefit user safety.

LITERATURE CITED

FSH 2309.18, Chapter 10

Travel Management Rule (including 36 CFR 212, 251, 261, and 295)

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APPENDIX A – DETAIL ASSESSMENT MAPS

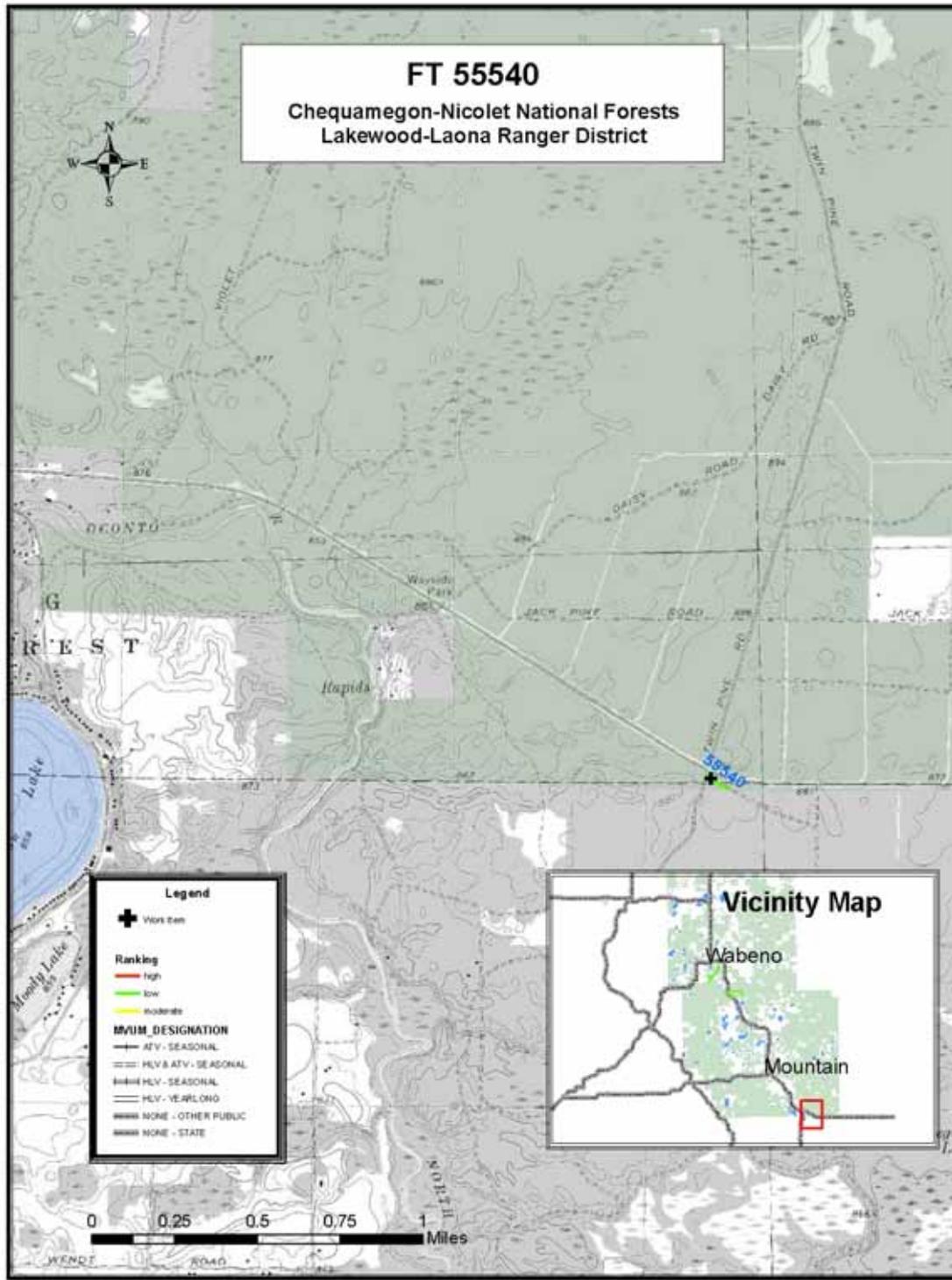


Figure A-1: 55540

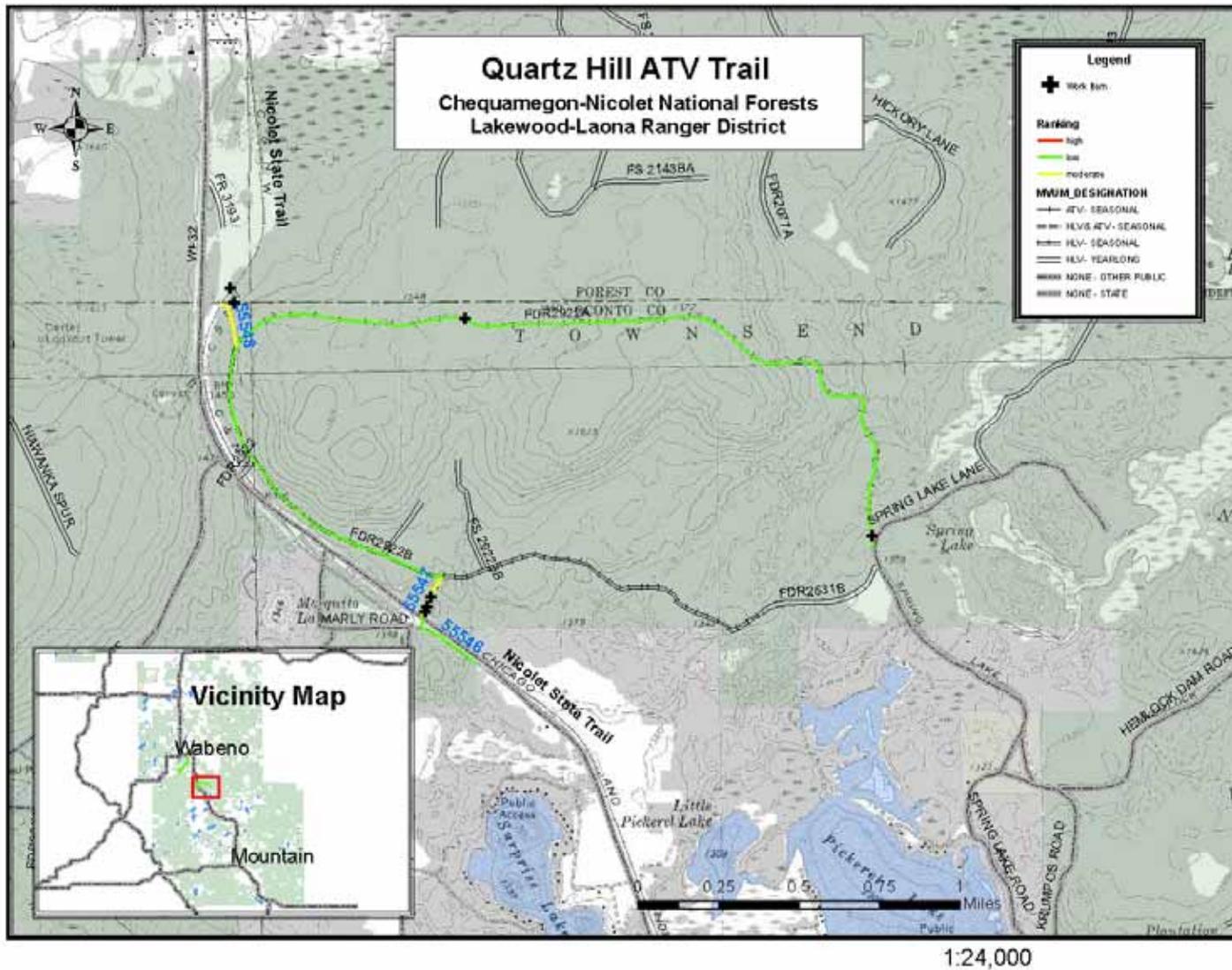


Figure A-2: FT 55546, 