

Quabbin/Ware River Region FY19 Forest Harvest Proposals

The Division of Water Supply Protection [<https://www.mass.gov/orgs/dcr-division-of-water-supply-protection>] (DWSP) is mandated to protect our water resources for future generations. Forest cover provides unparalleled water quality. DWSP has determined that the most stable land cover comes from a vigorous, species-diverse, many-aged forest. The Division's long-term objective is to diversify today's mostly even-aged forest into a multi-aged forest. We are determined to do this while conserving biodiversity using sustainable forestry practices. This process will not be fully implemented for many decades because we are proceeding at a measured pace.

DWSP Foresters [<https://www.mass.gov/service-details/dcr-watershed-forestry-program>] design timber harvests that will regenerate about 1% of the managed forest every year so that gradually, over time, the managed forest will include a much broader range of age classes than is currently present. Each year DWSP Foresters propose areas to be harvested which are then reviewed by professionals in Natural Resources, Environmental Quality, and Watershed Management. Finally, these proposals are made available for public comment as presented here. **Details on how to make public comments can be found below.**

The overall purpose of this management is to restore the forest to more balanced proportions of young, mid-aged, and older trees comprised of the greatest possible variety of native species. DWSP's working hypothesis is that the new makeup of the forest will help ease the damage caused by inevitable future severe weather events, outbreaks of disease, and insect infestations.

For full details on DWSP land management please see the 2017 Land Management Plan.

[<https://www.mass.gov/files/documents/2018/02/05/dcrdwsp2017landmanagementplan.pdf>]

Public comment on these proposals is welcome and can be submitted online at this link. [<https://www.mass.gov/forms/dcr-public-comments>] Comments may also be submitted by U.S. mail to

Department of Conservation and Recreation
Office of Public Outreach
251 Causeway St.
Boston, MA 02114

These proposals were presented at the following public meetings:

- **Ware River:** Ware River Watershed Advisory Committee, May 10th, 2018
- **Quabbin Reservoir:** Quabbin Watershed Advisory Committee, June 4th, 2018

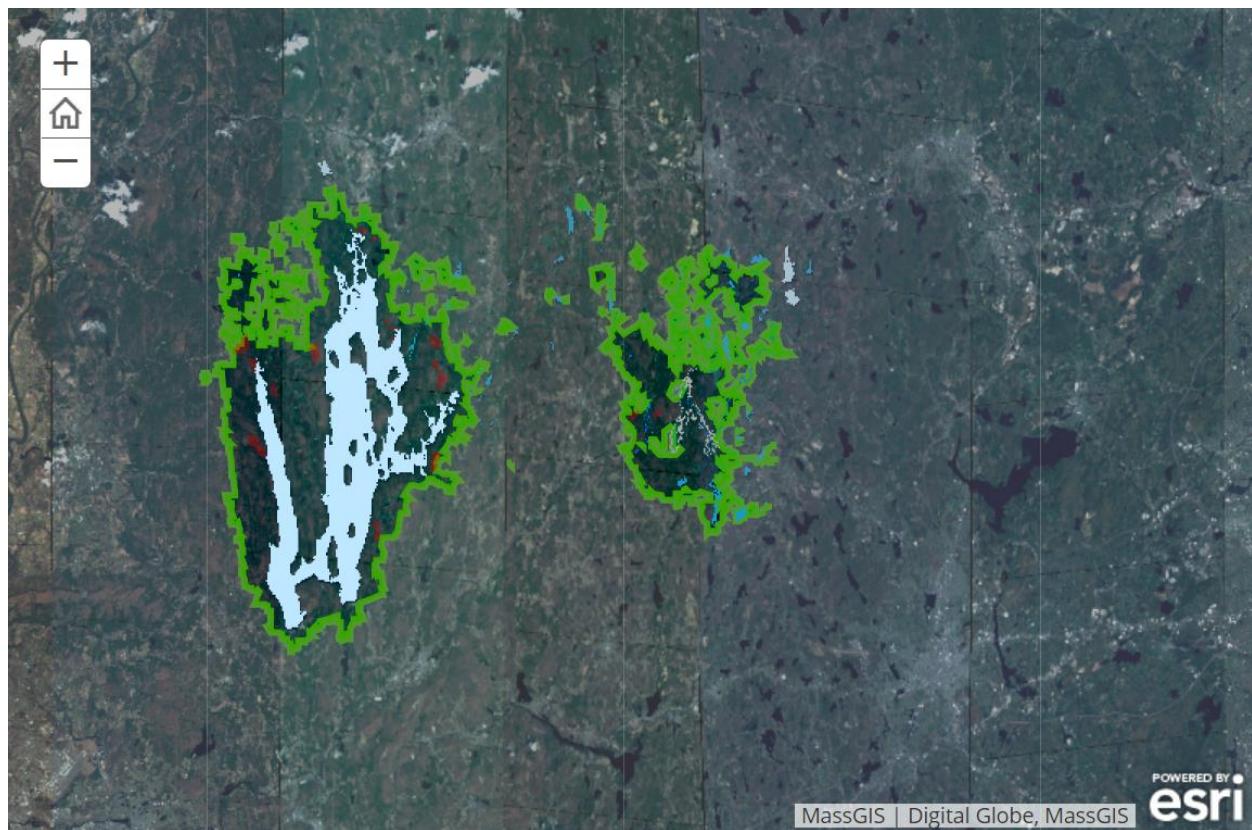
Comments must be received by the close of business on Monday, July 23rd, 2018.

If you have any questions, please contact Natural Resource Analyst Brian Keevan at brian.keevan@state.ma.us or at (413) 323-6921 x 551.

[https://youtu.be/Wi23c6Fla_Q]



Figure 1: 2019 Quabbin/Ware River Forestry Proposal Locations



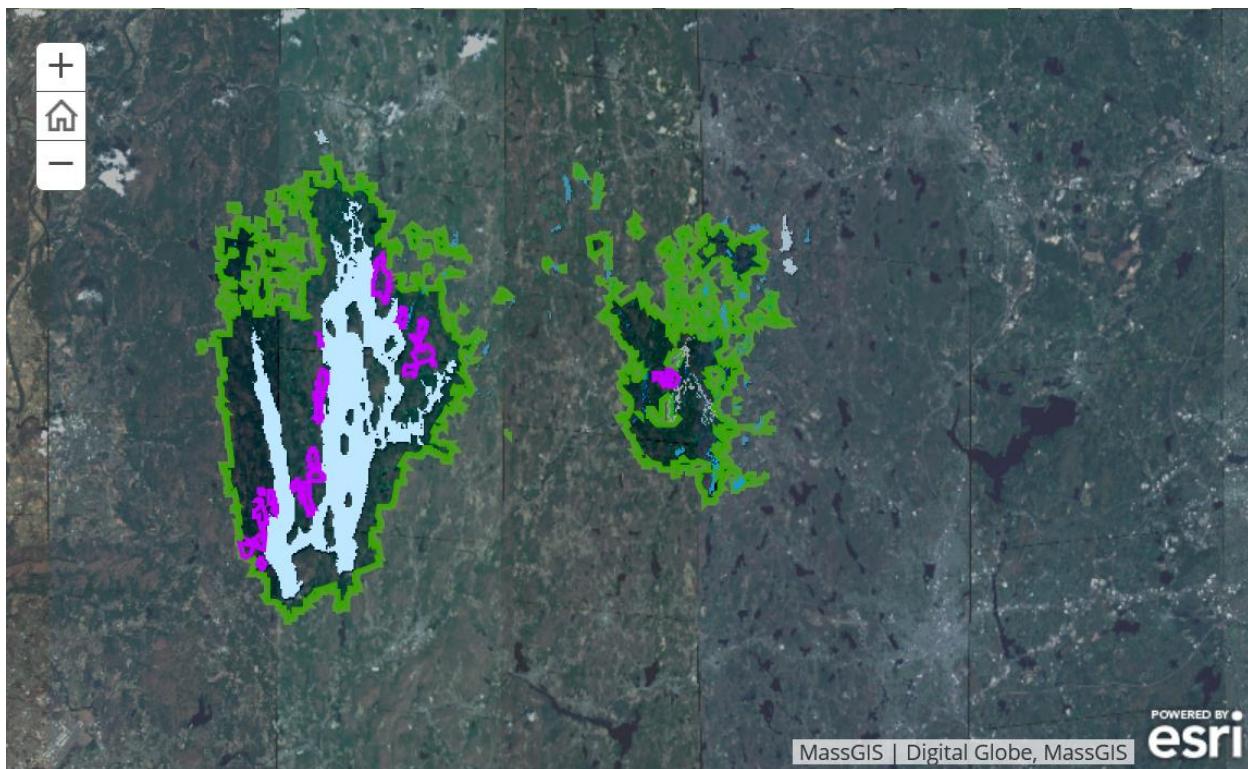
FY19 Gypsy Moth Related Oak Salvage

A combination of stress from a multi-year drought along with repeated extreme gypsy moth defoliation events has resulted in widespread oak mortality throughout the Quabbin forest. The degree of damage varies from place to place, but there are unfortunately some significant areas with near complete mortality, often of very high-quality timber. While a large amount of the dead oak will remain in place to add to wildlife habitat and forest structural diversity, DWSP intends to recoup some portion of the valuable wood volume that otherwise would have been harvested through normal practices many years from now.

This map identifies approximate areas of special concern for oak salvage. These areas have been identified through a combination of satellite imagery analysis ([performed by Pasquarella, Bradley, & Woodcock, 2017](#)) and field survey by DWSP foresters. The locations mapped here do not represent all areas with concentrated oak mortality, but those areas with the best access and operability for the amount of oak present for salvage. With these criteria, DWSP can salvage the most value from the dying oak for the least cost and impact. Ultimately, the full extent of these mapped areas will not be salvaged due to restrictions on operations (terrain, extreme slope, streams, etc.) and limited time before tree decay. It should also be understood that within each of these mapped areas salvage work will reflect the level of mortality; there will likely be scattered removals, similar to a thinning operation, mixed with pockets of near complete removals similar to our typical regeneration patch cutting operations. Some pockets of high mortality and low species diversity may have widely scattered residual trees.

All of [DWSP's standard management policies](#) apply to these salvage operations. The DCR Commissioner will need to approve any salvage work that will create openings >5 acres, as is the case for other DWSP silvicultural operations. There will be an accelerated proposal and sale schedule of these areas. Each of the locations mapped here has been reviewed by DWSP Natural Resources and Environmental Quality staff and, is here, undergoing public review prior to sale.

