Northwood Lake | Watershed Survey Results

TO: Brian Lobao, Northwood Lake Watershed Association (NLWA)
FROM: Christine Bunyon, FB Environmental Associates (FBE)
SUBJECT: **Northwood Lake Watershed Survey Results**
DATE: July 23, 2026
CC: Laura Diemer & Evan Ma, FB Environmental Associates

FB Environmental Associates (FBE) was contracted by the Northwood Lake Watershed Association (NLWA) to complete a watershed survey that identifies and documents nonpoint sources (NPS) of pollutants to Northwood Lake in the Northwood Lake watershed. Unlike pollution from a single pipe, nonpoint source (NPS) pollution occurs when rainfall or snowmelt moves over the ground, picking up diffuse contaminants, such as fertilizers, sediment, and road runoff, and depositing them into local waterways.

A watershed is a land area defined by topography that directs all stormwater runoff and snowmelt downhill toward a receiving body of water, Northwood Lake. The watershed expands into Northwood, Deerfield, Epsom, Pittsfield, and Strafford, New Hampshire. Water within small headwater ponds and tributaries also flows downhill toward Northwood Lake. The Northwood Lake watershed functions as an interconnected network of streams, ponds and lakes, that collectively feed and influence Northwood Lake. These waterbodies include Jenness Pond, Long Pond, Little Bow Pond, Durgin Pond, Harvey Lake, and Pleasant Lake.

Understanding the interconnectedness of these surface waters is critical when assessing NPS pollution, as upstream land use directly impacts downstream water quality. NPS sites require implementation of Structural Control Measures (SCMs) and Best Management Practices (BMPs) to address impacts from stormwater, erosion, impervious cover, culvert restrictions, and compromised riparian buffers.

On October 16 and 24, 2025, technical staff from FBE surveyed the watershed for NPS sites and met with numerous NLWA representatives and watershed residents. There was a total of 0.11 inches and 0.38 inches of rainfall in the area for the previous 72 hours of each survey date respectively. NPS site documentation included describing the problem, making recommendations for fixing the problem, rating the site's general impact to water quality, logging the site's location via GPS, and taking photographs. NPS sites were given an impact score of Low, Moderate, or High based on field observations (proximity to surface waters, severity of the NPS problem, habitat connectivity, etc.). **A total of 52 NPS sites were identified by FBE** (Figure 1). The Pleasant Lake subwatershed was previously surveyed by FBE during the development of the Pleasant Lake Watershed Restoration Plan. Therefore, this area was not resurveyed in 2025. Fifteen sites were identified within the Pleasant Lake watershed. Refer to the *Pleasant Lake Watershed Restoration Plan* for more information.

Following the Northwood Lake watershed survey, FBE used field notes, measurements, and photographs to calculate the pollutant load reduction estimates for each site if mitigation measures are implemented. These load reduction estimates, coupled with estimated implementation costs and impact to water quality were used to prioritize the sites for implementation. Sites are organized into the following major groupings: "water access sites, stream crossings, road surfaces and shoulders, and general nonpoint sources" and are presented in the order they were identified. Sites are presented in order of priority at the end of the document along with a summary of recommendations, load reduction estimates, and estimated costs for each site (Table 1).

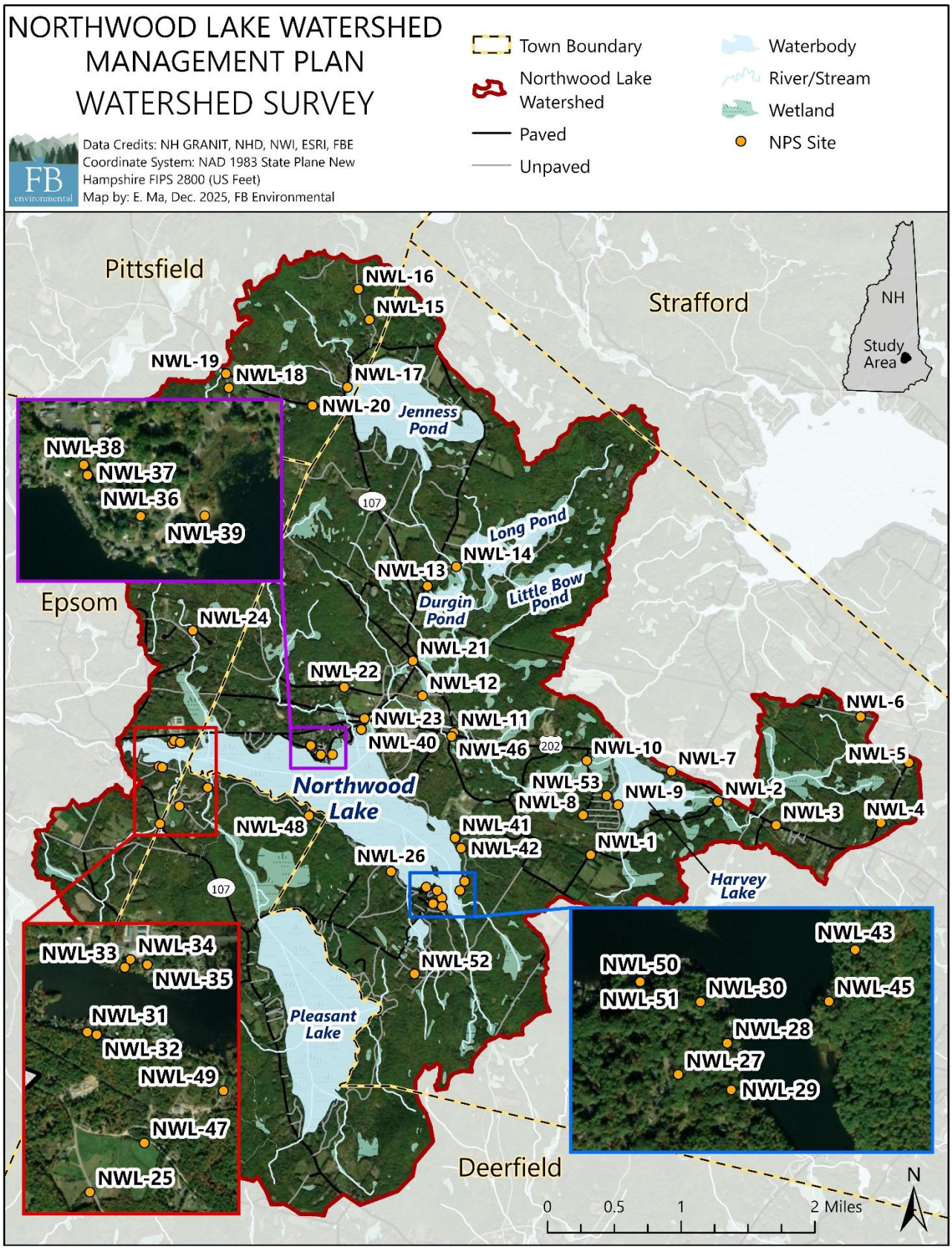


Figure 1. Map of NPS sites identified during the watershed survey.

WATER ACCESS

Site NWL-40: Northwood Lake Boat Ramp

Location: 43.2223, -71.2550 Impact: Medium Land use: State Boat Ramp

Observations: The Northwood Lake boat ramp is a frequently visited access point by many within the community and from day visitors. It is estimated that the ramp provides access to over 1000 boats each summer. The boat ramp is staffed five days per week, Thursday through Monday, with a Lake Host who inspects boats entering and exiting Northwood Lake for invasive aquatic plants. The boat ramp and access road are paved and the shoulders did not show any signs of stormwater scour resulting in gullies. The pavement ends before the lake, and trailers drive over the sandy substrate to launch and load boats. There are small shoulder areas to the ramp with minimal buffer, steep gradient changes, and exposed roots, indicating erosion occurring near the shoreline.

