Assessment of Railroad Re-construction on Areas with Sensitive and Diverse Natural Resources in Dalton, Whitefield and Bethlehem New Hampshire.

September 2025

Summary Report Prepared for:
Dalton Conservation Commission
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Introduction

Neighboring towns Dalton, Whitefield and Bethlehem New Hampshire cover over 98,524 acres or 153.9 square miles in both Coos and Grafton Counties. The three towns contain a large diversity of ecological habitats including high elevation mountains within the White Mountain National Forest, flatter and lower elevation river floodplain and riparian habitat, wetlands and rolling forested hills and fields.

The history or railroad use in northern NH played a significant role in the economy, providing transportation for goods and people, and was a crucial part of the state's infrastructure. Today's active railroad lines in New Hampshire are a small fraction of the lines that crossed the state from the mid-19th century through the late 20th century. There is a current plan to reopen the rail system from Whitefield, through Dalton and into Vermont, as well as use a current set of tracks in Bethlehem for railroad car storage.

In August 2025, the Dalton Conservation Commission contracted with Elise Lawson of Watershed to Wildlife to review sensitive natural resource features along the proposed railroad reconstruction through Dalton, Whitefield, and Bethlehem. Elise has extensive experience in all three towns, having completed natural resource inventories and wetland studies over many years. For this project, she used a combination of GIS mapping data and field surveys conducted within public rights-of-way to identify sensitive areas that could be affected by reconstruction activities, with particular attention to water quality. She also provided recommendations to minimize and avoid potential impacts to these areas across the three towns.

One day of field work combined with previous studies and GIS mapping resulted in this summary, which addresses natural resource concerns.

Methods

On September 15, 2025, Elise visited the railroad areas where they crossed public roads. She was not given permission to walk along the railroad, and respects the rules and wishes of the Vermont Rail System. Existing data used for this report include the following:

1. Existing natural resource data generated during the following natural resource inventory work
    a. 2025 NRI in Bethlehem NH (link here)
    b. 2023 NRI in Dalton, NH (link here)
    c. 2022 NRI in Whitefield, NH (link here)

2. Existing wetland study: Functional Assessment of Wetlands throughout Dalton, NH, 2006
3. Existing maps including:
    a. USGS topographic
    b. Recent and historical aerial photos
    c. US Fish and Wildlife National Wetland Inventory data
    d. US Natural Resource Conservation Service soils map: poorly and very poorly drained soils
    e. Aquifer data downloaded from the UNH Granit mapping database

Based on one day of field work, review of existing digital GIS data, and previous work throughout the three towns, Elise highlighted areas of concern as well as means to minimize negative impacts on natural resources throughout the area.