Figure 2 FY2019 Quabbin/Ware River Oak Mortality Locations for Potential Salvage



Quabbin Harvest Proposal NS-19-24BFA

Proposal Goals

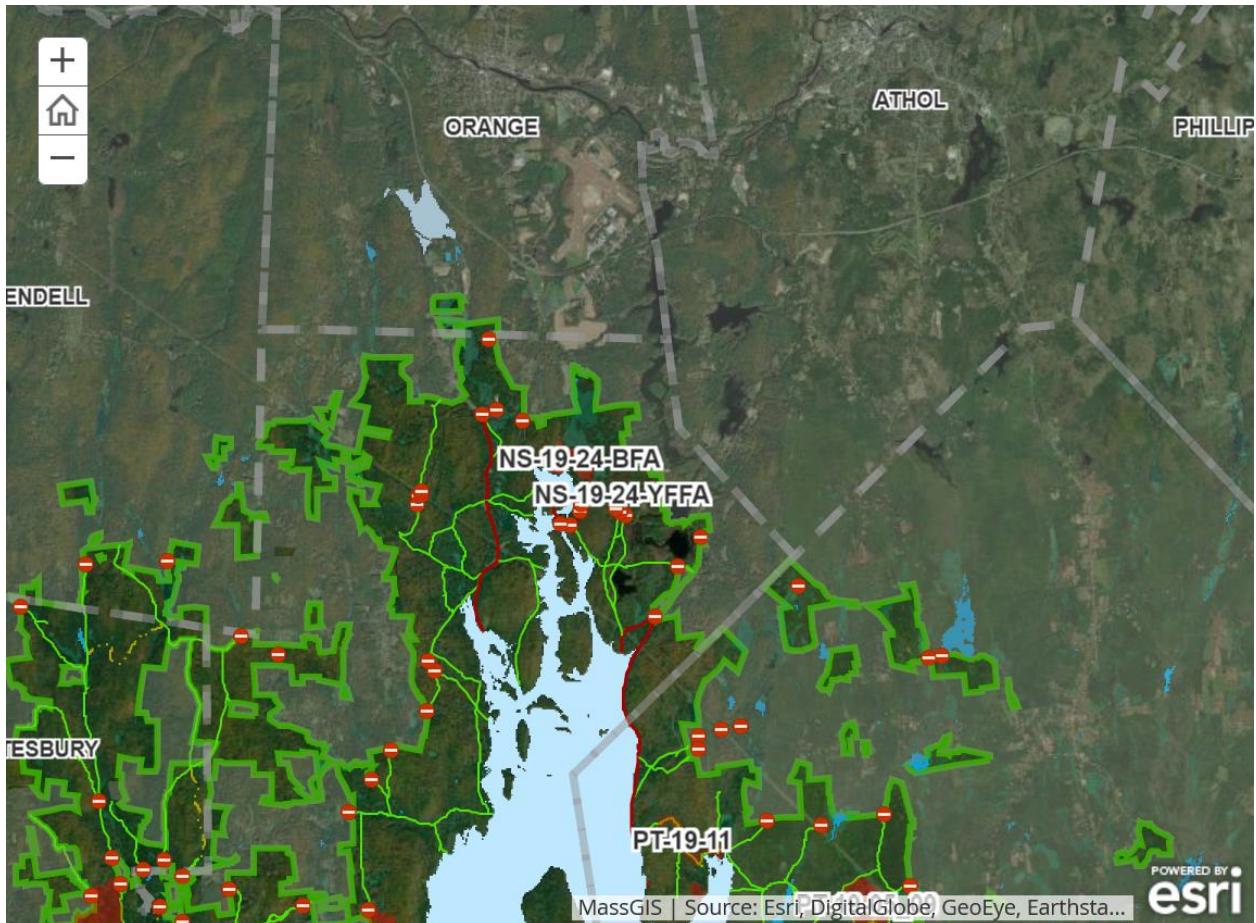
The goal of this proposal is to remove red pine before it's killed by [red pine scale](#), and to create/restore this site to a pitch pine-oak barrens. This proposal is a revision of NS-18-24 to bring it into alignment with the [2017 DCR-DWSP Land Management Plan](#), which designates this location as a Barrens Focus Area.

Proposal Location

On the north side of Route 122, between Orange Road and Gays Hill in New Salem.

Total Acres: 66.2

Previously Reviewed as: NS-18-24



General Description

	Overstory Type(s)	Acres
Dominant	Oak, mixed - dry site	34.7
Secondary	White pine/oak	24
Secondary	Red pine	7.6

	Understory Type(s)
Dominant	Tree seedlings/saplings dominate the site

Description of forest composition/condition:

The area between the access road and Gays Hill has a mix of white, red, and pitch pine, sometimes in remarkably even proportions, with associates of hemlock, mixed oak, and red maple. The white pine is of variable quality, sometimes straight with large vigorous crowns and few, small branches, and other times branchy, weevilled, or overcrowded and lacking vigor. White pine needle drop is present in the region but does not seem to be a significant problem on this lot at this time, perhaps because the recent drought set back this suite of fungal diseases. The pitch pine appears to be healthy at this time, but southern pine beetle (*Dendroctonus frontalis*) is a looming threat with the potential to kill all pitch pines in the area.

Most of the red pine is in the area north of the gravel pit, but it is also present as a minor element within the other types on the lower slopes along Route 122. Red pine scale (*Matsucoccus resinosae*) does not seem to have infected this lot yet, but it is present on the opposite side of Route 122 and can be expected to move into the proposed area in the near future. When it arrives it is likely to cause 100% mortality within a few years.

Gays Hill is dominated by oaks mixed with red maple and other hardwoods. Oak species diversity is high, with red, black and white oak on the lower slopes transitioning to scarlet and chestnut oak on higher, drier terrain. White pine is common on the lower slopes, along with lesser numbers of hemlock and red and pitch pine. All of these conifers become less common as one ascends, almost dropping out completely on the summit. Other tree species present include small numbers of hickory, ash, beech, black cherry, paper birch and poplar. Most hardwoods are pole to small sawlog sized, with form ranging from poor to good.

The understory contains wintergreen, clubmoss, low bush blueberry, bracken fern, and hay scented fern. High bush blueberry is present on the lowest terrain near the swamp and streams.

Past DWSP harvests in this area include:

- A 17 acres of selection in the northwest corner in 2001 (Quabbin harvest #3004)
- 13 acres of selection along Route 122 in the southeast corner in 1998 (Quabbin harvest #773)
- 13 acres of selection in the northwest corner in 1994 (Quabbin harvest #663)
- 4 acres of shelterwood prep in the southeast corner in 1975 (Quabbin harvest #114)

About 44 acres of the proposed area has never been harvested by DWSP.

This area also has a history of wildfire, the most recent being in the mid-twentieth century. The dominance of oaks and unusually high presence of pitch pine indicates that fire has likely been an important part of this ecosystem for many centuries. It is hoped that it will continue to be so as part of barrens restoration.



Soils

Drainage Class	%
Excessively Drained	20
Well Drained Thin	12

Well Drained Thick	27
Moderately Well Drained	30
Poorly to Very Poorly Drained	11

The poorly drained soils are mostly concentrated along the northeast border of the proposed area, adjacent to Blackington Swamp. They are included in the proposal area only because NRCS soil maps are imprecise; barrens restoration will not be undertaken in areas where field observations find saturated soils, regardless of whether they concur with NRCS maps.



Wetlands

- Wetlands present? - Yes
- Streams present? - Yes

- Vernal pools present? - **Yes**
- Seeps present? - **None known**
- Are stream crossings required? - **Yes**
- Are wetland crossings required? - **No**
- Is logging in filter strips planned? - **No**
- Is logging in wetlands planned? - **No**

There are several wetlands outside the proposed area, but most of the interior is very dry. Blackington Swamp and associated streams border this proposal to the north and east. There are two small wetlands to the west, fed by drainage from Adams Hill on the other side of the access road. There's a verified vernal pool to the south, between the proposed area and Route 122, just west of the access road to the gravel pit.

An intermittent stream is shown within the northwest corner of proposed area on both the DEP and Quabbin streams layers, although in different locations for each source (the DEP layer associates it with one of the small wetlands, the Quabbin layer with Blackington Swamp). If these layers are correct, a stream crossing may be needed. However, no stream channel was located during field reconnaissance.

All of the above features, including those outside the proposed lot borders, will be protected with filter strips.

The DCR verified and NHESP certified vernal pools will be appropriately buffered according to DWSP policy and [MA Forestry Best Management Practices](#).



Silviculture

Acres in Intermediate cuts: **10**

Acres in prep/establishment cuts: **10**

Acres in Regeneration cuts: **20**

Average regen opening size: **20**

Maximum regen opening size: **20**

Description of advance regeneration in proposal area:

Regeneration is present throughout the lot but generally not adequate in density. White pine seedlings and small saplings are most numerous, especially in the areas that received a selection

cut in 1998. White pine regeneration in the latter area is often badly weevilled. There is an unusually strong presence of oak regeneration throughout the lot, especially on higher terrain. Hemlock seedlings and saplings are present in a wide range of sizes, probably as a result of being released in various harvests over the years. Red maple stump sprouts are also common where there has been past harvesting. Black birch seedlings and saplings are present but much less common than in other places at the Quabbin.

General comments on silviculture proposed:

This proposal is the first step in the process of barrens restoration, as described on [pages 117-127 of the 2017 DCR-DWSP Land Management Plan](#). The Gays Hill Barrens Focus Area is shown in Figure 4-10 on page 125 of the Management Plan.

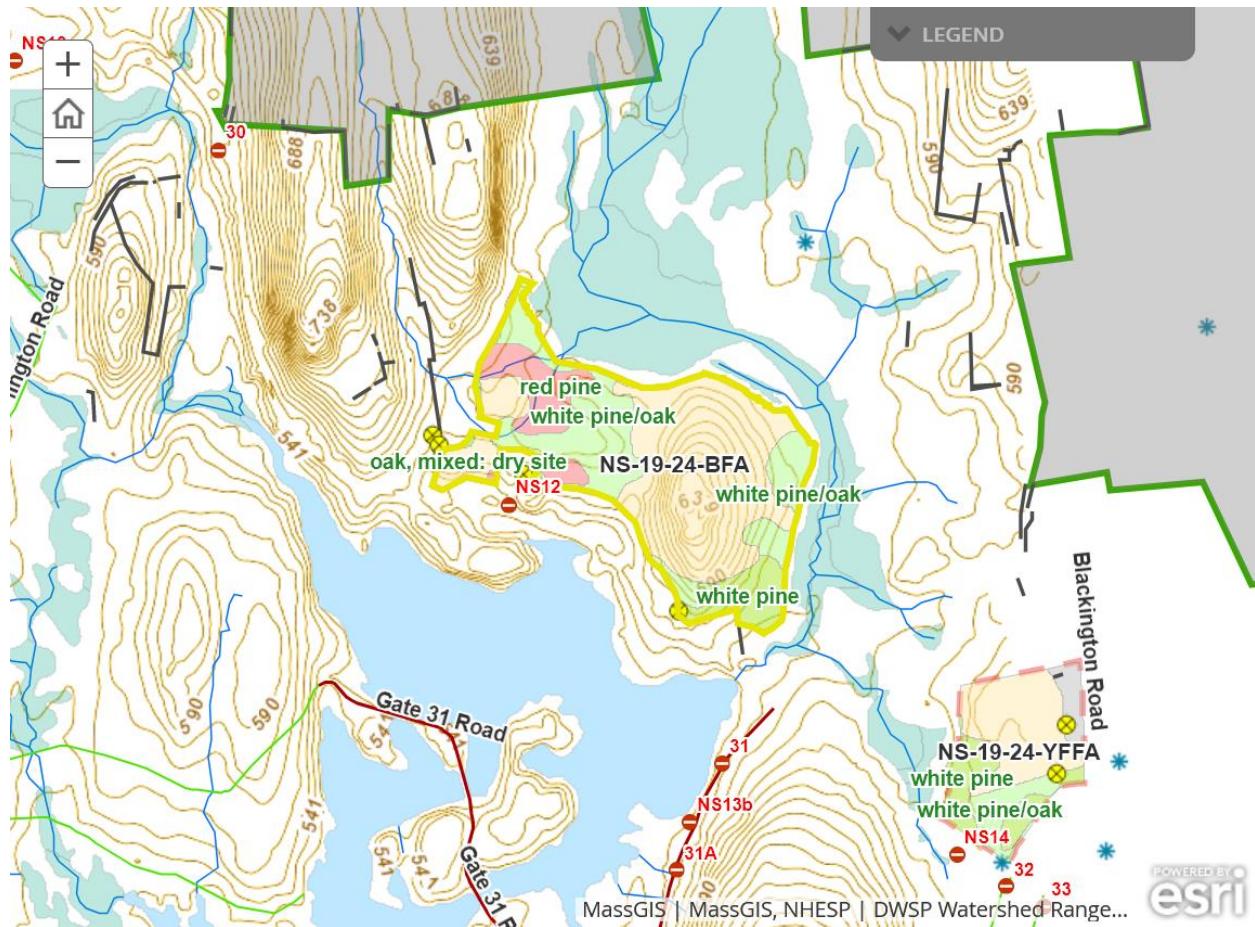
This harvest will take three silvicultural approaches to barrens restoration:

First, a 10 to 20 acre opening will be created, in an area with a high concentration of red pine (because it's expected to die of red pine scale), and a low concentration of pitch pine (because we want to retain as much of this barrens species as possible). Total basal area will be reduced to 10 ft²/acre, composed of healthy, vigorous pitch pines and oaks. Lower quality oaks will be cut in order to attain the target basal area, as will any white pine and hardwoods in the opening, including saplings. This is called regeneration cutting for the purposes of this proposal, because it's similar to smaller openings in other DWSP harvests.