Recommendations: Continue to support the Lake Host program to monitor invasive aquatic plants that may enter or exit Northwood Lake. Redirect stormwater flow from the access road to the northern side of the access road via two broad based dips, one at the first bend in the road, and one halfway between the first and the end of the ramp area, into the northern shoulder and to the established wetland. Increase the vegetated buffer along the shoreline with native shrubs and trees where possible to stabilize the shoreline and encourage foot traffic to stay on the paved areas. Note that the lake water level was low during the time of the survey due to a drought.

(Left) Exposed roots and a steep drop off of the shoreline to the water's edge indicating erosion, (right) the end of the paved boat ramp where it meets the water.

Site NWL-39: Northwood Town Beach

Location: 43.2196, -71.2593 Impact: High Land use: Town Owned Beach

Observations: Northwood Town Beach is enjoyed by many during the summer months and is used as an access point for activities on the ice in the winter. Members of the community noted that although dogs are not allowed, many are brought to the beach and pet waste has been an ongoing problem in addition to general trash disposal. Additionally, geese regularly congregate within this cove and likely influence the bacteria concentrations within the cove. The beach hosts a portable toilet in the summer which helps protect the lake, though not for 2026. The beach area is a large relatively flat plot of land that is mostly comprised of sand with scattered weeds and grass. The area adjacent to the lake slopes downward to the water and erosion gullies were observed through the sand.

Recommendations: Define pathways across high-traffic areas from the entrance gates using steppingstones spaced apart or interlocking permeable grid pavers. Observe the beach during heavy rainfall to note where flow paths are being created, then regrade the area as needed to divert stormwater flow into a rain garden or vegetated swale rather than continuing across the surface to the water. Reestablish vegetation (native grass, shrubs, groundcover) in all sandy areas that are not used for sand play. Install geese deterrents and revegetate the shoreline to the sides of the primary access point, as geese are less likely to congregate when their line of access between the water and shore is obstructed. To further address localized bacterial and phosphorus loading from the resident flock, specific management steps should include planting tall (24–30 inch) native shoreline buffers, installing low-profile temporary perimeter wire during summer molting periods, enforcing "Do Not Feed Waterfowl" signage, and letting turf grass grow taller near the water's edge to reduce attractive grazing habitat. This beach would also be an excellent location for a pollinator garden and educational signs about lake health.

(Top left) View of the beach area facing the entrance gates, (top right) view of the beach area as it slopes to the water's edge, (bottom left) erosion gullies were observed between the beach area and the water's edge, (bottom right) side view of the sloping area to the shoreline.

Site NWL-45: Camp Boat House Area

Location: 43.2048, -71.2405 Impact: Low Land use: Private, Recreational

Observations: The Camp Boat House area is heavily used by campers throughout the summer. The camp staff have observed stormwater flows along the sides of the building and have installed a gutter along the roof line. Fencing keeps the water access to a defined area and fencing above the building keeps campers from walking down the northern slope to the water. Due to the slope of the land and foot traffic, stormwater and people travel to the lowest point, the break in the fence, and to the dock.

Recommendations: Direct gutter downspouts into a French drain for subsurface infiltration. Consider installing a broad-based dip across the primary access way (photo on the right) to direct any stormwater flow into the vegetated area on the lake side of the fence in a vegetated retention basin (or rain garden).

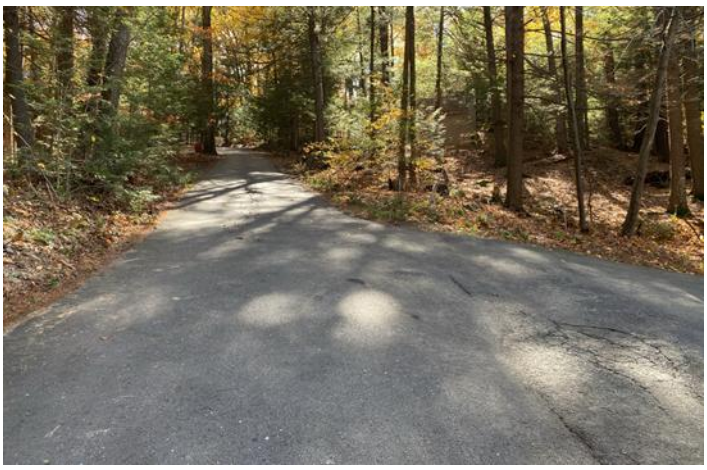
(Left) the evidence of erosion from roof runoff prior to gutter installation along with the white gutter downspout. (Right) the water access area sloping to the lake with fencing to define access points.

Site NWL-50: Community Beach

Location: 43.2052, -71.2455 Impact: Low Land use: Private, Recreational

Observations: A community beach is present at the end of Cole Road. This beach has a small parking area, a large sandy beach area, and a clubhouse. Many stormwater management initiatives have been completed at this site already and are quite effective, transforming a potentially high impact site into a low impact site. Stormwater flows down the paved and unpaved sections of Cole road to the fork with Pine Point Lane. At this intersection, a paved swale was created to direct stormwater runoff into the forested area between these two roads. Stormwater then is directed via a riprapped swale to a series of infiltration basins. It is evident that the retention basins are working due to the accumulation of sediment within them and lack of large break-through flow paths. Eventually, stormwater might make its way to the last retention basin near the clubhouse steps where it would travel through a grate (next to the orange cone in the photo) and through a pipe that outlets about 10 feet from the lake.

Recommendations: Continue maintaining the series of infiltration basins and check dams through the wooded area. To increase storage potential, periodically remove accumulated sand and debris from the retention basins and maintain as needed to the stabilizing edges. Deepen the last basin, closest to the lake, so the outlet serves as an overflow outlet rather than a drain. Consider adding water-tolerant plants this last basin as well to promote nutrient uptake. Consider adding an educational sign about the use of rain gardens for pollinators and stormwater/nutrient management for the lake.




(Left) View up Cole Road with the paved swale in the bottom right corner, (right) the paved swale entering the forest.


(Left) The first retention basin with lots of accumulated road surface material. (Right) No large erosion gullies were observed across the beach area.


(Left) a walkway leading to the club house with a tree trunk for stabilization. (Right) The last retention basin with the outflow grate next to the orange cone.

Site NWL-51: Community Beach Southern Gully

Location: 43.2052, -71.2455 Impact: Low Land use: Private, Recreational

Observations: A small shoulder road gully was observed along the western edge of the community beach access road, parking area, and beach. This gully originates higher up the road, above the residential property.

Recommendations: Add broad dip to across Pine Point Road about fifty feet down Pine Point road from the current paved swale that leads to the wooded area. Direct the new dip to the west and into the wooded area south of the residential home. Continue to look for signs of stormwater flowing down Pine Point Road towards the parking area by the beach and direct to infiltration areas as needed.


(Left) View of Pine Point Road shoulder facing the lake, (right) View of the road shoulder gully facing up hill, away from the lake.

Site NWL-17: Jenness Pond Boat Launch

Location (latitude, longitude): 43.2594, -71.2568 Impact: High Land use: Boat Ramp

Observations: The Jenness Pond boat shows signs of erosion, especially the unpaved portion. Stormwater can likely flow from the nearby road over the unpaved section and to the ramp, carrying sediment, associated nutrients, and material into the pond. A stream was also observed directly to the south of the boat ramp.