55547, 55548, and FR2922A, 2922B

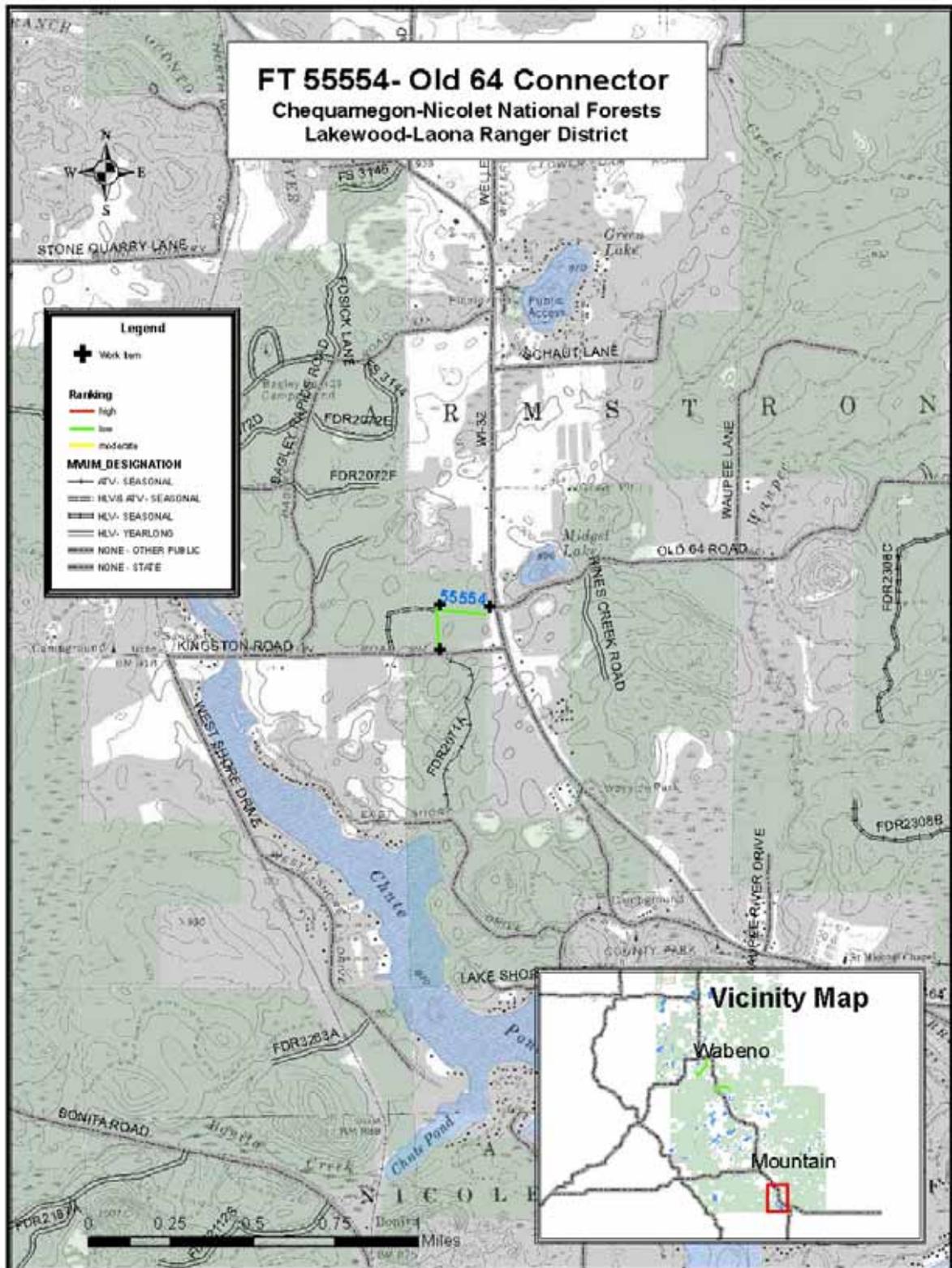


Figure A-3: FT 55554