Second, where red, white and pitch pine occur together and pitch pine stocking exceeds 10 ft²/acre, all red and white pine will be cut. Pitch pine will be retained at a stocking level of 80 ft²/acre or less, above which it would be at more risk of infestation by southern pine beetle. If hardwoods are also present, oak will be retained unless it's competing with pitch pine. Non-oak hardwoods will be cut. This will result in a small area of savannah-like forest, with spacious stocking of pitch pine and oak. This part of the harvest is called prep cutting for the purposes of this proposal, because post-harvest stocking levels will be similar to that of a shelterwood prep cut.

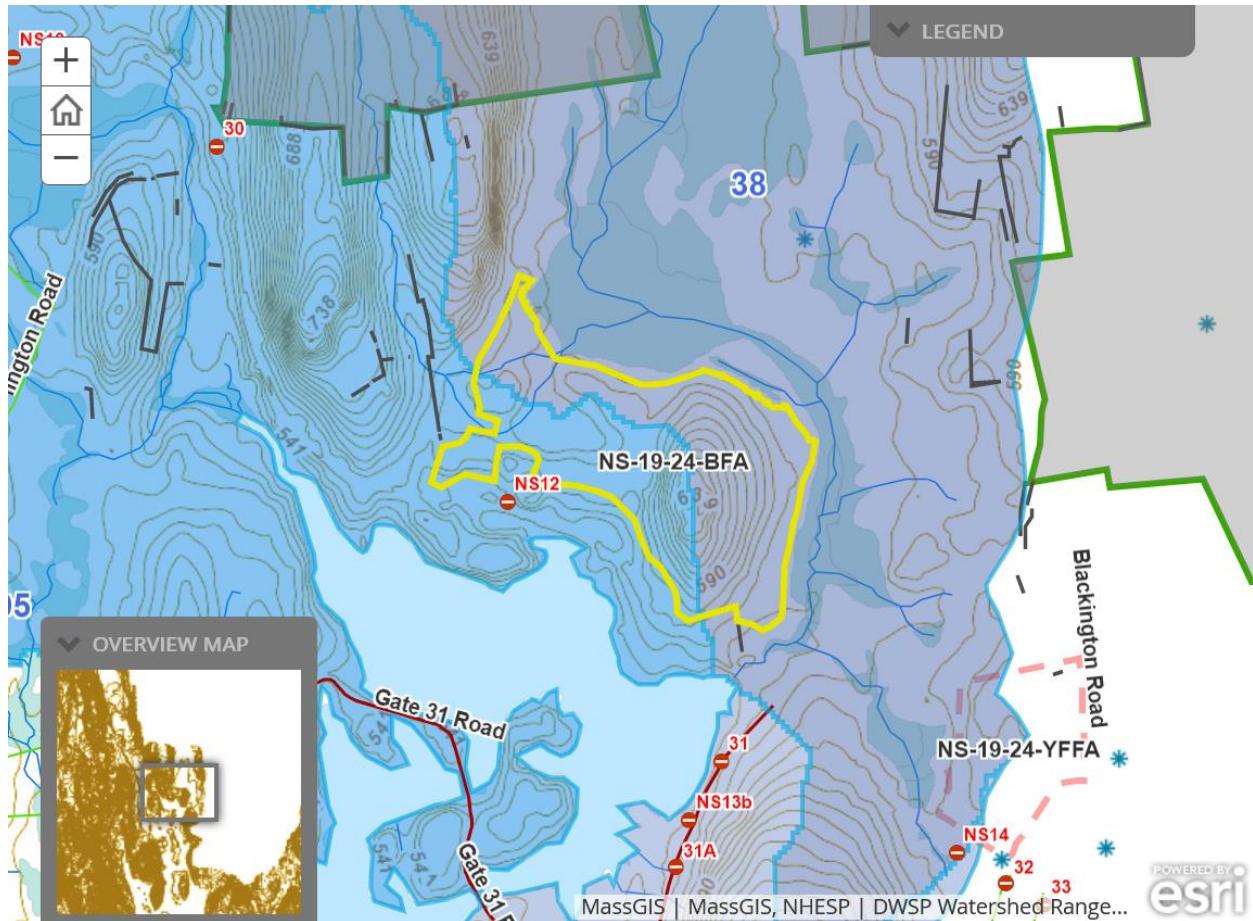
A third type of silviculture will be employed where red pine is scattered, and mixed with oak and/or white pine. In this case, all red pine will be cut. Most other species will be retained, unless they need to be cut to in order to access the red pine. If possible trees to be cut will be poor quality or in decline due to competition, disease, and/or poor stem structure. Silviculturally, this could be called a salvage cut, but for this proposal, it's called thinning because it will improve stand health and composition.

Acreages listed for these treatments are approximate and likely to change, but the regeneration opening will not exceed 20 acres. Note that portions of the earlier proposal (NS-18-24) that are outside the barrens restoration area may be cut at the same time as the barrens, in accordance with the silviculture described in the earlier proposal.



Subwatershed Analysis

Sub-watershed number	Total DCR-owned Acres	Acres Regenerated on DCR Land in the last 10 years	Acres Remaining for Regenerating Up to the 25% / 10 Year	Acres part of this proposal
38	402.2	7.7	92.9	40.2
95	1079.1	20	337.4	26



Harvesting Limitations

Forwarder required: **No**

Feller/processor required: **No**

Steep slopes present: **No**

Comments on harvesting limitations:

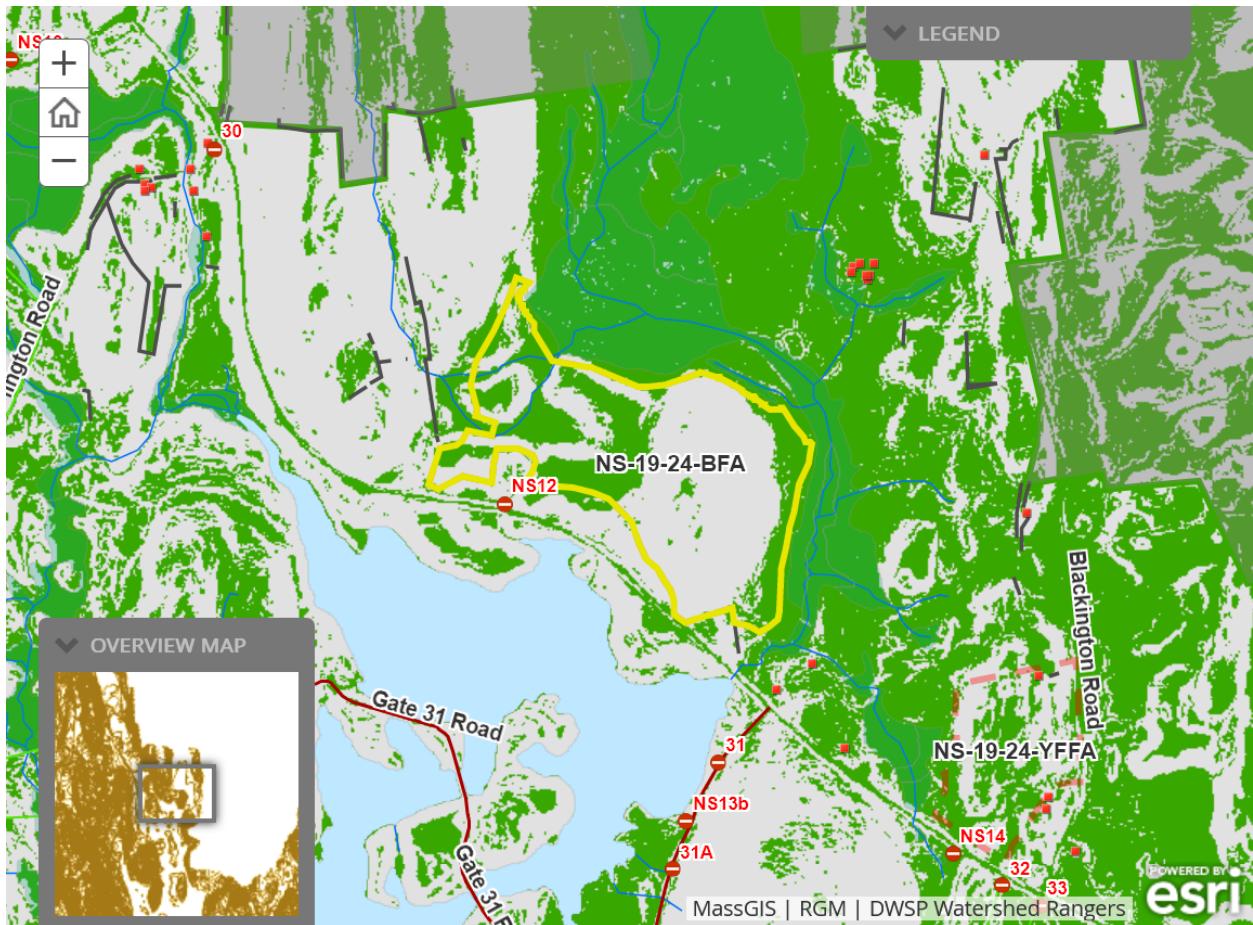
Ideally, this would be a whole tree operation, in order to minimize slash in anticipation of follow up with prescribed fire, and because barrens are nutrient poor and therefore don't need soil enrichment as a result of decaying slash. This will require creation of a large landing, probably on the unnamed access road to the west of the harvest area.



Cultural Resources

Comments on Cultural Resources:

There is a fieldstone just south of an iron pipe on the north side of Gays Hill, and “thrown” stone walls along a short portion of the southeast border of this lot. Existing barways will be used where feasible and harvest layout will protect walls as much as possible. If applicable DWSP will follow any additional recommendations from DCR's Archeologist regarding protection of sensitive sites.



Wildlife Resources & Rare and Endangered Species

Comments on Unique or Unusual Sites or Habitat:

According to the wildlife biologists at Mass. Wildlife, this area was historically a barrens, a type of ecosystem that is declining in Massachusetts due to suppression of fire and other disturbances. To counter habitat degradation, they recommend heavy harvesting, targeting white pine, hemlock and red maple for removal and protecting oak and pitch pine. This proposal is consistent with those recommendations.

There is a vernal pool about 100 feet south of the lot boundary, northwest of the intersection of the gravel pit access road and Route 122. This pool will be protected by the provisions in the DWSP Management Plan and the Massachusetts Forestry BMPs, including prevention of ruts greater than 6" deep within 200 feet of the pool.