Recommendations: Engage an engineer to re-design the boat ramp and parking/driving area, which may include using interlocking permeable pavers to prevent erosion while also allowing stormwater to infiltrate. There may be areas where impervious cover may be removed from the site (to the south near the stream bank or to the north by the neighboring lawn) to further promote infiltration. Bare soil areas should be stabilized, and silt fences may be used as a temporary measure in shoreline areas that are not used for the boat ramp to prevent un-stabilized sediment from entering the pond.

(Top Left) A stream runs parallel to the south side of the boat ramp. (Top Right) The boat ramp parking/driving area is wide and unpaved. (Bottom Left) The boat ramp is mostly unpaved with a small, paved portion near the water's edge. (Bottom Right) There is moderate erosion at the bottom of the boat ramp; note that water levels were likely lower than typical at the time of the survey.

Site NWL-9: Harvey Lake Boat Launch

Location: 43.2140, -71.2170 Impact: High Land use: Boat Launch

Observations: The road uphill of the boat ramp is steeply sloped, as is the boat ramp itself. Sediment and organic material have accumulated at the bottom of the boat ramp, indicating that pollutants are reaching the lake over the paved boat launch. Once reaching the bottom of the pavement, there is a gully leading through the beach until the water's edge. There is a large break in the shoreline buffer to accommodate the boat ramp and beach.

Recommendations: Stabilize the gully with large, crushed stone and divert stormwater into the forested area by either re-crowning the road, using water bars, or creating a swale so that stormwater does not directly enter the lake. Reinstate the shoreline buffer in shoulder areas of the boat launch that are not used for recreation. Consider using cleared areas for a plunge pool for diverted stormwater or as a vegetated area for stormwater to infiltrate.

(Right) The steeply sloped paved area directs stormwater to the lake. (Left) A large gully has formed at the bottom of the boat launch.

STREAM CROSSINGS

Site NWL-2: Harmony Road – Tucker Brook

Location: 43.2143, -71.2022 Impact: Low Land use: Stream Crossing, Town Road

Observations: Exposed soil was observed at the culvert inlet and outlet of the Tucker Brook stream crossing on Harmony Road. On both sides of the culvert, there are clear paths where stormwater has traveled down the bank, carrying stormwater and sediment from the road and road shoulder into the stream. Most of the culvert inlet is armored with rip rap, but the culvert outlet is not.

Recommendations: Armor the culvert outlet with additional rip rap to prevent bank erosion. Divert stormwater away from the site by using a berm along the road shoulder to direct water into the adjacent vegetated shoreline areas. Revegetate bare areas and assess with low growing shrubs or a ground cover if possible.

(Left) The bare road shoulder above the culvert outlet site, (middle & right) stormwater has eroded the shoreline, providing paths for stormwater to directly enter Tucker Brook.

Site NWL-5: Ridge Road – Stream Crossing

Location: 43.2184, -71.1739

Impact: Low Land use: Town Road

Observations: Though this is an intermittent headwater stream, the cross-road culvert on Ridge Road is partially blocked by a large stone and is filled in with leaves and sediment. This would likely cause stormwater to back up at the site and erode the backslope, which abuts the forest. Impacts to water quality are only minor at the site as the culvert outlet does not have a well-defined stream channel. Stormwater from the site would likely form the headwaters of Tucker Brook if a stream channel formed during high flows.

Recommendations: Clean out the culvert and remove the large stone that is blocking it. Armor the culvert inlet, outlet and the backslope with rip rap.

(Left) Road shoulder erosion leading to a catch basin. (Right) The catch basin is nearly completely buried in gravel.

Site NWL-10: Harvey Lake Road – Stream Crossing

Location: 43.2188, -71.2216 Impact: Low

Land use: Stream Crossing, Town Road

Observations: There is an undersized and cracked culvert on Harvey Lake Road that is contributing to minor bank erosion at the culvert outlet. The culvert currently restricts the natural flow of Kelsey Brook due to its size

Recommendations: Enlarge or replace the culvert with an open bottom crossing to promote natural flow.

An undersized culvert is causing bank scours at the culvert outlet.

Site NWL-12: Olde Canterbury Road

Location: 43.2259, -71.2459 Impact: Moderate Land use: Stream Crossing, Town Road

Observations: Severe erosion was observed at the culvert outlet on Olde Canterbury Road, and minor erosion was observed at the culvert inlet. There are twin culverts at the site that carry Kelsey Brook under Olde Canterbury Road near its confluence with Narrows Brook.

Recommendations: Stabilize the culvert inlet and outlet with rip rap to prevent future erosion. Consider recrowning the road. Berms along the road shoulders may be used to direct stormwater into vegetated areas rather than directly into the stream at the culvert inlet and outlet.

(Left) Severe erosion at the culvert outlet. (Middle) View of twin culverts. (Right) There is minor erosion at the culvert inlet.

Site NWL-14: Long Pond Road

Location: 43.2399, -71.2408

Impact: Low Land use: Private Road

Observations: Long Pond Road directly abuts a stream crossing, which is part of a larger wetland complex upstream of Durgin Pond. Part of the stream bank at the culvert outlet is eroding. On the road surface, a berm was installed to prevent stormwater from entering the stream, instead directing it into vegetated areas along the stream bank. Stormwater bypasses the berm in some locations and is eroding the bank

Recommendations: Reinstall the berm and stabilize bare soil at the culvert outlet, either using live stake plantings or rip rap.

(Left) The streambank at the culvert outlet is eroding, partly due to a crumbling berm. (Right) The stream is part of a larger wetland complex.

Site NWL-25: Griffin Brook at Route 107

Location: 43.2122, -71.2849

Impact: High Land use: Agricultural

Observations: Griffin Brook lacks an adequately wide and dense riparian vegetated buffer on a private agricultural land near its crossing with Route 107 and Ritchie Road. Much of the riparian buffer is mowed grass. Where there are shrubs, the buffer is only as wide as one plant.

Recommendations: Consider improving the buffer to 20-50 feet on each side of the stream to allow agricultural runoff to be intercepted and nutrients retained by the plants rather than entering Griffin Brook. Use native plants and shrubs as recommended in the Native Shoreland/Riparian Buffer Plantings for New Hampshire guide to stabilize the soil and decrease nutrient laden runoff from entering Griffin Brook.

Griffin Brook lacks a riparian buffer on an agricultural property.

Site NWL-29: Lagoon Road – Stream Crossing

Location: 43.2031, -71.2431

Impact: Moderate Land use: Private Road

Observations: A small, intermittent stream crossing was observed on Lagoon Road. The stream channel leads to a culvert underneath Lagoon Road. The inlet area to the culvert has a large area of eroded soil and exposed tree roots indicating stormwater flows may be large and fast during heavy amounts of precipitation. A local resident noted that during heavy flows, stormwater often overtops the road.

Recommendations: Begin by stabilizing the inlet side of the culvert with the exposed tree roots. Add large rip rap stones to stabilize the edges and base. Stabilize the outlet side with rip rap as well. Consider installing check dams in the flow path that leads to this culvert to slow the speed of stormwater and stream flow and promote infiltration along the way.

(Left) The upgradient side of the culvert showing the large, eroded basin. (Right) View of the eroded soils and exposed tree roots on the upstream side of the culvert.