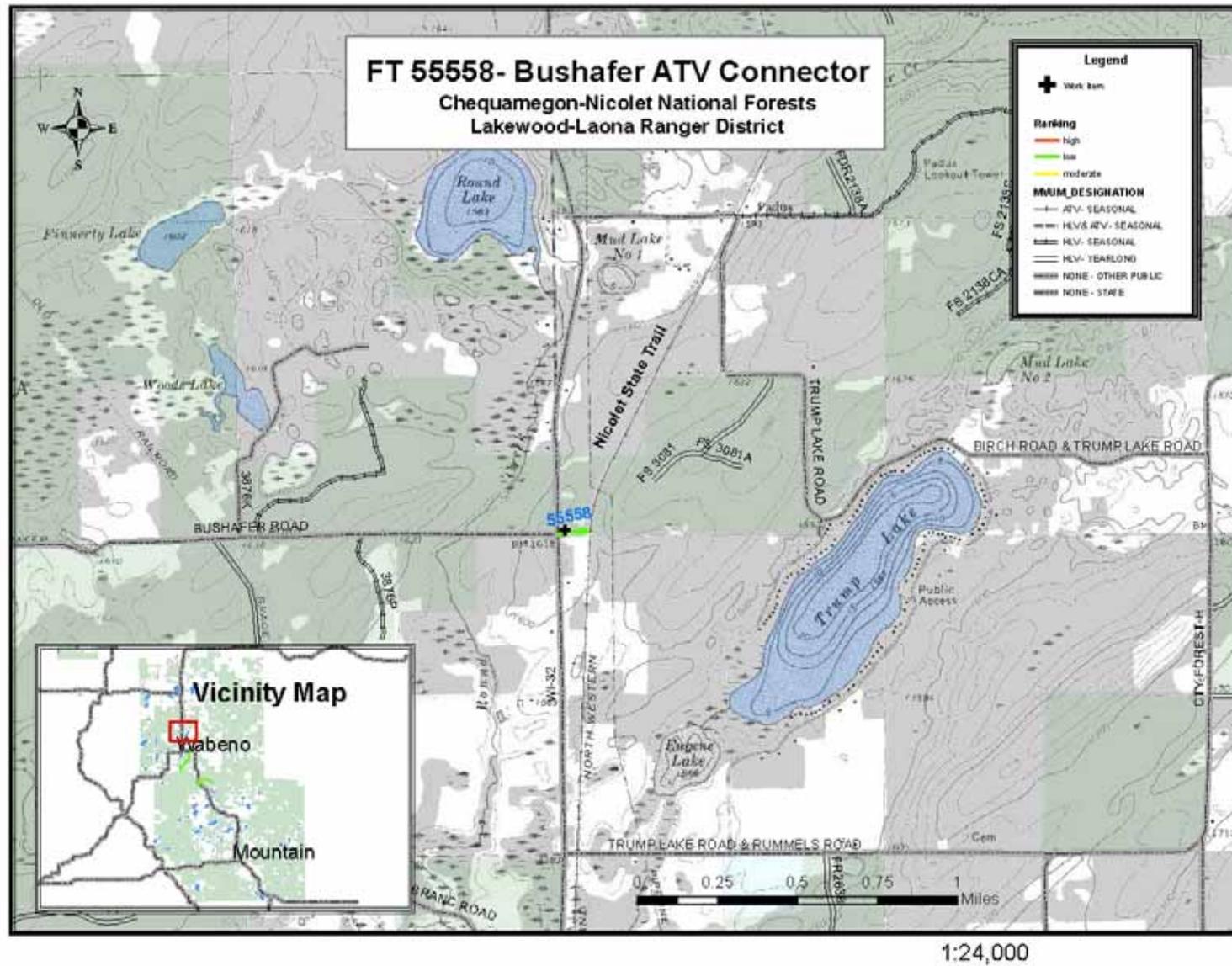


Figure A-4: FT 55558

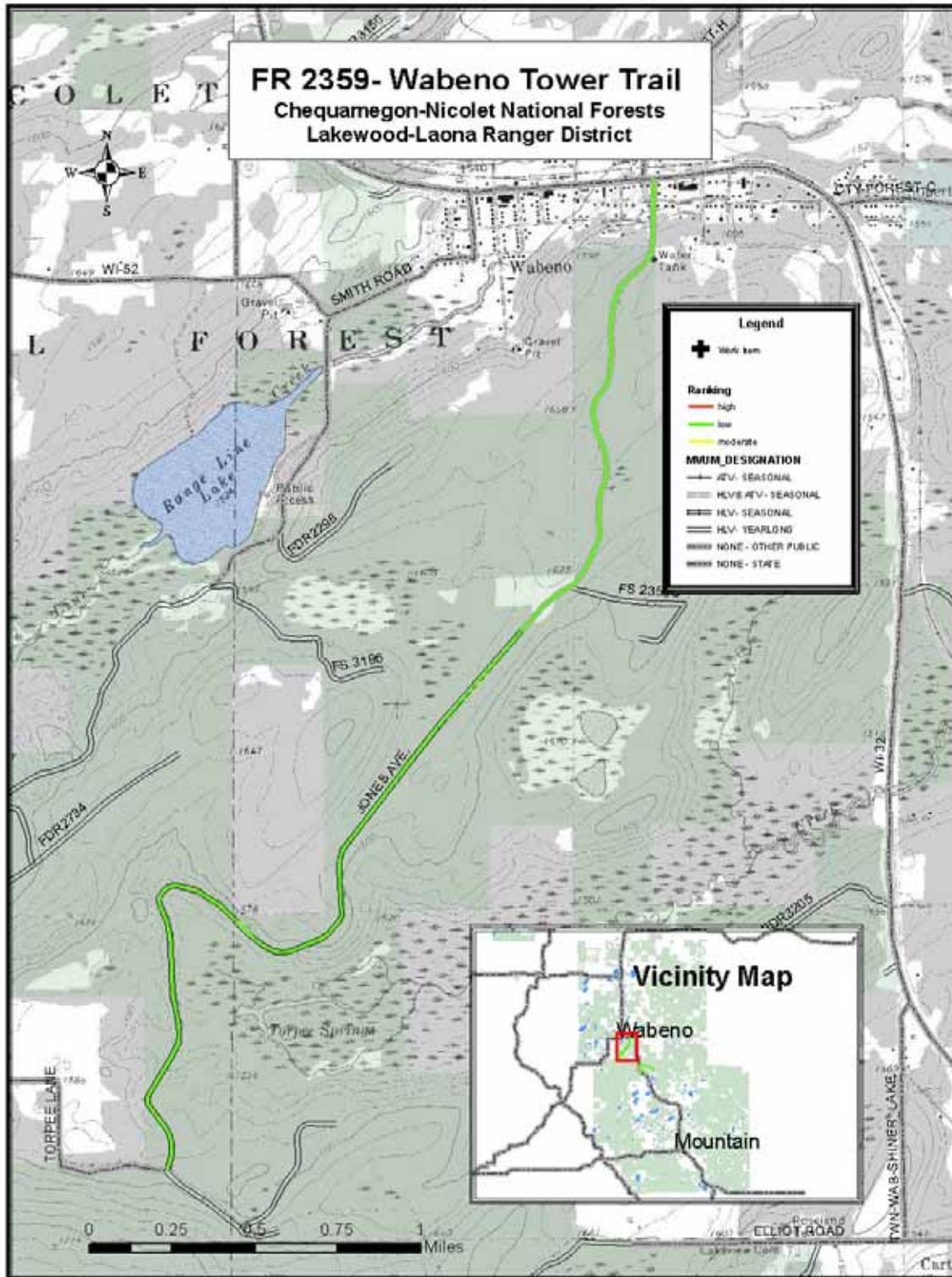


Figure A-5: FR 2359