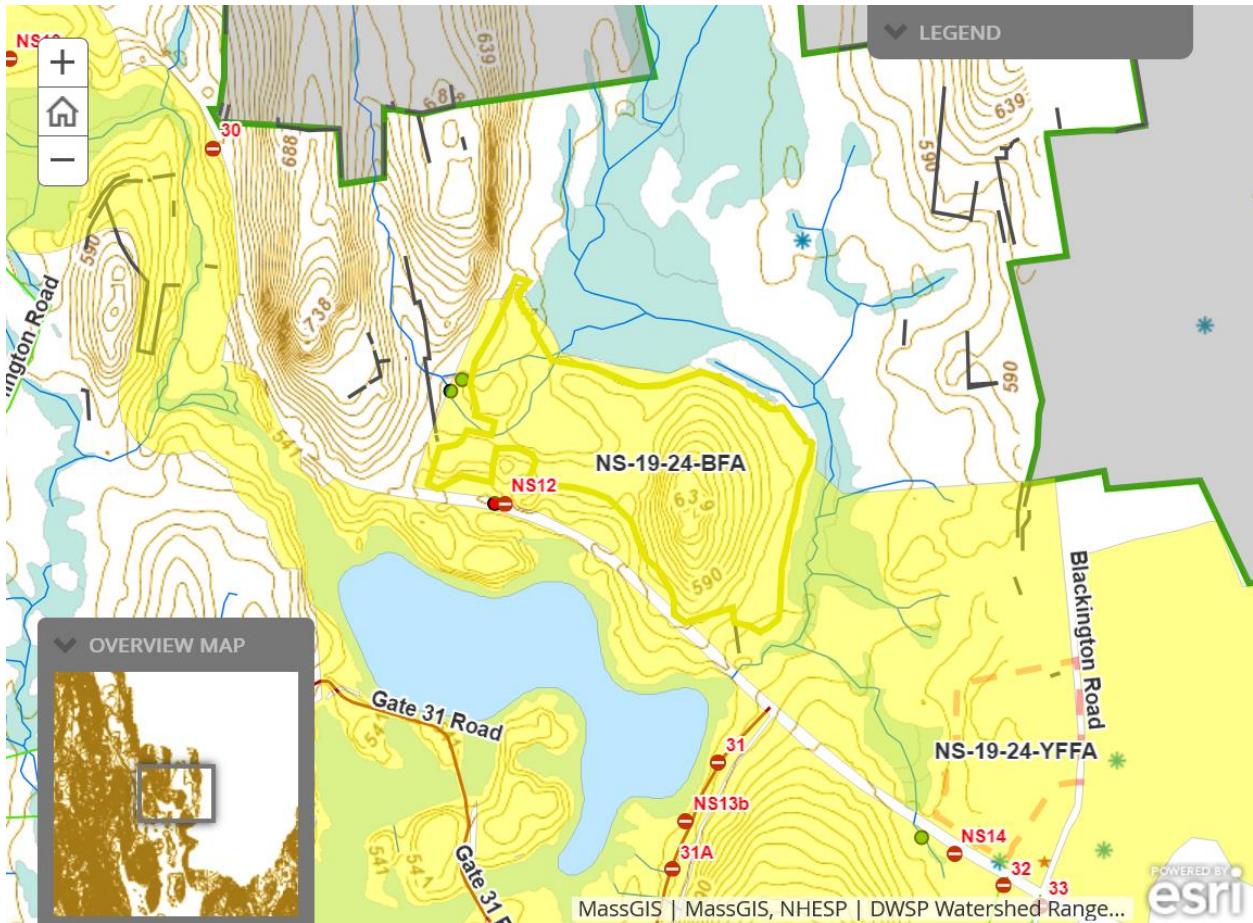
Blackington Swamp, which is just to the north of the lot, is mapped as a rare, unique and exemplary natural community, containing both blackgum (*Nyssa sylvatica*) and black spruce (*Picea mariana*). However, these communities are described as “marginal” and “scattered” at the east end of the Swamp, on the opposite side from this lot.

General Wildlife Comments:

The purpose of this harvest is to create barrens habitat for wildlife. Wildlife habitat features that are consistent with barrens will be protected wherever possible, including large diameter oak den trees and potential den trees, and large diameter logs and snags.

Comments on Rare Species/Habitats:

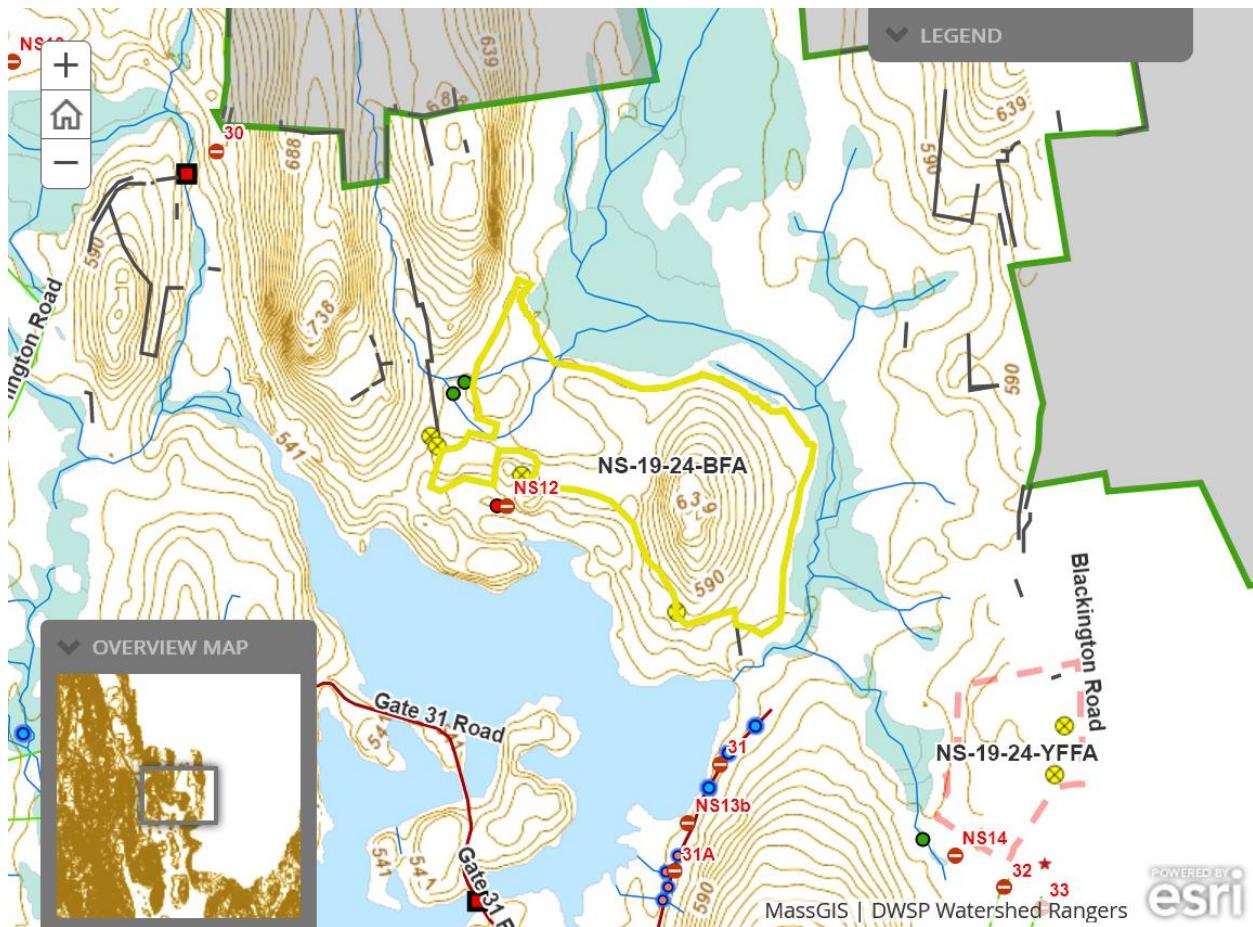
Cavity trees and potential/existing nest trees will be retained if possible. NHESP has determined that certain state-listed sensitive species or habitats may exist within the northern section of the lot proposal area. To protect them from unnecessary disturbance, detailed information regarding affected species and their locations is not included in this report. DWSP will coordinate with NHESP and follow recommendations to protect these species during the proposed harvest.



Environmental Quality Engineering

Comments on EQ Issues:

No perennial stream crossings.



Forest Access Engineering

Gravel needed: Yes

Landing work needed: Yes

Culverts needed: Yes

Work needed on permanent bridges: No

Beaver issue: No

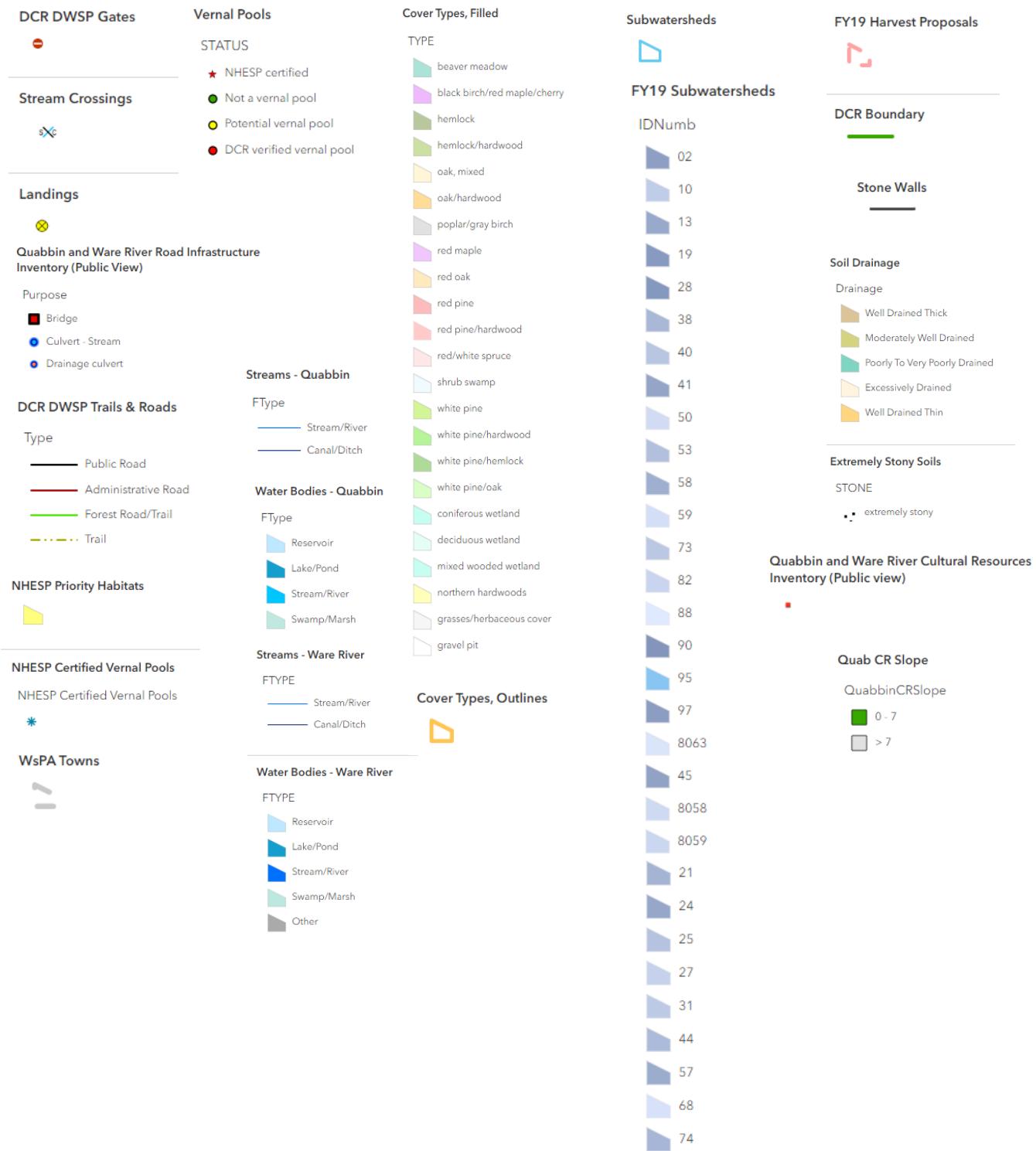
Further comment on access needs:

A landing suitable for a chipping operation needs to be constructed to the south of Gays Hill. Gravel may be needed for parts of the access road as well as for the landing.