ROAD SURFACES AND SHOULDERS

The Northwood Lake Watershed has a mix of both paved and unpaved roads. Proper road management is a crucial component for both public safety and environmental protection. Unpaved roads, including private ones, require routine maintenance and care. There are several resources available to provide guidance on gravel road maintenance and problem solving, addressing issues like gullies, tire rutting, wash boarding, soft spots, and potholes. The University of New Hampshire maintains a database of resources for gravel roads. Other helpful resources include the Maine Department of Environmental Protection's Gravel Road Maintenance Manual, the US Environmental Protection Agency's Gravel Road Maintenance and Design Manual, and A Ditch in Time gravel road manual. Additionally, the University of Kentucky and Kentucky Transportation Center have a guidance document on When to Pave a Gravel Road, which provides a detailed step-by-step process to consider if paving may be a better long-term solution to gravel road maintenance.

Site NWL-1: Harmony Road

Location: 43.2086, -71.2211 Impact: Low Land use: Town Road

Observations: A steeply sloped portion of Harmony Road has road shoulder ditch erosion leading partially down the road; erosion does not lead directly to stormwater infrastructure or a stream. The bottom of the ditch is bare (beneath the fallen leaves) and has a moderately sized gully. The backslope of the ditch also shows signs of erosion with an accumulation of this material within the ditch. Some check dams have been installed as a stormwater control measure, but require maintenance.

Recommendations: Reshape the ditch into a U-shape. Armor the ditch and backslope with rip rap if revegetation with grass is not possible.

(Left & Middle) A well-defined gully is present in the road shoulder ditch, which is typically bare, but was filled with fallen leaves at the time of the survey. (Right) The road shoulder of Harmony Road is eroding into the ditch.

Site NWL-3: Route 4 – Road Shoulder

Location: 43.2117, -71.1936

Impact: Low Land use: State Road

Observations: There is moderate road shoulder erosion on the north side of Route 4 between Gary Road and Town Works Way. The erosion channel cuts through the sandy gravel in the road shoulder and a nearby lawn, leading to a blocked catch basin; the catch basin is filled with sediment and blocked at the surface by gravel. Erosion begins at the mailbox of house 702 and extends west to the following driveway.

(Left) Road shoulder erosion leading to a catch basin. (Right) The catch basin is buried in gravel.

Recommendations: Clean out the catch basin and remove debris/gravel from the grate. Enlarge the catch basin area and stabilize the catch basin with rip rap. Check dams may be used across the road shoulder ditch to slow stormwater and settle out sediment before reaching the catch basin.

Site NWL-4: Ridge Road shoulder ditch

Location: 43.2119, -71.1781

Impact: Low Land use: Town Road

Observations: The road shoulder ditch on Ridge Road has exposed, bare soil and minor erosion. Downhill of this ditch, there is a vegetated swale with minor erosion. It appears that recent work was done on the utility pole, which may account for some of the bare soil in the ditch.

Recommendations: Seed the ditch to create a grass swale and stabilize loose soil.

Bare soil areas in the road shoulder ditch.

Site NWL-6: Range Road

Location: 43.2234, -71.1810 Impact: Low Land use: Town Road

Observations: Stormwater on Range Road has caused road surface and shoulder erosion. Stormwater from the top of the hill erodes the road surface instead of entering the roadside ditch. It eventually enters the ditch and turns out into the forested area. There is a large sediment pile at the turnout, which is likely a result of plowing and erosion over many years. There is no stream channel near the turnout, but the area is mapped as a wetland, and there are multiple sediment deposits in the forest. Stormwater also completely bypasses an under-driveway culvert, which also has become exposed, indicating that the driveway surface has eroded. This culvert is more vulnerable to damage due to being exposed.

Recommendations: Replace the under-driveway culvert and add surface material to cover it. Create a U-shaped (cross-section) road shoulder ditch and armor it with rip rap. Install a plunge pool at the bottom of the turnout to prevent sediment from accumulating in the wetland. Dig ditches to connect the culverts to the road shoulder ditch and prevent surface erosion; regrade the road if needed.

(1) The turnout on Range Road has accumulated sediment at its end. (2) The road shoulder ditch is eroding. (3) An under-driveway culvert is exposed. (4) The road surface of Range Road is eroding.

Site NWL-8: Pine Street & Harvey Lake Road

Location: 43.2129, -71.2222 Impact: Low Land use: Town Road & Private Road

Observations: Stormwater from Pine Street (unpaved) leads directly to a culvert. Sediment has accumulated at the bottom of the road, likely from stormwater runoff and winter snow maintenance, and some of the sediment is presumed to have entered the culvert's flow path. The culvert outlet likely forms a stream channel that leads to Kelsey Brook.

Recommendations: Remove the accumulated sediment from the site. If possible, revegetate the area; if establishing vegetation is not possible, armor it with rip rap. If the area is used for plow piles and snow storge, remove accumulated sediment each spring and mind how far plows push snow (and road surface material) towards the culvert area.

Stormwater and/or winter plowing on Pine Street carries sediment down to the intersection with Harvey Lake Road.

Site NWL-13: Jenness Pond Road

Location: 43.2378, -71.2451 Impact: Low Land use: Town Road

Observations: There is minor ditch erosion on Jenness Pond Road. In some stretches, the ditch is bare (beneath the leaves). This ditch leads directly to an intermittent stream. There is one check dam installed further uphill at the site. The intermittent stream likely flows into Durgin Pond.

Recommendations: Reshape the ditch into a U-shape and armor it with rip rap. Use multiple check dams to slow stormwater flow and settle out sediment before it reaches the stream.

(Left) The backslope of the road shoulder ditch. (Middle) The ditch on Jenness Pond Road. (Right) Stormwater from the ditch enters the intermittent stream at the culvert.

Site NWL-15: Clough Road #1

Location: 43.2667, -71.2535 Impact: Moderate Land use: Town Road

Observations: Large amounts of road shoulder erosion were observed along Clough Road with a gully nearly 500 feet long. Stormwater follows the road shoulder until reaching a culvert that leads to a stream that feeds Jenness Pond. The culvert inlet is perched, meaning stormwater settles and may infiltrate before moving downstream under low flow conditions. The area around the culvert inlet is completely bare and shows signs of erosion.

Recommendations: Reshape the road shoulder into a U-shaped ditch and armor it with rip rap and check dams. Install turnouts wherever the slope of the adjacent forest allows. Remove accumulated sediment from the site; consider installing a check dam and plunge pool at the end of the ditch and stabilizing the area with vegetation or rip rap.

(Left) The culvert inlet has bare soil. (Middle) The end of the gully is a wide, bare soil area. (Right) The gully extends 500 feet up the road.

Site NWL-16: Clough Road #2

Location: 43.2700, -71.2551

Impact: Moderate Land use: Town Road

Observations: The road shoulder on Clough Road (unpaved) is eroding, depositing sediment into a nearby stream channel. At the culvert outlet of the stream crossing, the banks are slightly incised, suggesting that there may be high or flashy stormwater flows here. There are also three pipes leading to the culvert from a nearby home; the sources of these pipes are unknown.

Recommendations: Remove accumulated sediment from the road shoulder ditch. Vegetate the road shoulder wherever possible. Armor the road shoulder ditch with rip rap where vegetation is not feasible. Install check dams across the ditch and at the end of the ditch to slow down stormwater and settle out sediment. Investigate the source of the three pipes and consider re directing pipe outflows into residential BMPs. For examples of residential BMPs, see the New Hampshire Homeowner's Guide to Stormwater Management.

(Left) Three pipes appear to route water from a nearby home to the culvert inlet. (Right) Road shoulder ditch erosion at the site.