Impacts on Natural Resources

Wetlands and Perennial Streams

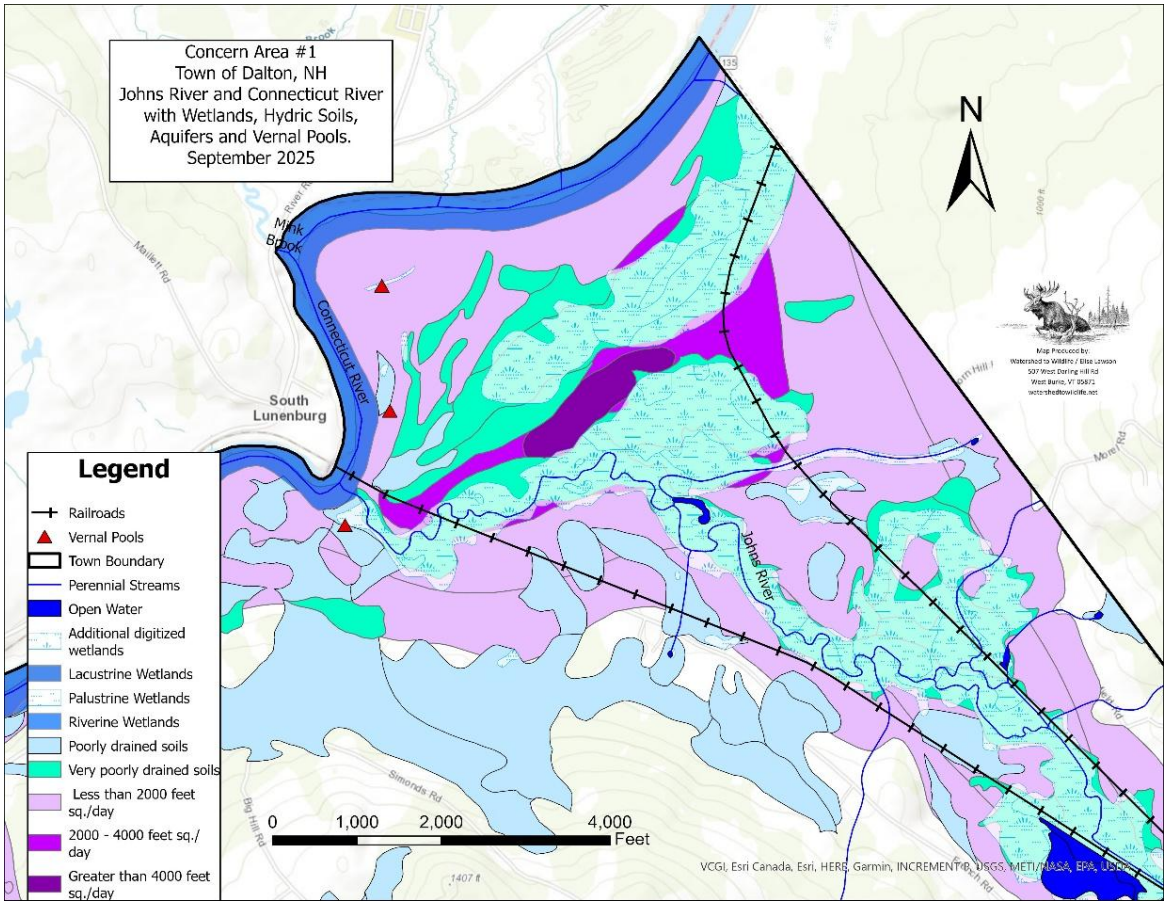
Wetlands are a critical habitat type in New Hampshire, providing ecological functions essential to the majority of the state's plant and animal species. Their composition and structure vary according to hydrology, soils, topography, and climate. Palustrine wetlands are broadly classified into four categories—marshes, swamps, bogs, and fens—with additional subtypes defined within each class. Individual wetlands support complex assemblages of vegetation and wildlife that are maintained by dynamic hydrologic regimes. Transitional zones at wetland margins, as well as riparian corridors along streams and rivers, provide high habitat value due to their structural diversity and resource availability. Collectively, wetlands and riparian areas are estimated to be used by over 90% of regional wildlife species, serving as primary or preferred habitat for more than 40%.

In 2015, the U.S. Environmental Protection Agency's (USEPA) Office of Research and Development has finalized a report called: *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence* (US EPA, 2015). The report reviews more than 1,200 peer-reviewed publications and summarizes current scientific understanding about the connectivity and mechanisms by which streams and wetlands, singly or together, affect the physical, chemical, and biological integrity of downstream waters. The report focusses on how surface and shallow subsurface connections including small or temporary streams, wetlands, and open waters affect larger waters such as rivers, lakes, reservoirs, and estuaries. It makes five major conclusions, summarized below.

- Streams, regardless of their size or frequency of flow, are connected to downstream waters and strongly influence their function.
- Wetlands and open waters in riparian areas (transitional areas between terrestrial and aquatic ecosystems) and floodplains are physically, chemically, and biologically integrated with rivers via functions that improve downstream water quality. These systems act as buffers to protect downstream waters from pollution and are essential components of river food webs.
- Many wetlands and open waters located outside of riparian areas and floodplains, even when lacking surface water connections, provide physical, chemical, and biological functions that could affect the integrity of downstream waters.
- Variations in the degree of connectivity are determined by the physical, chemical and biological environment, and by human activities. These variations support a range of stream and wetland functions that affect the integrity and sustainability of downstream waters.
- Incremental contributions of individual streams and wetlands are cumulative across entire watersheds, and their effects on downstream waters should be evaluated within the context of other streams and wetlands in that watershed.

Based on field surveys and a review of previous studies, several areas along the proposed railroad reconstruction corridor emerged as priority concerns. These areas are particularly important for maintaining wetland connectivity, protecting water quality, and supporting biodiversity.