The culvert under the unnamed access road is broken in the center and crushed on the east end, and needs to be replaced for use during the harvest. A larger diameter culvert may be desirable to reduce backup of water on the west side. This work may require a Notice of Intent and Request for Determination to the New Salem Conservation Commission.



DWSP FY 2019 Quabbin and Ware River Forestry Proposals – Master Legend for story maps



Quabbin Harvest Proposal NS-19-24YFFA

Proposal Goals

The goal of this proposal is to create a 10-14 acre patch of young forest, which will provide early successional habitat for species that are undergoing regional population declines due to loss of this kind of habitat. This area is designated in the [2017 DCR-DWSP Land Management Plan](#) as a Young Forest Focus Area.

Proposal Location

On the north side of Route 122, between Blackington Road and Blackington Swamp in New Salem.

Total Acres: 22.7



General Description

	Overstory Type(s)	Acres
Dominant	Oak, mixed - dry site	13.7
Secondary	White pine	5.5
Secondary	White pine/oak	3.5

	Understory Type(s)
Dominant	Dry site - blueberry/huckleberry
Dominant	Tree seedlings/saplings dominate the site

Description of forest composition/condition:

The north-central area is dominated by pole sized black and white oak. Oak form and vigor are poor to fair. Associated species include red pine, usually in clumps, and scattered pitch pine. Both red and pitch pine appear to be healthy at this time, but red pine is expected to be killed by red pine scale. There are widely scattered small patches of mountain laurel. Regeneration is patchy and, where it exists, dominated by white pine seedlings. The understory is dominated by blueberry, huckleberry, and wintergreen, with some clubmoss and bracken fern.

As one moves south through the center of the lot, sawlog size white pine becomes increasingly prevalent, as does sawlog size red oak. The form of both oak and white pine is fair, with forks and large dead stubs on many of the oaks, and weevil damage and low branches on many of the pines. White pine dominance increases toward the east and west boundaries of the lot.

Past DWSP harvests in this area include:

- 1 acre of shelterwood prep cutting around the wetland in the southeast corner in 1975 (Quabbin harvest #114)
- 17 acres of thinning in 1985 (Quabbin harvest #441)
- 1½ acres of shelterwood prep cutting along the east and west borders in 1985 (Quabbin harvest #489)

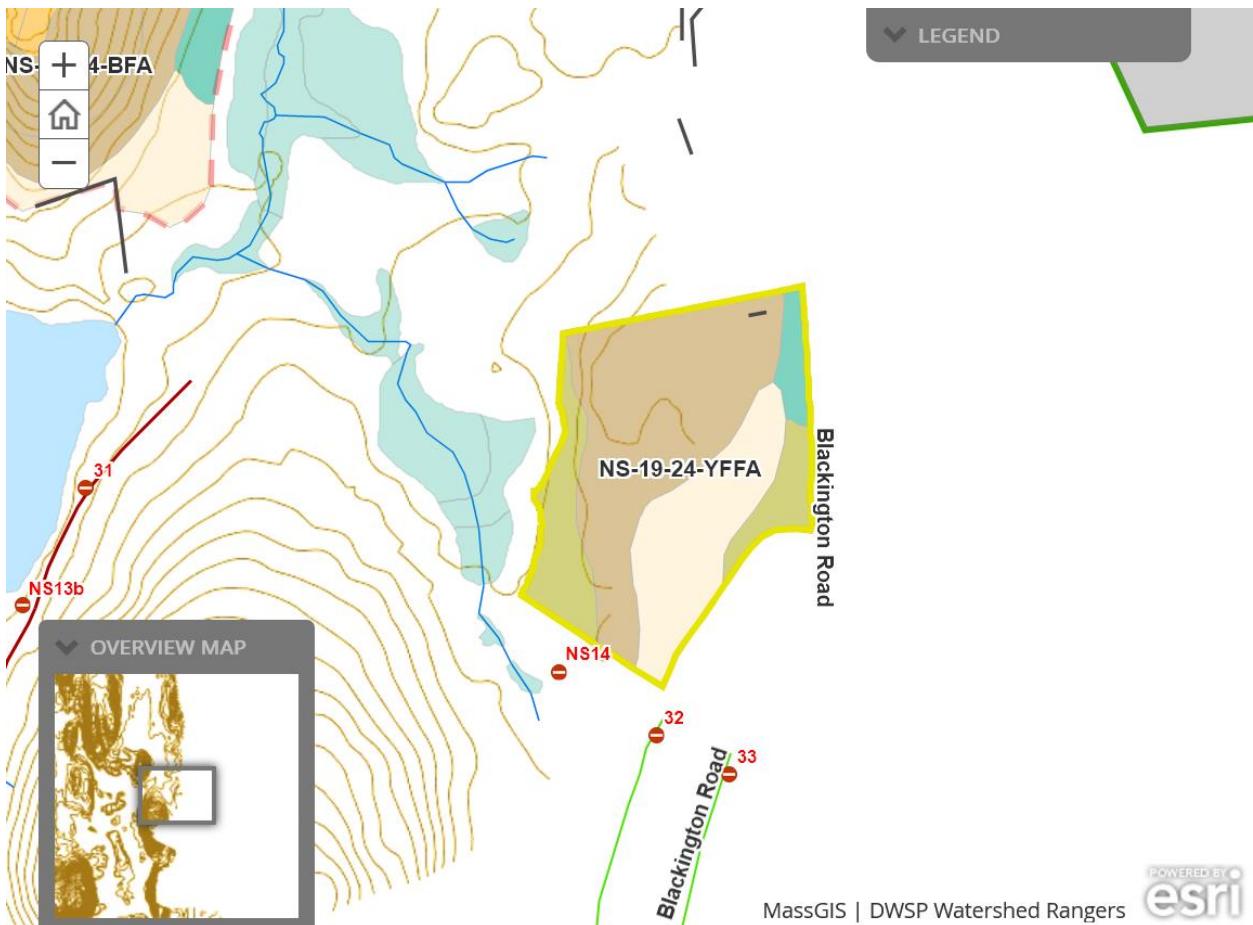
About 13 acres in the northern part of the proposed area has never been harvested by DWSP.



Soils

Drainage Class	%
Excessively Drained	26
Well Drained Thin	0
Well Drained Thick	50
Moderately Well Drained	20
Poorly to Very Poorly Drained	4

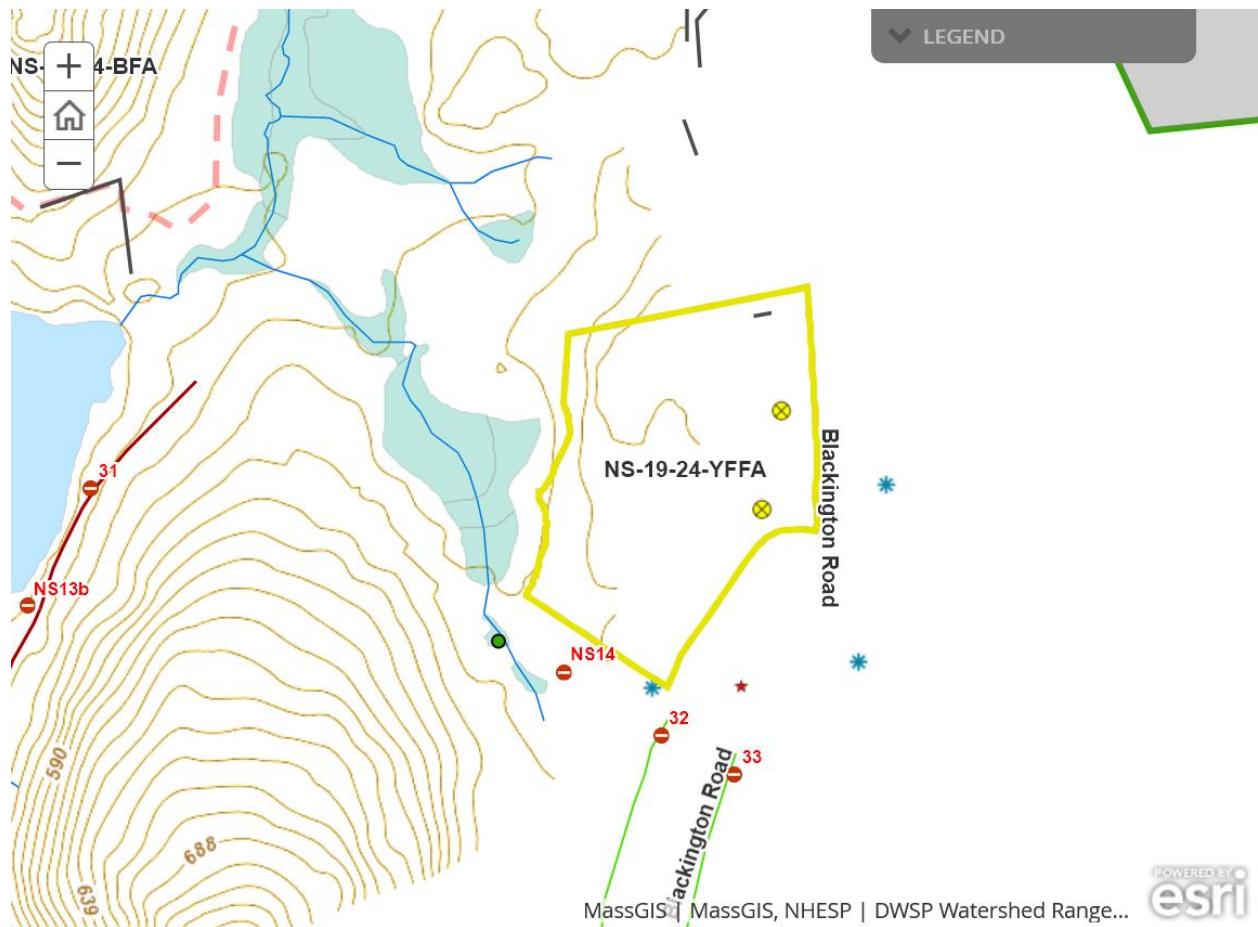
Soil types include Windsor loamy sand, Deerfield loamy sand, , Walpole sandy loam, Newfields fine sandy loam, and Canton fine sandy loam, very stony. Slopes are gentle, under 10%, with low risk of erosion.



Wetlands

- Wetlands present? - **Yes**
- Streams present? - **No**
- Vernal pools present? - **None known**
- Seeps present? - **None known**
- Are stream crossings required? - **No**
- Are wetland crossings required? - **No**
- Is logging in filter strips planned? - **No**
- Is logging in wetlands planned? - **No**

There is an NHESP Certified Vernal Pool in the old borrow pit at the south end of Blackington Road. This vernal pool will be protected in accordance with M.G.L. Chapter 132 and the 2017 DWSP Land Management Plan. The lot boundary is 100 feet away from the pool in order to maintain a filter strip/shade zone; actual cutting may be still farther away. In addition, there will be a 200 foot low ground disturbance zone in which ruts will be kept under 6" so that they do not impede salamander migration.