Site NWL-19: Catamount Road #1

Location: 43.2609, -71.2748

Impact: Low Land use: State Road

Observations: Very heavy road shoulder material is eroding into a catch basin on Catamount Road. Based on the weight of the material and design of the catch basin, it is likely that this stretch of the road experiences high stormwater flows. This catch basin is located in a headwater stream area.

Recommendations: Re-form the road shoulder ditch with more erosion resistant material, such as rip rap. If needed, convert the road shoulder ditch into a paved swale, and route stormwater from the catch basin to an engineered BMP downhill where it can be treated. An engineered BMP may be an infiltration basin, a vegetated swale basin. A standard rain garden may not be large enough to handle the amount or velocity of flow capable of causing this erosion.

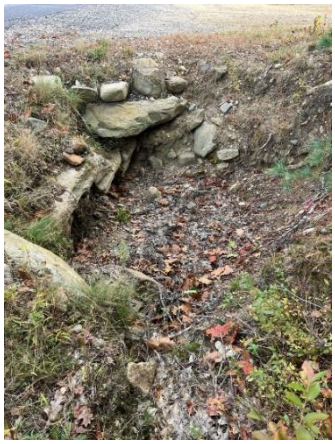
Road shoulder erosion on Catamount Road. Eroded material enters a catch basin designed for high stormwater velocities.

Site NWL-20: Catamount Road #2

Location: 43.2574, -71.2620 Impact: Moderate Land use: State Road

Observations: The road shoulder at the site is very wide, completely bare, and composed of loose sand. This area is actively eroding, and stormwater travels from the site through a culvert. The soil around the culvert inlet also shows signs of erosion. A gully on the downflow side of the road leads towards Jenness Pond.

Recommendations: Revegetate road shoulder. Armor bare areas of the culvert inlet with rip rap. Stabilize the culvert outlet with a vegetated swale and armored swale outlet to prevent breakthrough gullies from forming.


(Left) The road shoulder is composed of loose, bare sand. (Middle) The culvert inlet also shows signs of erosion. (Right) The gully created by the outflow.

Site NWL-21: Main Street Paved Swale

Location: 43.2297, -71.2473 Impact: Moderate Land use: State Road

Observations: A paved swale on Main Street leads to a catch basin that outfalls to Narrows Brook. Sediment was observed on the road surface leading to the catch basin. While paved swales prevent erosion, they channelize untreated stormwater directly to the receiving location, and mobilize other pollutants that have accumulated on the road surface.

Recommendations: Multiple options exist to treat stormwater at the site. One option is to direct stormwater from the catch basin to a nearby vegetated area that could be used as an infiltration area for stormwater. The area could also be converted to an engineered stormwater control measure, such as a rain garden or bioretention basin.



(Left) Sediment from the road enters the catch basin through the paved swale. (Middle & Right) Vegetated areas that may be used to infiltrate stormwater.

Site NWL-22: Ye Olde Canterberry Road

Location: 43.2269, -71.2575 Impact: Moderate Land Use: Town Road

Observations: Large amounts of erosion were observed along the road shoulder of Ye Olde Canterberry Road leading to a culvert that routes stormwater into a nearby stream. Road surface erosion was also observed at the site. Erosion begins at the unpaved section of the road. Runoff from a nearby residential property appears to be directed toward the road.

Recommendations: Ensure that residential stormwater runoff enters the road shoulder ditches rather than the road surface where it could cause erosion. Re-crown the road to divert stormwater into road shoulder ditches. Stabilize the road shoulder ditches with vegetation and/or rip rap, if possible.

(Photos 1-3) Road surface erosion in addition to road shoulder ditch erosion. (Bottom Left) Stormwater is eroding the road surface. (Photo 4) Stormwater enters water resources through a culvert.

Site NWL-26: Lynn Lane

Location: 43.2069, -71.2507

Impact: High Land use: Private Road

Observations: Moderately sized erosion gullies were observed on Lynn Lane, carrying sediment directly to Northwood Lake.

Recommendations: Stormwater control measures such as a broad-based dip or water bars may be used to divert stormwater to road shoulders and other designated areas for infiltration. Assess if there are open space areas downhill (possibly private property) to infiltrate stormwater and filter sediment and nutrients. Consider removing excess impervious cover downhill if needed to accommodate an area to infiltrate stormwater.

Road surface erosion on Lynn Lane leading to Northwood Lake.

Site NWL-27: Frary Road

Location: 43.2034, -71.2445 Impact: Low Land use: Private Road

Observations: Frary Road (unpaved) is known to wash out frequently with rain events, causing a loss of surface material. Frary Road was resurfaced earlier in 2025, and there is a small drainage ditch on the eastern side of the road behind the houses that leads to the lake.

Recommendations: To prevent future washouts, consider installing water bars across Frary Road to direct stormwater runoff into the adjacent forested area.



(Left) Looking down Frary Road, (center) looking up Frary Road, (right) looking up Frary Road near the top.

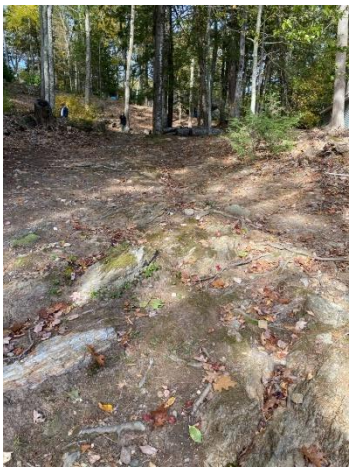
Site NWL-28: End of Lagoon Road

Location: 43.2040, -71.2432 Impact: Moderate Land use: Private

Observations: A long gully in the pathway at the end of Lagoon Road was observed leading down the hill to the dock at the bottom. The substrate was loose sandy gravel.

Recommendations: Collaborate with the homeowners in this area to promote residential stormwater BMPs to reduce the volume of water reaching this hillside. Consider installing water bars across the pathway to direct stormwater runoff to the adjacent vegetated area. Consider re-grading the road just before this driveway/walkway to drain away from the lake and into a stable road shoulder ditch and infiltration basin.



(Lef two) Lagoon Road slopes steeply to the side towards the lake. (Right two) Gullies lead to the dock along the water.

Site NWL-30: Pine Point Road

Location: 43.2048, -71.2439 Impact: High Land use: Private Road, Private Property

Observations: Stormwater likely flows down Pine Point Road (unpaved) towards both a foot path and a driveway along the most northern section of the road. The footpath (unpaved) and driveway (paved) are steeply sloped towards the lake. Gullies were observed along Pine Point Road within the tire track lines that continue to both downhill slopes.

Recommendations: Consider installing rubber razors or broad-based dips across Pine Point Road to direct stormwater flow into the wooded areas rather than continuing down the roadway. Alternatively, crowning the road and establishing road shoulder ditches with turnouts would be helpful. Consider adjusting the location of the pathway to create a meandering path with infiltration basins on the bends and rubber razors across the pathway as needed to redirect stormwater from its current straight pathway downhill.

(1) Gullies were present along Pine Point Road leading to the north east bend in the road to a steeply sloped driveway in the second photo. (3) Gullies were also present on the northern stretch of Pine Point Road that lead to an unpaved walkway straight down to the lake (4).

Site NWL-31: Sleepy Hollow Intersection

Location: 43.2184, -71.2850 Impact: Moderate Land use: Private Road

Observations: A wide (unpaved) intersection on Sleepy Hollow Road is present where the primary road splits in two directions to access the shoreline homes. A small stormwater erosion gully was observed through the patch of pine trees behind the small shed, likely coming from sheet flow across the roadway. Further up the hill on Sleepy Hollow Road, away from the lake, the road shoulder directed stormwater flow to a turnout which seemed to be working well as sediment was observed in the turnout and in the nearby wooded area.