1. **Concern Area #1 in Dalton**: Includes the Johns River and associated wetland complex particularly near its confluence with the Connecticut River. This area has been identified as a rich ecological gem in Dalton in both the 2006 wetland study as well as the 2023 Natural Resource Inventory. Field inventory of this area for these two projects showed that it contains a large diversity of wetlands including rivers and streams, open water, emergent, scrub shrub, and forested wetlands. The area is rich with wildlife habitat diversity. During these past field studies, many species of song birds, great blue heron, green heron, American bittern, beaver, muskrat, moose, deer, black bear, fox, coyote, ruffed grouse, snapping turtles, wood turtle, wood frogs, wood peckers, painted turtles and broad-winged hawks were documented in this area alone. A large, productive aquifer is also under this area.



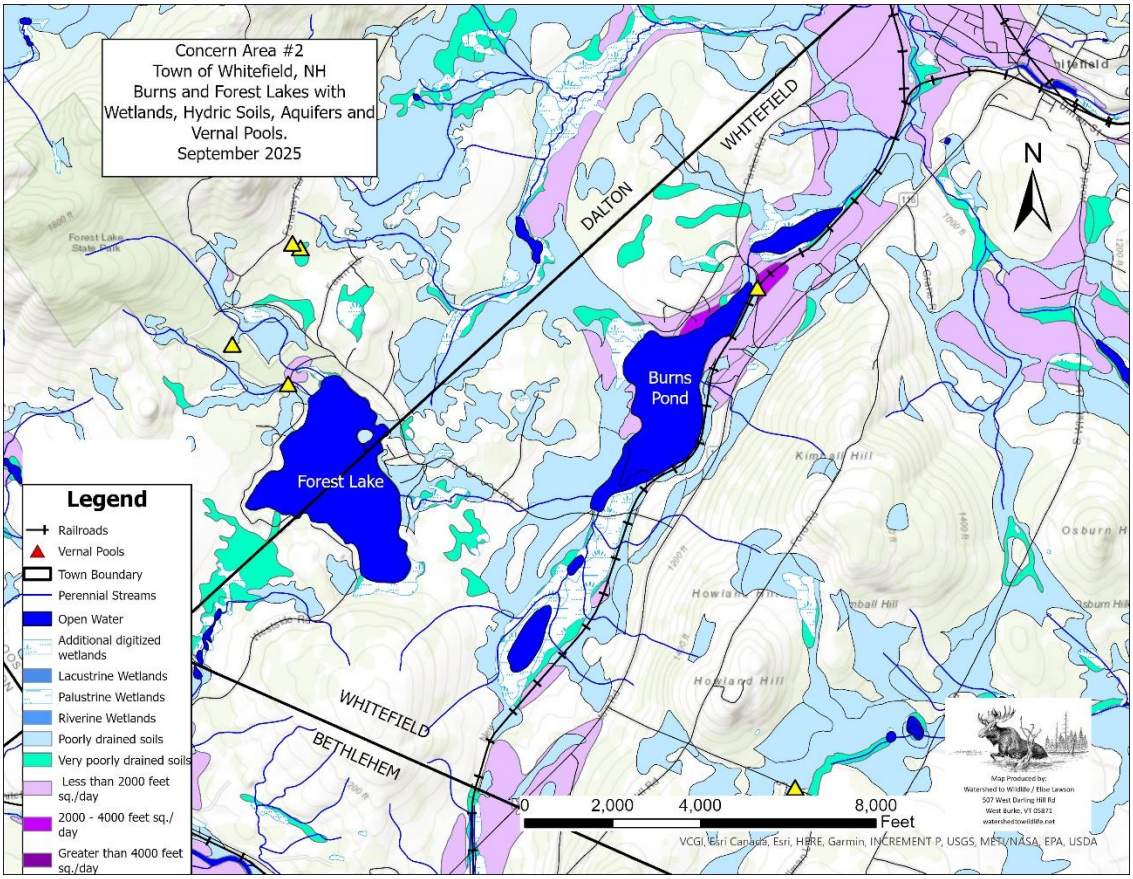
Railroad crossing the Connecticut River into Vermont. Photo taken 10-6-2022.

Facing upstream on the Johns River near its confluence with the Connecticut River. Photos taken 10-6-2022 (left) and 9-15-2025 (right)

Diverse, productive wetland complex associated with the Johns River near its confluence with the Connecticut River. Photo taken 10-6-22.