Silviculture

Acres in Intermediate cuts: **0**

Acres in prep/establishment cuts: **0**

Acres in Regeneration cuts: **14**

Average regen opening size: **14**

Maximum regen opening size: **14**

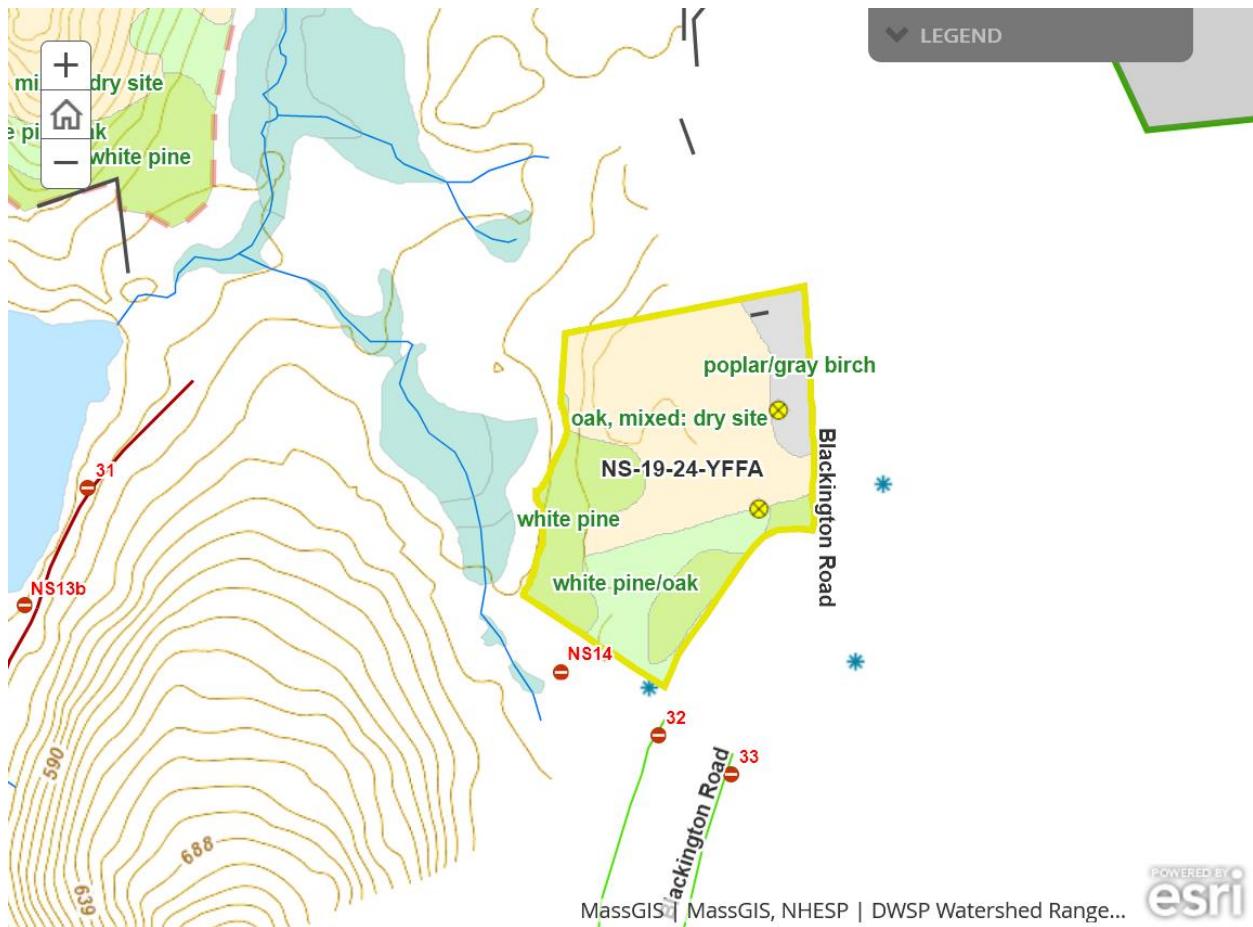
Description of advance regeneration in proposal area:

Regeneration is patchy, present in some areas but not in others. Along roads and where past harvesting has created small openings there are mixed saplings, mostly white pine, red maple and other hardwoods, and some hemlock. In lightly harvested or unharvested areas in the center of the lot, regeneration is dominated by white pine seedlings or completely absent.

General comments on silviculture proposed:

This proposal will create early successional habitat for species that are undergoing regional population declines due to loss of this kind of habitat, as described on pages [117-127 of the 2017 DCR-DWSP Land Management Plan](#). The Blackington Road Young Forest Focus Area is shown in Figure 4-8 on page 122 of the Management Plan.

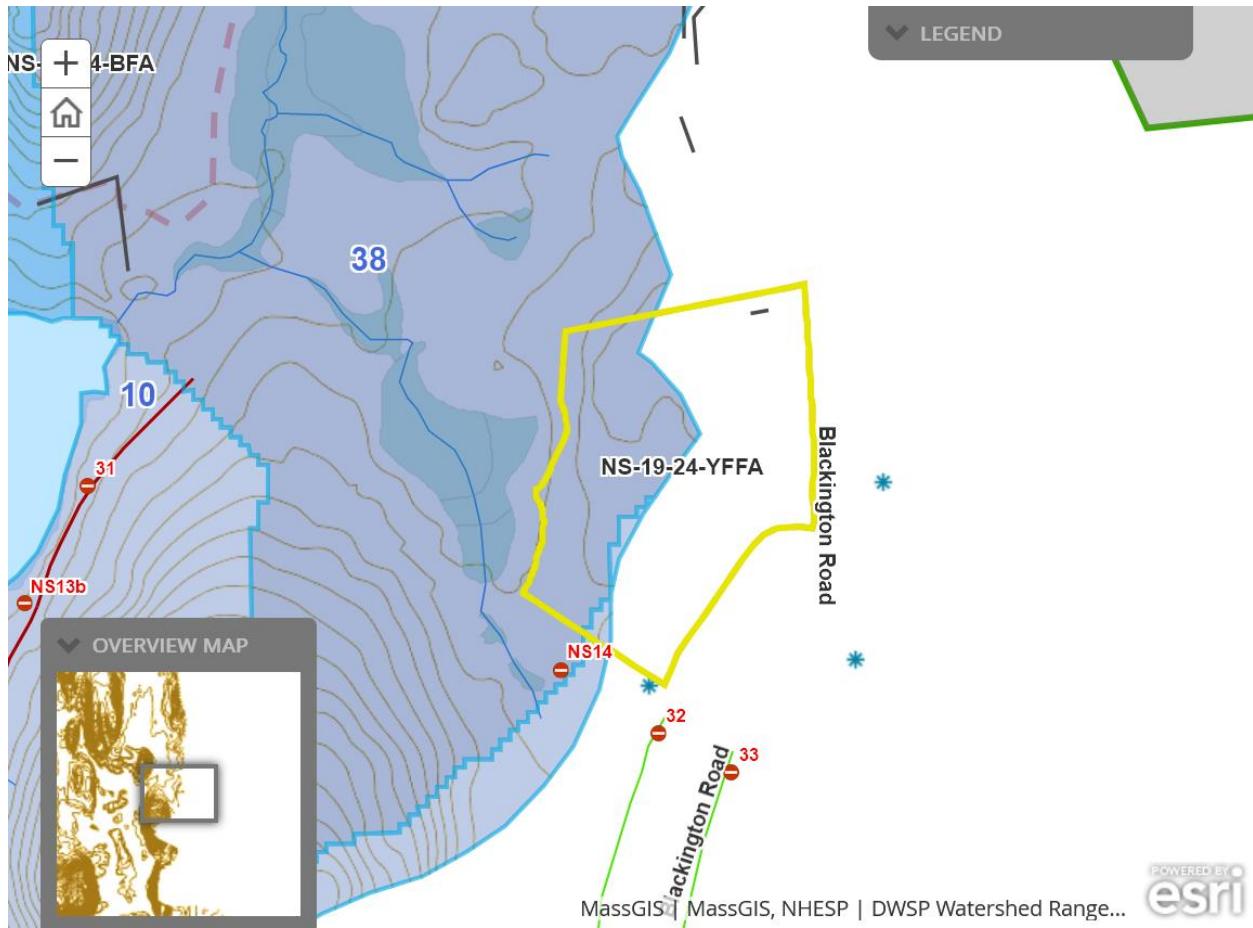
This harvest will create a 10 to 14 acre opening at the southern end of the Blackington Road Young Forest Focus Area. In order to retain filter strips and road buffers, the opening will be at least 100 feet away from Blackington Swamp, the wetland/vernal pool in the borrow pit, and Route 122, and at least 50 feet away from Blackington Road. Basal area retention in the opening will be minimal, in order to achieve maximum benefit for early successional wildlife. However, unique or high value wildlife trees may be retained.



Subwatershed Analysis

Sub-watershed number	Total DCR-owned Acres	Acres Regenerated on DCR Land in the last 10 years	Acres Remaining for Regenerating Up to the 25% / 10 Year	Acres part of this proposal
38	402.2	7.7	92.9	8.4
10	796.8	7.1	192.1	0.5

13.7 acres are outside the Quabbin Reservoir watershed.



Harvesting Limitations

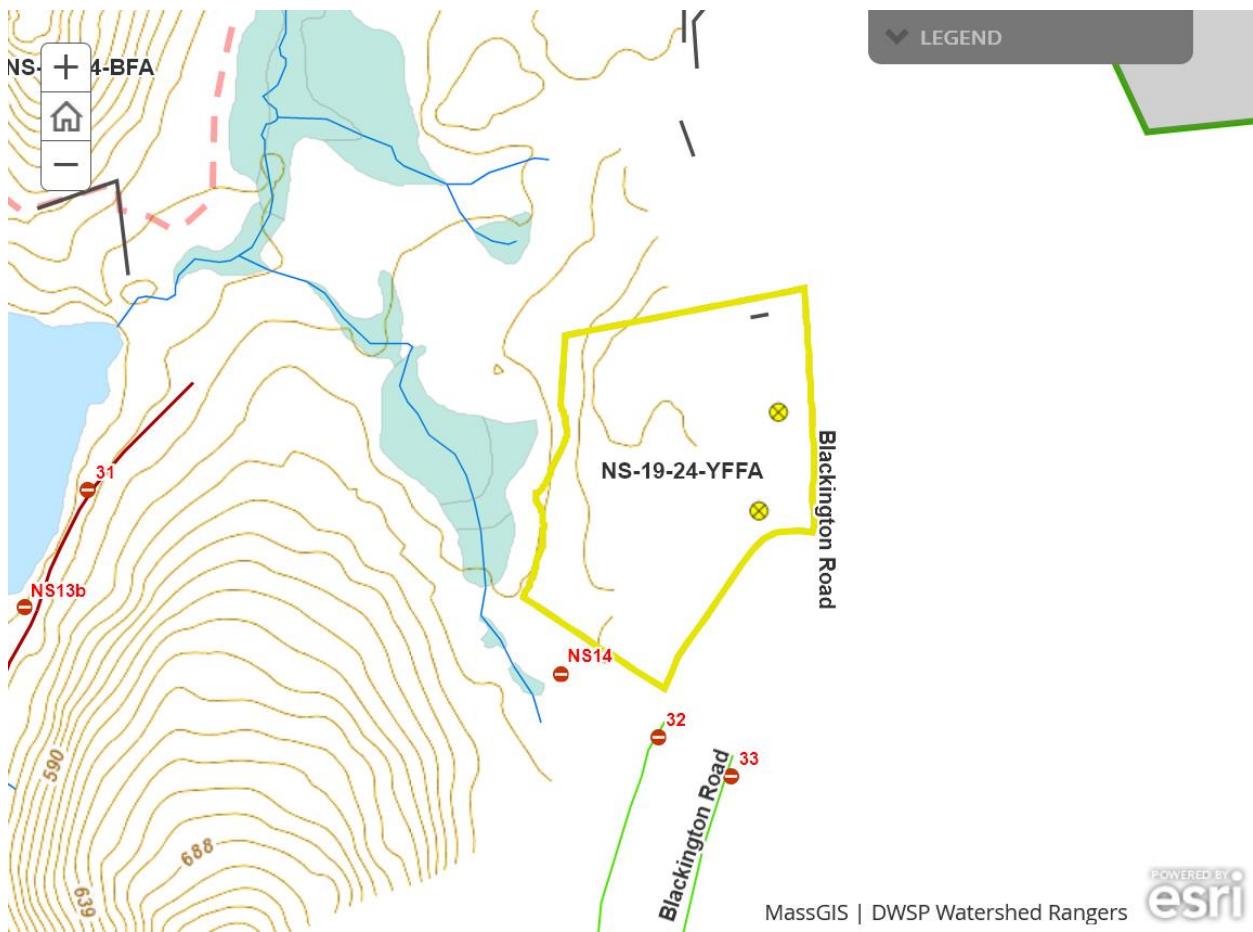
Forwarder required: **No**

Feller/processor required: **No**

Steep slopes present: **No**

Comments on harvesting limitations:

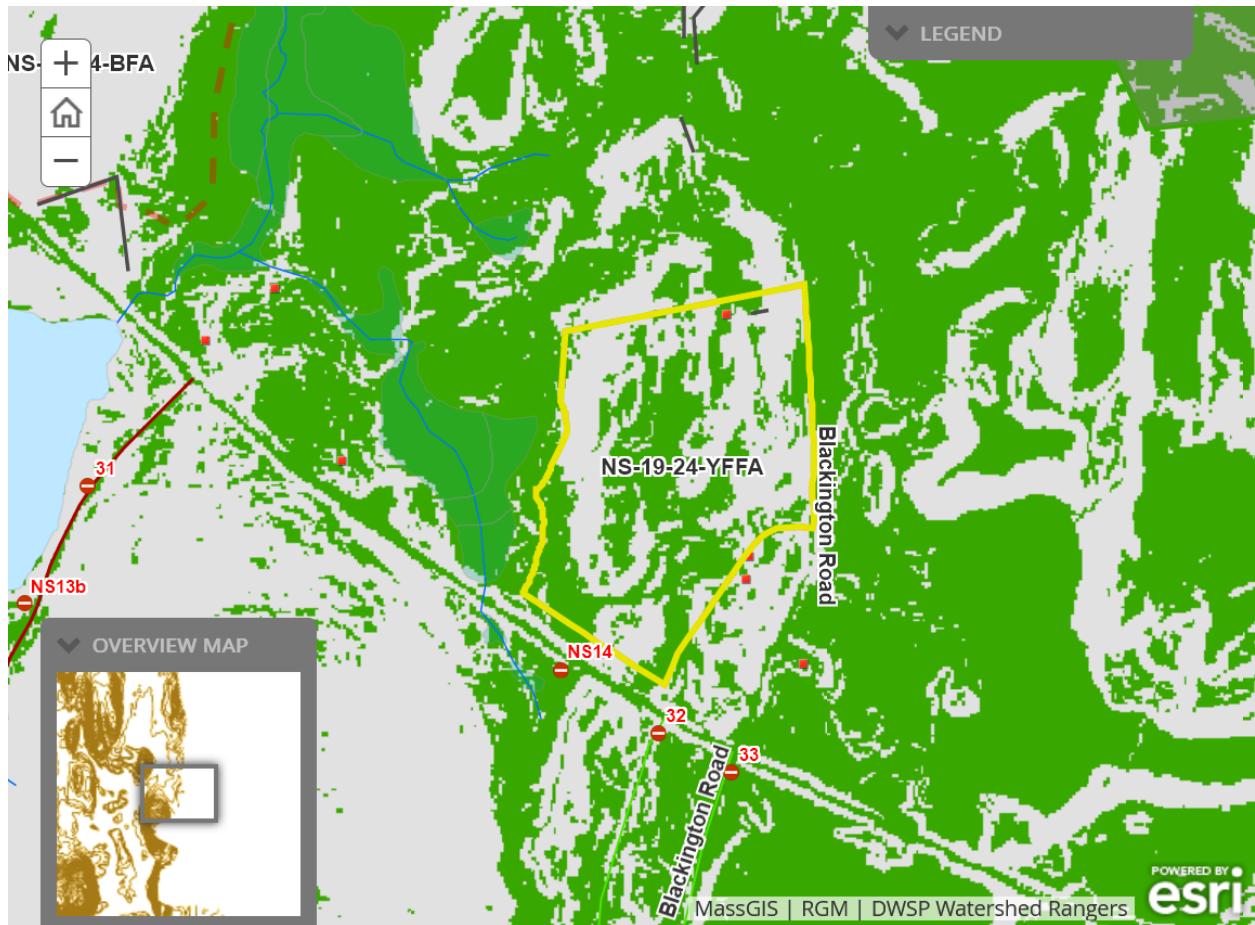
None.



Cultural Resources

Comments on Cultural Resources:

There are two cellar holes in or near this lot, as well as some stone walls. Existing barways will be used where feasible and harvest layout will protect walls as much as possible. Cellar holes will be flagged and avoided. If applicable DWSP will follow any additional recommendations from DCR's Archeologist regarding protection of sensitive sites.



Wildlife Resources & Rare and Endangered Species

Comments on Unique or Unusual Sites or Habitat:

As noted in the Wetlands section, the wetland in the old borrow pit near the junction of Routes 122 and Blackington Road is the probable location of the Certified Vernal Pool that is mapped slightly to the west. This needs to be checked and verified by DWSP and NHESP wildlife biologists. In any case, this wetland will be protected as a certified vernal pool, in accordance with M.G.L. Chapter 132 and the 2017 DWSP Land Management Plan. The lot boundary has been drawn 100 feet away from the pool in order to maintain a filter strip and shade zone; actual cutting may be still farther away. In addition, there will be a 200 foot low ground disturbance zone in which ruts will be kept under 6" so that they do not impeded salamander migration.

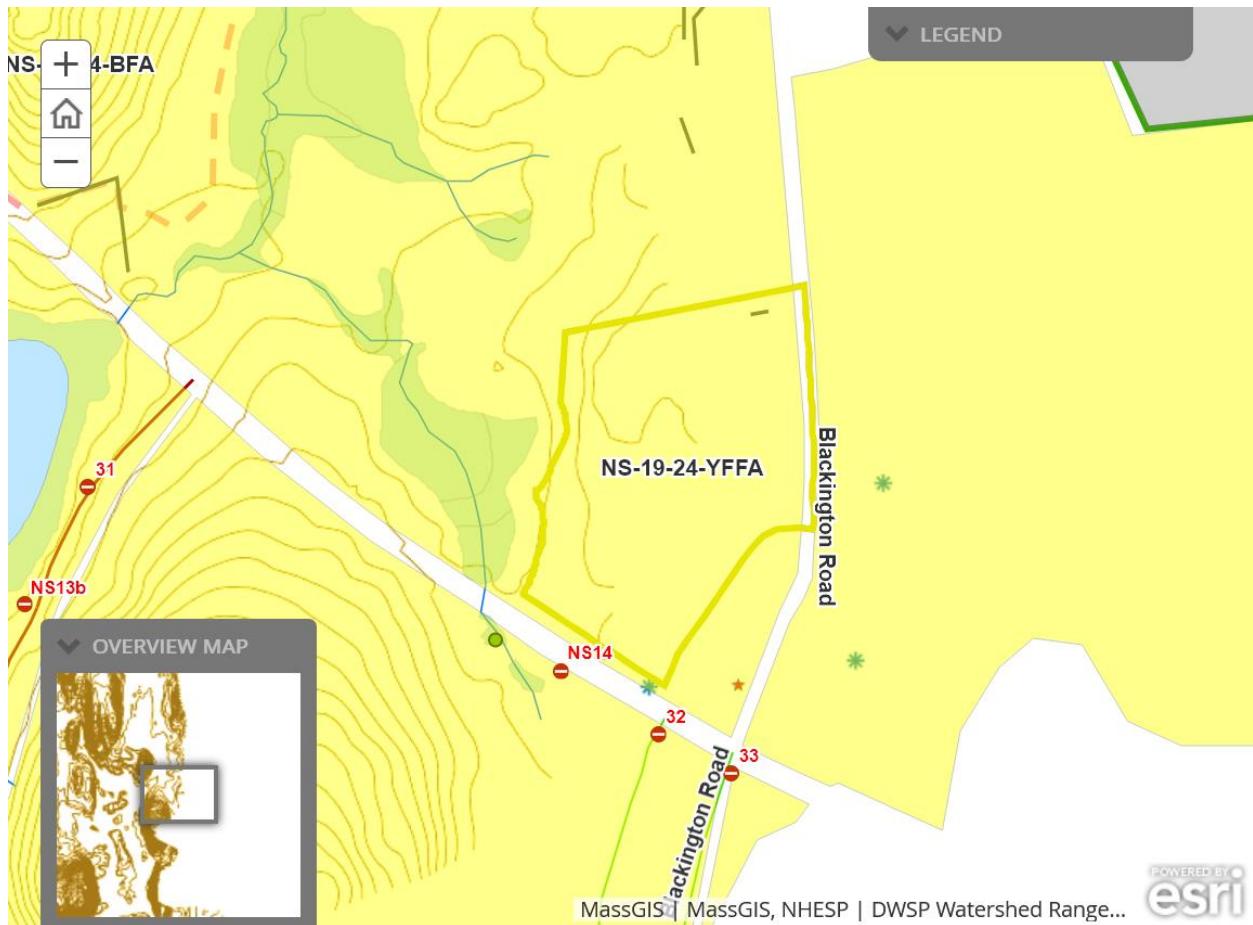
Blackington Swamp, particularly the east edge where it parallels this lot, is mapped as a rare, unique and exemplary natural community, containing both blackgum (*Nyssa sylvatica*) and black spruce (*Picea mariana*). These communities are described as "marginal" and "scattered," but will be protected if found. Again, the lot boundary has been drawn 100 feet away from the swamp in order to provide a o-cut filter strip.

General Wildlife Comments:

The purpose of this harvest is to create early successional habitat for rare and endangered species of wildlife.

Comments on Rare Species/Habitats:

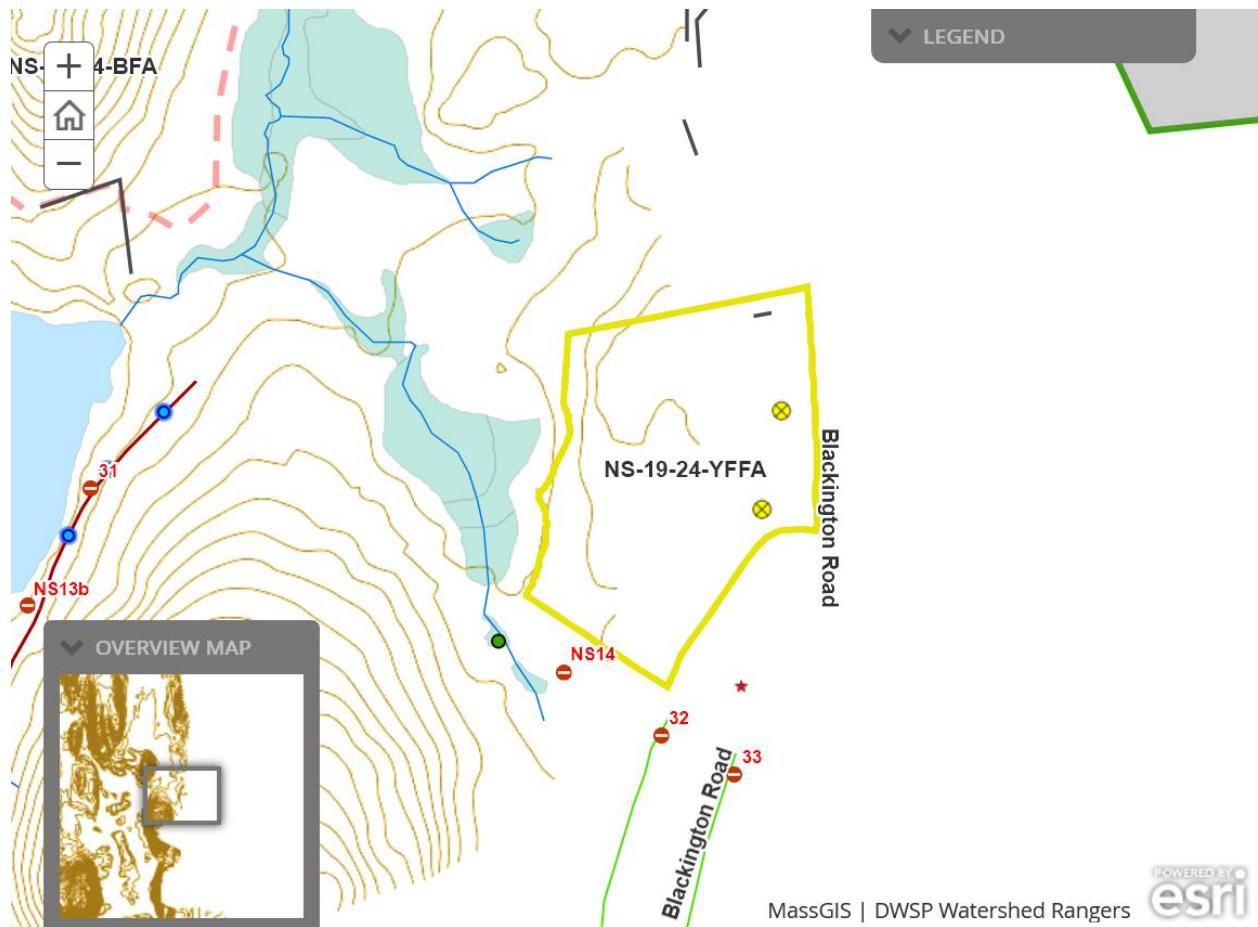
Cavity trees and potential/existing nest trees will be retained if possible. NHESP has determined that certain state-listed sensitive species or habitats may exist within the northern section of the lot proposal area. To protect them from unnecessary disturbance, detailed information regarding affected species and their locations is not included in this report. DWSP will coordinate with NHESP and follow recommendations to protect these species during the proposed harvest.



Environmental Quality Engineering

Comments on EQ Issues:

No perennial stream crossings.



Forest Access Engineering

Gravel needed: No

Landing work needed: No

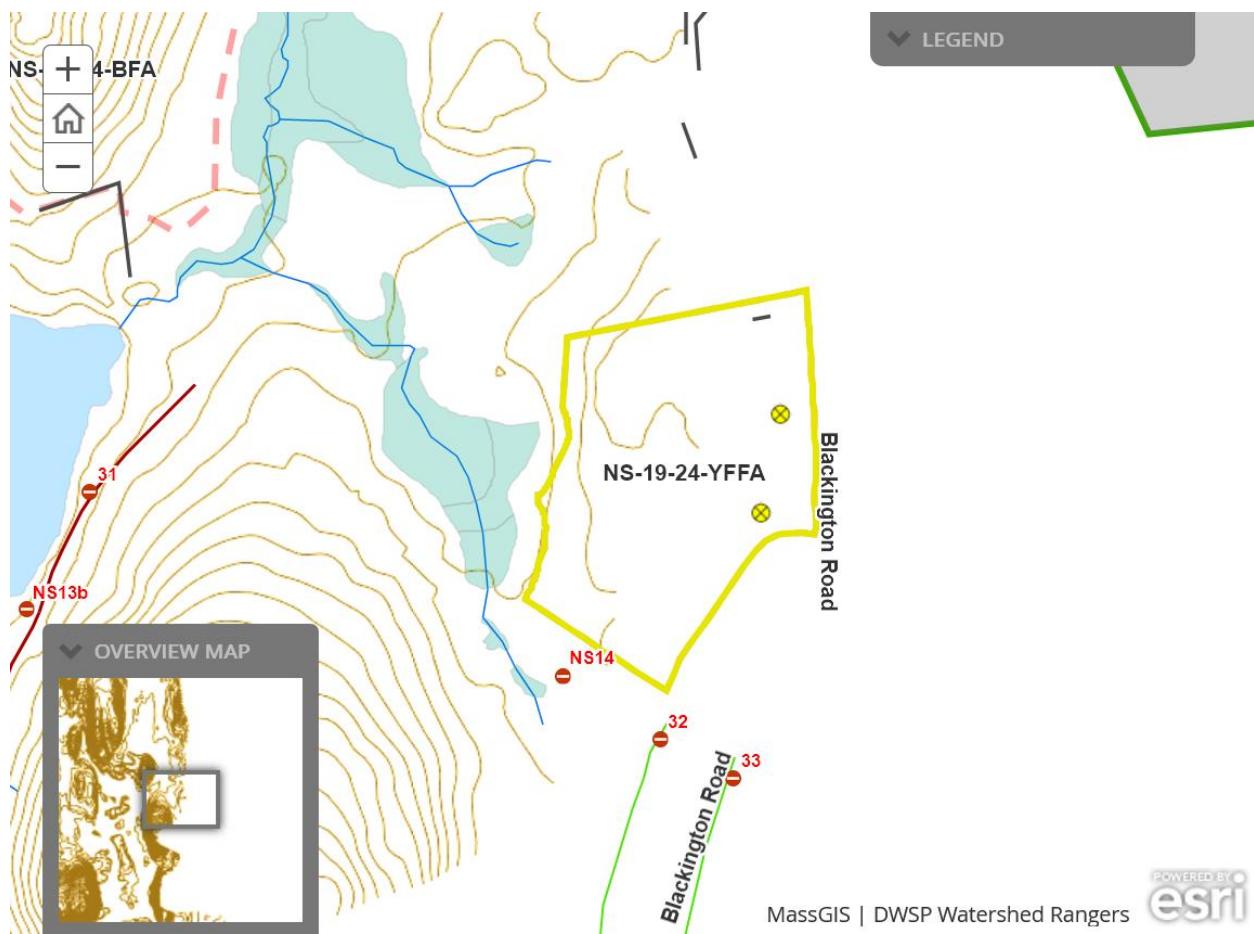
Culverts needed: No

Work needed on permanent bridges: No

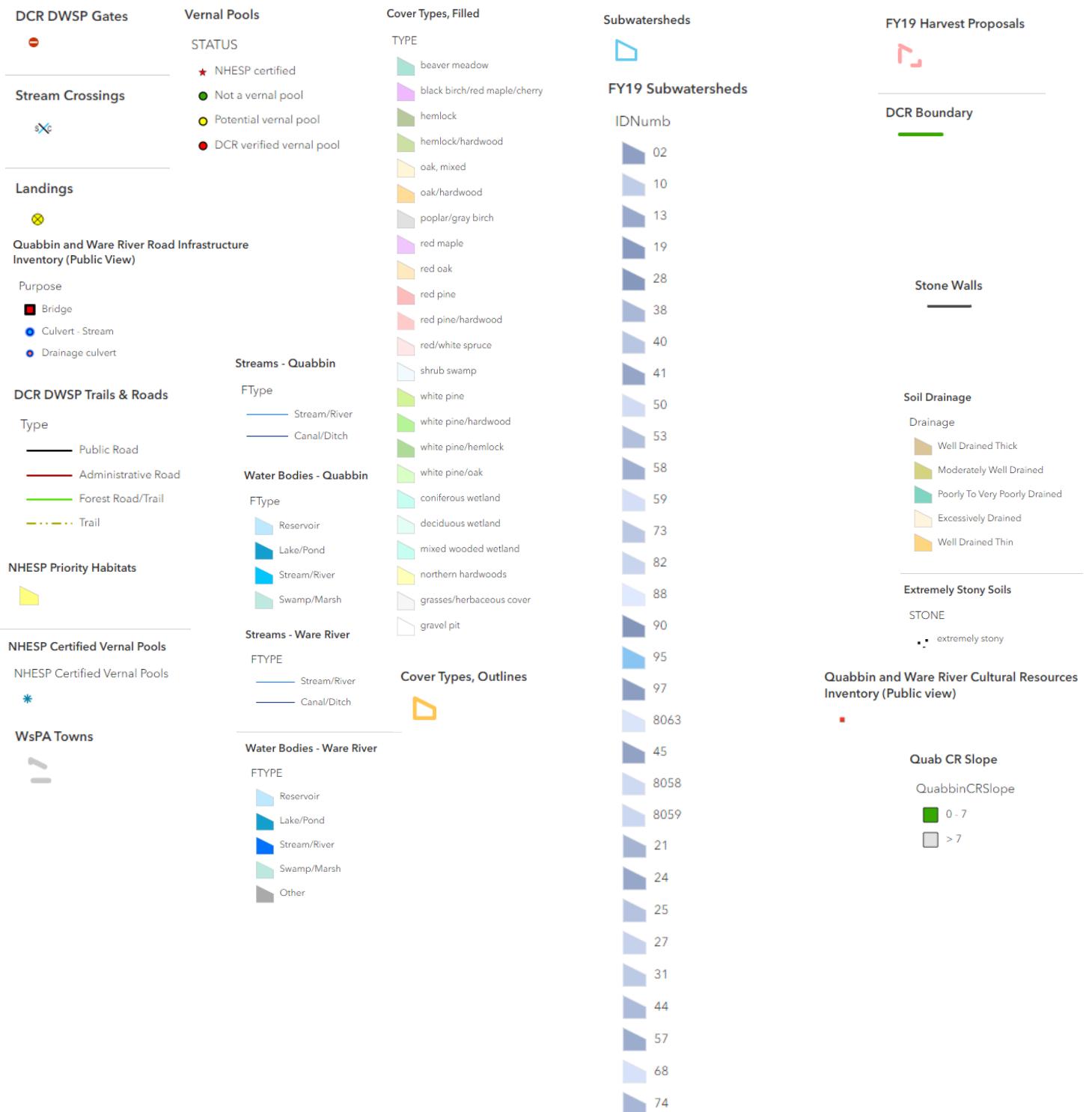
Beaver issue: No

Further comment on access needs:

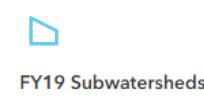
None.



DWSP FY 2019 Quabbin and Ware River Forestry Proposals – Master Legend for story maps

**Cover Types, Filled**

TYPE	
beaver meadow	
black birch/red maple/cherry	
hemlock	
hemlock/hardwood	
oak, mixed	
oak/hardwood	
poplar/gray birch	
red maple	
red oak	
red pine	
red pine/hardwood	
red/white spruce	
shrub swamp	
white pine	
white pine/hardwood	
white pine/hemlock	

Subwatersheds

IDNumb	
02	
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73	
82	
88	
90	
95	
97	
8063	

FY19 Harvest Proposals**DCR Boundary****Stone Walls****Soil Drainage**

Drainage	
Well Drained Thick	
Moderately Well Drained	
Poorly To Very Poorly Drained	
Excessively Drained	
Well Drained Thin	

Extremely Stony Soils

STONE	
extremely stony	

Quabbin and Ware River Cultural Resources Inventory (Public view)**Quab CR Slope**

QuabbinCRSlope	
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Cover Types, Outlines

45	
8058	
8059	
21	
24	
25	
27	
31	
44	
57	
68	
74	

Water Bodies - Quabbin**FTYPE**

Stream/River	
Canal/Ditch	

Lake/Pond	
Stream/River	

Reservoir	
Swamp/Marsh	

Swamp/Marsh	
Other	

Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	
Swamp/Marsh	

Swamp/Marsh	
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Other	
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Reservoir	
Lake/Pond	

Lake/Pond	
Stream/River	

Stream/River	

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