Recommendations: Create additional turnouts along Sleepy Hollow Road further downhill from the first. Consider re-grading the road surface to direct stormwater off to the side rather than down the roadway. Consider re-grading the two arms of Sleepy Hollow to drain to the uphill side, away from Northwood Lake into an established road shoulder stabilized with vegetation.

(Left) Sleepy Hollow Road intersection looking up the roadway where it splits to access shoreline properties. (Middle) Sleepy Hollow Road intersection looking downhill, towards Northwood Lake. (Right) Stormwater flows through the patch of pine trees behind the little shed.

Site NWL-32: Sleepy Hollow – Settling Basin

Location: 43.2183, -71.2845

Impact: Low Land use: Private Road

Observations: A relatively new stormwater infiltration basin/ditch has been established along the eastern arm of Sleepy Hollow Road next to a driveway on the southwest side of the road. The soil surface of the dug area does not appear to be stabilized, though boulders were placed at the top for vehicle safety.

Recommendations: Add large, crushed stone to the basin's walls and bottom to stabilize the loose soil and prevent erosion. Additionally, the basin could be seeded and planted with water-tolerant plants and shrubs.

Eastern (left) and western (right) views of the small infiltration area.

Site NWL-35: Lake Road Behind Boat Yard

Location: 43.2210, -71.2818 Impact: Moderate Land use: Private Road

Observations: Lake Road, located behind the boat yard is a combination of both paved and unpaved surfaces. Where unpaved, the loose sandy gravel surface has ruts, gullies, and is at a slightly lower elevation than the paved portion. This could be due to compaction, weathering, and/or erosion.

Recommendations: Regrade the unpaved section of Lake Road with crushed. Consider paving this area and creating infiltration basins within the road shoulders that are regularly cleaned out. Work with homeowners in this area to create residential BMPs for stormwater management to decrease the volume of water flowing across and down Lake Road.

(Left) Lake Road facing east, (middle) west, (right) and behind the boat yard.

Site NWL-37: Driveway on Maple Avenue

Location: 43.2204, -71.2624 Impact: Moderate Land use: Private Road, Residential

Observations: A large gully was observed beginning along a residential driveway and continuing on Maple Avenue. The home appears to be a newer construction and may still be undergoing improvements.

Recommendations: Collaborate with the homeowner to provide education on unpaved driveway management. Begin uphill and address sources of stormwater runoff entering the driveway with residential BMPs. Create turnouts along the driveway to direct stormwater flow into the vegetated ditch rather than continuing down the driveway and through Maple Avenue.

Erosion gully at the base of the driveway turning onto Maple Avenue.

Site NWL-36: Park Avenue

Location: 43.2196, -71.2610 Impact: High Land use: Private Road

Observations: Park Avenue has experienced lots of stormwater erosion as evident in the long and deep gullies present which have left a prominent hump in the middle of the road. Park Avenue is not plowed in the winter or maintained during the other seasons. The road surface is comprised of hard compacted sediment and gravel. Smaller particulates have eroded away to more downhill areas towards the lake. A local resident shared that the road is used by many in the neighborhood and access is sometimes challenging, particularly for the year-round residents. Six years ago, the road was resurfaced but has not been maintained since, indicating all visible erosion occurred in the last six years.

Recommendations: Mitigating runoff and erosion at Park Avenue may be challenging due to road, neighborhood, and landscape characteristics which naturally appear to funnel high flows along the road. Collaboration with the neighborhood residents is crucial. We strongly recommend consulting with an engineer to develop a neighborhood site plan. Mitigation should not only focus on the road itself, but the sources of stormwater from residential roofs, driveways, and other areas. Beginning at the top of the hill, our preliminary recommendations are a broad-based dip or drivable berm across the road at the intersection of Sawyer Lane to divert runoff into vegetation to the east. Residential BMPs like gutters to French drains, water barrels (if emptied between storms), rain gardens, driveway rubber razors, and turnouts would decrease the volume of stormwater runoff entering Park Avenue. Once sources of stormwater runoff are mitigated, regrade the road surface and create a road shoulder ditch stabilized with rip rap and many check dams. Maintain the road shoulder ditch by regularly cleaning out any accumulated sediment, debris, and leaf litter. Once the ditch and check dams are established, consider adding an infiltrating catch basin at the bottom of Park Avenue at Lakeshore Drive, as well as at the intersections of Hillcrest and Maple Ave and Maple Lane and Lakeshore Dr. Designate a responsible party to maintain all improvements.

(Left and middle) Park Avenue looking towards Lakeshore Drive. (Right) Park Avenue looking uphill towards Sawyer Lane.

(Left) Intersection of Park Ave and Sawyer Ln where the broad-based dip leading to the potential area for infiltration (right)

Site NWL-38: Wildwood Ave to Lakeshore Drive

Location: 43.2206, -71.2625 Impact: Moderate Land use: Private Road

Observations: Wildwood Ave and Park Ave are the two most used roadways into this neighborhood off Lakeshore Dr. Wildwood Ave is unpaved and comprised of a more gravely substrate than Park Ave. Uphill stormwater issues at sites NWL-36 and NWL-37 are contributing to the erosion occurring on Wildwood Ave, which has evidence of sheet flow erosion and channelization. The road was created less than 10 years ago and has not been maintained since.

Recommendations: Work with residents in this neighborhood to establish a road maintenance committee. In conjunction with addressing recommendations for sites NWL-36 and NWL-37, consider installing rubber razors across Maple Ln to direct stormwater flow into the vegetated area to the west.

Photos of Wildwood Ave from the intersection with Maple Ave to the intersection with Lakeshore Dr. (paved).

Site NWL-41: Camp Road to Cabins (Camp Conrad)

Location: 43.2105,-71.2412 Impact: Moderate Land use: Private, Recreational

Observations: A gully was observed along the camp roadway that leads to the cabins (labeled as "Camp Conrad" on the camp map) and to a water access point. An accumulation of sediment was observed at the bottom of the hill near the docks.

Recommendations: Install broad-based dips or water bars along the camp road with turnouts to carry stormwater into the wooded area to the north of the road rather than continuing down the unpaved camp roadway. Consider creating a designated and stabilized pathway from the dock storage area down the slope to the flat area by the water's edge.

(Left) Camp road with gully, (center and right) camp road as it slopes down to the water from the dock storage area.

Site NWL-42: Williams Lodge

Location: 43.2094, -71.2403 Impact: Low Land use: Private, Recreational

Observations: Runoff coming from lodge down towards the parking area washes away wood chips, exposing bare soil across the full path. Path continues to lead onto to site NWL-41, presented above.

Recommendations: Consider adding residential stormwater BMPs to Wiliams Lodge such an infiltration dripline trench and a broad base dip in the pathway to divert water into a vegetated area, which could be reconfigured into a rain garden. Consider adding educational signage about the rain garden if installed.

Williams Lodge (left) and the pathway that leads to it (right).

Site NWL-43: Road to Boat House at Camp

Location: 43.2058, -71.2398 Impact: Low Land use: Private, Recreational

Observations: Walking along the primary camp roadway that parallels the lake, evidence of stormwater runoff was observed entering the roadway from the cluster of cabins between Vervaert Lodge and the South Showers. The roadway is sloping to the south in this area, towards boathouse and waterfront.