2. **Concern Area #2 in Whitefield:** Includes Burns Lake/Pond and associated wetland complex. Proposed work runs right along Burns Lake and two large wetland areas to the northeast (downstream) and southwest (upstream) of Burns Lake. There is hydrological connection between Burns Lake and Forest Lake via a perennial stream, wetlands and hydric soils. The railroad runs very close to Burns Lake and

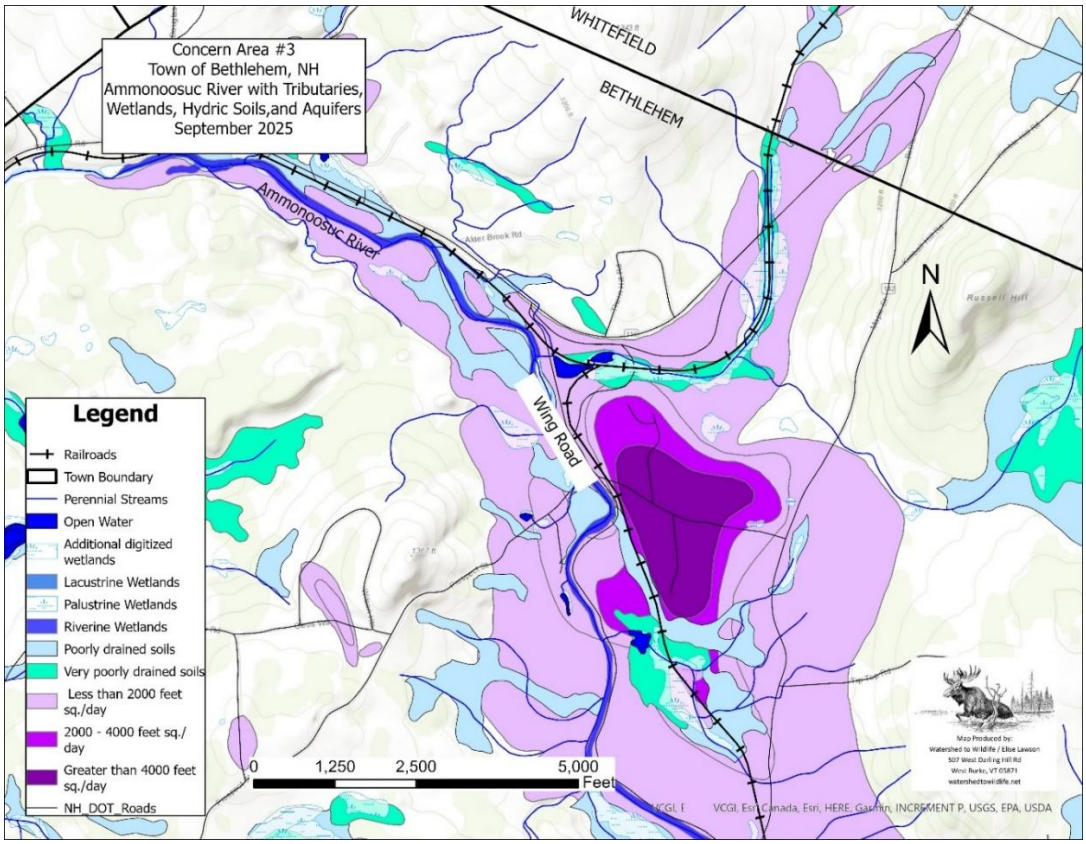
associated wetlands. Construction work could directly impact water quality on the lake, the adjacent wetlands as well as the aquifer below.



Burns Lake facing SW across lake. Proposed railroad construction would run along the left side of the photo. Photo taken 9-15-2025.

Large wetland complex upstream / southwest of Burns Lake. This wetland and perennial stream connect Burns and Forest Lakes. Insert photo: moose tracks on the side of the road near this wetland. The moose (likely a cow/calf based on track sizes) entered the forested wetland to the right of this photo. Taken 9-15-2025

3. **Concern area #3 in Bethlehem**: Includes the Ammonoosuc River, a diversity of wetland types, and a large, productive aquifer along Wing Road, Whitefield Road, and existing railway. During the 2025 NRI in Bethlehem, this wetland complex with its proximity to the Ammonoosuc River, was identified as an ecologically diverse area with many wetland types including the Ammonoosuc River.




Left photo (taken 9-15-2025): pond with large wetland complex upstream. The railroad runs right along this pond on the left side of the phot, and crosses Wing Road. **Right Photo** (taken 6-13-2023): Ammonoosuc River on the south side of Wing Road

Specific concerns with both temporary and permanent impacts on all wetlands and streams, especially the three areas described and shown above are the following:

1. Loss of biodiversity not only to wetlands, but also adjacent upland plant and animal communities
2. Increased opportunities for invasive species to establish
3. Surface water quality may be impaired not only in the Connecticut, Johns, and Ammonoosuc Rivers, but also in the perennial and intermittent streams that flow into them. Potential impacts include erosion, stream bank destabilization, increased sedimentation, nutrient loading, and altered hydrology, which can degrade water/habitat quality and water clarity. These effects may occur both at the immediate site of disturbance as well as downstream from the impacted areas.
4. Aquifer degradation. Regardless of the size, all aquifers need special consideration to ensure good water quality now and into the future. Given the worldwide water crises we are experiencing, all aquifers should be considered potential drinking water sources.

Vernal Pools

Vernal pools are distinct, often isolated, and important wetland types. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as wood frogs (*Rana sylvatica*), yellow spotted salamanders (*Ambystoma maculatum*), marbled salamanders (*A. opacum*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend

on vernal pools as breeding sites because they are only temporary water bodies preventing fish and other aquatic predators from taking up residency. Reptiles such as Wood turtles (*Glyptemys insculpta*) also rely on vernal pools as an important feeding area in early spring. Vernal pools fill annually from precipitation, runoff, and rising groundwater, typically in the spring and fall. By mid-summer, however, these wetlands are typically dry, making them a dynamic system inhabitable to specifically adapted plant and wildlife species. For this reason many unique, rare, threatened, and endangered species are linked to this wetland type. They are common in New Hampshire, and the State recognizes their value as important habitat.

Because of the time of year of site visit (September 15, 2025) Elise did not document vernal pools. However, 5 vernal pools have been documented adjacent to the proposed railroad reconstruction from previous studies (4 in Dalton and 1 in Whitefield). There are likely more as the railroad track can isolate bodies of water on both sides. This can create habitat sufficient for vernal pools.