Recommendations: Create a broad-based dip or water bar across the top of the pathway that leads to these cabins to direct stormwater flow to the south (right) side of the little stone wall and into a designated area for infiltration (recessed and vegetated, or stabilized with crushed stone). There were also three opportunities along this roadway to create more formalized infiltration areas – the three areas where snowplows pile the snow. Each of these three areas should be accompanied with a broad-based dip to divert sheet flow from the roadway into the retention basins. Consider lining these basins with rip rap rather than vegetation because of the winter snow maintenance, as snow would likely be pushed into and on top of these retention areas.

(1) Stormwater flow path coming from the cluster of cabins to the primary camp roadway (2). (3 and 4) Two of the three areas along the roadway where it widens and the infiltration basins could be created, minding snow maintenance needs.

Site NWL-46: Intersection of Blake's Hill Road & Route 4

Location: 43.2215, -71.2416 Impact: Low Land use: Town Road/State Road intersection

Observations: Two eroding gullies were observed along the road shoulders of Blake's Hill Road as it slopes to its intersection with Route 4. The road edge was also found to be crumbling into the road shoulder.

Recommendations: Establish a road shoulder ditch, stabilized with rip rap, and crossed with check dams to decrease stormwater erosion and sediment transport. Depending on the amount of stormwater volume this site receives, consider also installing an infiltrating catch basin at the western corner (near the small advertisement sign in the first photo).

Western road shoulder (left and right), and eastern road shoulder (right).

Site NWL-48: Baker Avenue

Location: 43.2130, -71.26280

Impact: Moderate Land use: Private Road

Observations: An intermittent ditch or stormwater flow path was observed through the woods perpendicular to Baker Ave. The channel originates from a culvert on the upward side of the road. It appears as if the upward side was hand dug or severely scoured, with lots of loose soil edges and a depth of approximately 2-3 feet.

Recommendations: Stabilize the uphill ditch area with rip rap to prevent loose sediment from being easily transported downhill to Northwood Lake. Additionally, try to stabilize the flowpath on the downhill side with rip rap or vegetation where possible. Sediment coir logs may be placed across the ditchway if they can be maintained and accumulated sediment cleaned out periodically. Consult a wetland scientist before beginning improvements as this the drought conditions make it difficult to discern if this is a ditch or an intermittent stream channel.

The downhill view of the ditch/flow path with caving edges and exposed roots.

Site NWL-47: Old Richie Road

Location: 43.2141, -71.2820 Impact: Low Land use: Town Road

Observations: Road shoulder gully erosion was observed along Old Richie Road leading to Griffin Brook (the stream at site NWL-25) that flows through the mowed/hayed field. The gully travels down the hill and then across the road surface towards Northwood Lake Road. The road shoulder ditch has lost its finer sediments, which have been transported downhill and are deposited at the intersection of Northwood Lake Road

Recommendations: Install a turnout at the top of the hill, near the opening into the hayfield but on the opposite side, so that stormwater flows on the uphill side of the rock wall and into the wooded area. Stabilize road shoulder from further erosion with large crushed stone and check dams. An infiltration area could be created near the mailboxes. Alternatively, consider re-grading the road away from the hayfield and install turnouts on the uphill side of the road before the steep edge on the northern road shoulder.

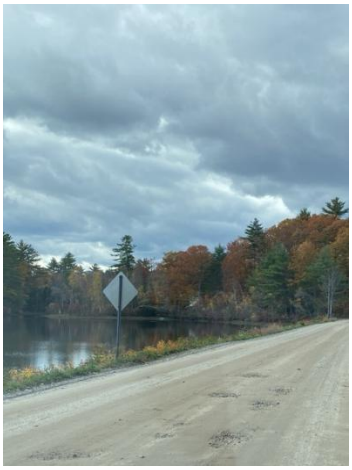
(Right) Southern road shoulder of Old Richie Road facing downhill towards its intersection with Northwood Lake Road (middle and right).

Site NWL-52: Voydatch Pond Roads

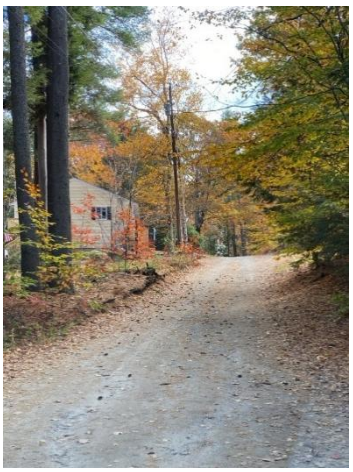
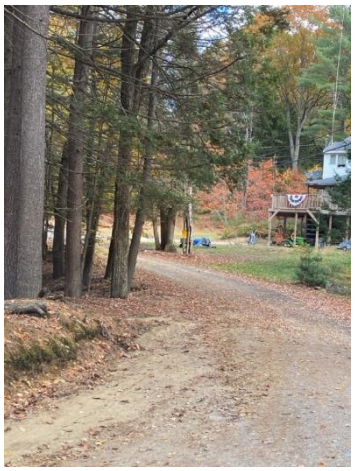
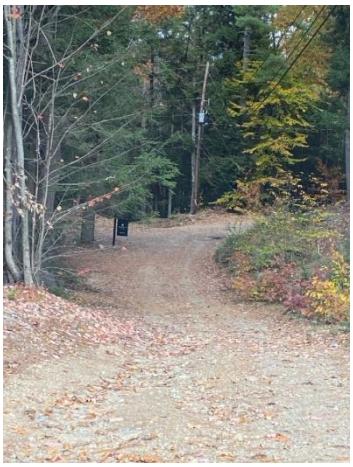
Location: 43.1958, -71.2473 Impact: Moderate Land use: Private Roads

Observations: The roadways encircling Voydatch Pond (Cole Road, Rita's Circle, and Jack Street) are unpaved and show signs of erosion with gullies, potholes, and uneven surfaces. Additionally, only a small, vegetated buffer was observed between Cole Rd and Voydatch Pond. The roads are hilly, and many small gullies were observed.

Recommendations: Collaborate with the homeowners in this area to regrade and resurface each road with a more stable surface material. Add turnouts to vegetated areas where possible to keep erosion from progressing down the road surface. Work with homeowners that have pond access to ensure accessways are stable and maintained, and revegetate shoreline areas where possible. Increase the vegetated buffer along Cole Road with hearty native shrubs and trees. Stabilize any access points here with crushed stone, vegetation, and/or perched (and infiltrating) sitting area or dock. Consult shoreline regulations and permitting needs before conducting work so close to the shoreline.



Views of Cole Road from Google street view (left) and from the watershed survey (right) showing the limited buffer.


Erosion gullies and stormwater flow paths on the road surfaces of Rita's Circle and Jack Street.

Site NWL-53: Birch Street Road Shoulder

Location: 43.2150, -71.2187 Impact: Moderate Land use: Private Road

Observations: A large road shoulder gully was observed along Birch Street and Shore Drive. The gully travels along Birch Street but also continues across the road and to Shore Drive, then into a ditch that appears to flow during non-drought conditions. The lower end of the gully has very loose piles of sediment (on the southern side of the intersection).

Recommendations: Clean out accumulated sediment and debris from flow path and from the piles of loose sediment. Install check dams and consider installing a plunge pool at the base of the road shoulder by the telephone pole. Regrade the road to the south to direct stormwater runoff into the southern road shoulder check dams and plunge pool.

(Left) Southern road shoulder gully looking uphill. (Middle) Southern road shoulder gully looking downhill. (Right) Flow path of the road shoulder flow crossing Birch Street to the intersection with Shore Drive.