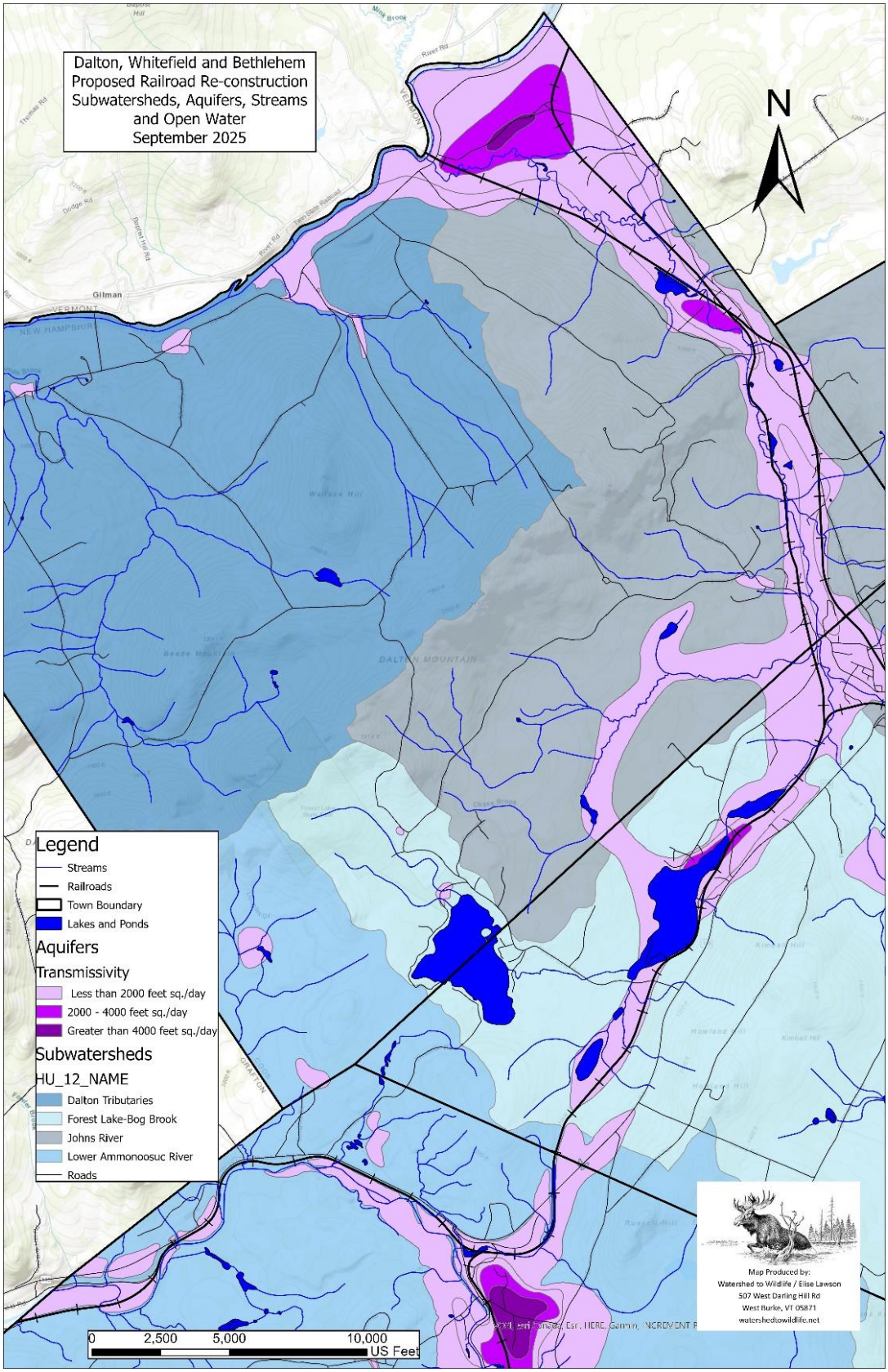
Stratified-Drift Aquifers

Stratified-drift aquifers are an important source of ground water for commercial, industrial, domestic, and public-water supplies in the State of New Hampshire. Approximately 14% of land surface in the State is underlain with stratified-drift aquifers. Wells used by communities and private landowners draw groundwater from aquifers. The stratified-drift aquifers represent the greatest potential groundwater source for the Towns of Dalton, Whitefield and Bethlehem. These aquifers contain potential usable water sources for municipal purposes and should be protected to ensure their future quality and availability.

All but a few hundred feet of the proposed railroad re-construction contains aquifers. The four most productive aquifers throughout the three towns includes:

1. At and near the confluence of the Johns and Connecticut Rivers
2. Along the Johns River near Scotts Junction and Winter Lane Roads
3. Under Burns Lake and associated wetlands
4. Along the Ammonoosuc River and associated wetlands along Wing Road

The majority of aquifers are made up of sand material with a small amount containing glacial till material. Stratified drift aquifers consisting of sand material tend to be more porous and have a higher potential for quicker transmissivity and recharge. These three towns are fortunate to have these potential drinking water sources. Runoff, erosion, soil contamination, and soil compaction from this proposed project could all contribute to degradation of water quality in these aquifers.


Dalton, Whitefield and Bethlehem
Proposed Railroad Re-construction
Subwatersheds, Aquifers, Streams
and Open Water
September 2025
N
Legend
Streams
Railroads
Town Boundary
Lakes and Ponds
Aquifers
Transmissivity
Less than 2000 feet sq./day
2000 - 4000 feet sq./day
Greater than 4000 feet sq./day
Subwatersheds
HU_12_NAME
Dalton Tributaries
Forest Lake-Bog Brook
Johns River
Lower Ammonoosuc River
Roads
0
2,500
5,000
10,000
US Feet
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Discussion and Recommendations to Minimize Negative Impact to Natural Resources

The revitalization of railroads for cargo and passenger use along existing railroad lines offers great potential for our region in the North Country. However, railroad lines often travel along flatter valleys and waterways for ease of construction and to avoid hills and rugged topography, typical of northern New Hampshire and Vermont. These river valleys also contain our most diverse and productive natural resources – rivers, riparian habitat, floodplains, wetlands, and aquifers. For transportation and natural resources to co-exist, proper care and monitoring of our natural resources is necessary. Recommendations to minimize negative impacts in Dalton, Whitefield and Bethlehem include the following:

1. Work with a natural resource professional to identify areas of concern throughout the railroad reconstruction areas. This professional should be documenting and monitoring areas before, during and after construction to ensure best management practice, avoidance, minimization, and site reclamation where necessary.
2. All work should follow best management practices for rail road construction to protect and preserve good water quality throughout the watersheds.
3. Consider alternative treatments to harmful chemicals, such as creosote to treat railroad ties.
4. Monitor water quality and ensure proper containment of leachates to safeguard aquatic and groundwater resources.

Best Management Practices

The proposed rail reconstruction corridor runs near or across multiple surface waters, rivers and streams, riparian and floodplain areas, wetlands, and aquifer recharge areas, which increases concerns for the potential for erosion, sedimentation, and stormwater-related impacts during construction. To minimize risks to water quality and aquatic resources, it is recommended that the project incorporate the best management practices outlined in the *New Hampshire Stormwater Manual* (New Hampshire Department of Environmental Services [NHDES], 2025) and the *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas, Volume 3* (NHDES, 2008).

Environmentally Preferable Options for Railroad Ties

The reconstruction of the rail corridor adjacent to ponds, rivers, wetlands, and aquifer recharge areas warrants careful selection of tie materials to minimize environmental impacts. Traditional creosote-treated wood ties present measurable risks of polycyclic

aromatic hydrocarbon (PAH) leaching into surface waters, which can adversely affect aquatic organisms, including early life stages of fish (Kang & Lebow, 2005; Duncan et al., 2017).

Several alternatives exist that reduce or eliminate these risks:

1. **Chemically Treated Wood (Non-Creosote)**
   Preservatives such as copper naphthenate or borate-based treatments offer lower aquatic toxicity than creosote and can be effective for decay protection (Khademibami et al., 2022). However, leaching of metals or biocides is possible and should be considered, particularly in areas near wetlands or aquifers.
2. **Non-Wood Materials**
   Concrete, steel, and composite/recycled-plastic ties eliminate PAH leaching entirely, with long service lives and minimal chemical risk (Bolin & Smith, 2013). These alternatives present tradeoffs in terms of higher embodied energy, installation considerations, and mechanical differences from wood.
3. **End-of-Life and Recycling Considerations**
   Thermal treatments, such as pyrolysis or torrefaction, can mitigate environmental hazards from creosote ties at disposal, converting wood waste into safe byproducts (Kazimierski et al., 2023). Implementing end-of-life management strategies reduces the long-term risk of soil and water contamination.

Conclusion

The proposed revitalization of the rail corridor through Dalton, Whitefield, and Bethlehem has the potential to deliver regional transportation benefits; however, the alignment's proximity to high-value natural resources requires care, and a science-based approach. Effective mitigation will depend on early and continuous engagement with natural resource professionals, strict adherence to state and federal regulations, best management practices, and implementation of alternative tie materials or lower-toxicity preservatives. Incorporating stormwater management standards from the NHDES Stormwater Manual and related technical guidance will be essential to minimize sedimentation, leachate migration, and hydrologic alteration along sensitive reaches.

References

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Proposed Railroad Re-construction
Water Resources
in Dalton, Whitefield and Bethlehem, New Hampshire
September 2025

N

Connecticut River

Forest Lake

Burns Pond

Legend

- Vernal Pools
- Railroads
- Town Boundary
- Roads
- Perennial Streams
- Open Water
- Lacustrine Wetlands
- Palustrine Wetlands
- Riverine Wetlands
- Poorly drained soils
- Very poorly drained soils
- Less than 2000 feet sq./day
- 2000 - 4000 feet sq./day
- Greater than 4000 feet sq./day

0 3,750 7,500 15,000 Feet

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Dalton, Whitefield and Bethlehem
Proposed Railroad Re-construction
Subwatersheds, Aquifers, Streams and Open Water
September 2025

N

Connecticut River

Johns River

Ammonoosuc River

Dalton

Whitefield

Bethlehem

Gilman

VERMONT

NEW HAMPSHIRE

Legend

- Streams
- Railroads
- Town Boundary
- Lakes and Ponds

Aquifers

Transmissivity

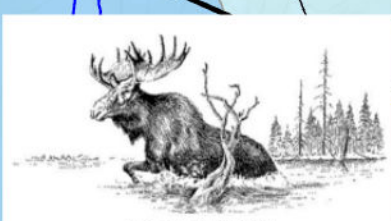
- Less than 2000 feet sq./day
- 2000 - 4000 feet sq./day
- Greater than 4000 feet sq./day

Subwatersheds

HU_12_NAME

- Dalton Tributaries
- Forest Lake-Bog Brook
- Johns River
- Lower Ammonoosuc River
- Roads

0 3,750 7,500 15,000 US Feet



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