GENERAL NONPOINT SOURCES

Site NWL-7: Route 4 by School & Church

Location: 43.2176, -71.2091 Impact: Moderate Land use: State Road, Town/Commercial Property

Observations: Route 4 is a major road with curbing and a stormwater system. Pollutants can accumulate on impervious surfaces in the form of dust, leaf litter, automobile chemicals and animal waste. During rainstorms, stormwater can mobilize these pollutants and impact water quality. While there are no signs of erosion or flooding (note the survey was conducted during a drought), there is ample room for surface-grade stormwater management, rather than piped stormwater infrastructure which discharging to surface waters. There are four catch basins present here.

Recommendations: Identify the outlet point(s) of the catch basin system. If the system discharges to surface waters, consider creating an engineered stormwater control measure, such as a vegetated swale to infiltrate stormwater and filter stormwater runoff. There are large open spaces near the school parking lot that may be suitable for such infiltration. Alternatively, filtration bags may be installed at each catch basin inlet to collect sediment and debris before it enters piped stormwater infrastructure. These techniques can be replicated elsewhere along Route 4 to reduce pollutant concentrations in stormwater. Other benefits of surface-level green stormwater infrastructure include groundwater recharge, traffic calming, aesthetic improvements, and better access for inspection and maintenance.

(Left) Open area near parking lot may be used for a rain garden, vegetated swale or other engineered stormwater control measure. (Right) Untreated stormwater from Route 4 enters catch basins.

Site NWL-11: Route 4 Construction

Location: 43.2219, -71.2413 Impact: Moderate Land use: Private/Commercial

Observations: Active construction was observed along Route 4. Bare soil covers the lot and erosion/sediment control measures were not observed. There were also large, uncovered sediment piles.

Recommendations: Revegetate the road shoulders. Encourage property owners to use sediment/erosion controls while under construction. This may involve covering exposed piles, using silt fences and coir logs to either stabilize bare soil or capture mobilized sediment.


Bare soil and sediment piles at the construction site on Route 4.

Site NWL-18: Hill Road

Location: 43.2594, -71.2744 Impact: Moderate Land use: Agricultural

Observations: A small strip of rip rap was observed leading from an agricultural property on Catamount Road/Hill Road to a roadside ditch on Hill Road, suggesting that agricultural runoff likely follows this flow path to enter the road shoulder ditch. The ditch leads to a crossroad culvert that ultimately enters a headwater stream. There is minor road shoulder erosion on Hill Road, though eroded sediment is likely attenuated by the large amount of vegetation in the road shoulder ditch.

Recommendations: Engage with farmers about agricultural BMPs and stormwater control measures that can retain and treat all stormwater onsite. The plastic culvert at the site is also crushed and may merit replacement.


(Left) Trail of rip rap leading from an agricultural property to the road shoulder ditch, obscured by vegetation in the photo. (Right) Slightly crushed culvert outlet at the site.

Site NWL-23: School Street & Route 4 at Heritage Market

Location: 43.2235, -71.2545 Impact: High Land use: State Road and Commercial

Observations: Catch basins on School Street and in the parking lot of the Heritage Market collect stormwater from impervious surfaces. Untreated stormwater contains pollutants from various sources such as atmospheric dust, winter sand, soil, automotive chemicals, leaf litter, other organic matter, and pet/animal waste. Large pervious surfaces also restrict infiltration and increase the volume of stormwater runoff traveling to more downhill areas.

Recommendations: Multiple opportunities exist to utilize engineered urban stormwater control measures onsite. On School Street, planter bump outs may be used to capture and infiltrate stormwater in the road shoulder apron. A large open space area is present adjacent to the parking lot, which could be converted to a rain garden, vegetated swale, or other engineered green stormwater infrastructure. There is already a catch basin in this area, meaning it is already connected to stormwater infrastructure. Investigate the location of the catch basin outlet(s). Engage with the property owner about winter salt use and opportunities for reducing the extent of impervious cover on the parking lot.

(Left) The catch basins in the market parking lot by the orange cone. (Right) The catch basin along School Street.

(Left) The large impervious parking lot. (Right) An open space area with a catch basin in the center may be a suitable location for engineered green stormwater infrastructure.

Site NWL-24: McEvoy Lane

Location: 43.2331, -71.2799

Impact: Low Land use: Private Road

Observations: Stormwater from McEvoy Lane discharges through an under-driveway culvert and leads to a stream channel. No erosion was observed at the site. Improving vegetation at the site would enhance pollutant and nutrient uptake from stormwater and decrease pollutant loads downstream while also reducing the volume of stormwater reaching the stream.

Recommendations: Stormwater management could be improved at the site by increasing stormwater infiltration, through installations such as a rain garden or vegetated swale. Alternatively, letting the current vegetation grow freely between the culvert outlet and stream would provide additional pollutant filtering capacity and some nutrient uptake by plants. A minimal improvement would be to increase the mower height to at least four inches.

Stormwater exits the under-driveway culvert and enters the stream after traveling through a sloped, grassed area.

Site NWL-33: Boat House

Location: 43.2209, -71.2830 Impact: Low Land use: Private

Observations: No vegetated shoreline buffer was observed along the boat house property at the marina. Only a few small plants were present. An apron of soil and mulch is present and ready for planting.

Recommendations: Plant a vegetated buffer with native, deep rooting species for stability against winds and weather. Refer to the Native Shoreland/Riparian Buffer Plantings for New Hampshire guide for species suggestions. Ensure soil and mulch are not being pushed over the top of the retention wall and into the lake.

The shoreline of the Boat House

Site NWL-34: Side of Boat Yard

Location: 43.2212, -71.2827 Impact: Low Land use: Commercial

Observations: At the time of the watershed survey, a smaller retention basin was present at the south western corner of the boat storage yard. Stormwater that falls on the yard (paved) travels to a series of catch basins, but some also enters the south western corner of the lot. The previous retention basin was dug and lined with rip rap, but has since filled in after years of infiltrating stormwater and settling out sediment. Additionally, a small breakthrough channel was observed leading to Lake Road and the homes along the shoreline.

Recommendations: Following the site visit, the MacCallum's Boathouse staff promptly enlarged the retention basin by making it both deeper and wider, and building up the side walls to decrease the chance of breakthrough flow paths. A sediment coir log is also present along both the inlet and outlet sides to provide further stability and sediment/pollution retention capabilities. No further recommendations are provided at this time, great work!

The boat yard catch basin (left) and the original retention basin and breakthrough path during the watershed survey (right).

Photos of the improved retention basin, deeper, lined with rip rap, and stabilized with coir logs. Photos provided by MacCallum's Boathouse.

Site NWL-49: Sand Pit Avenue

Location: 43.2161, -71.2778 Impact: High Land use: Private Road

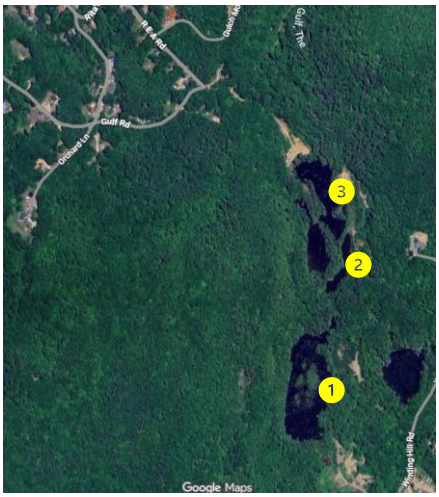
Observations: A large clear-cut area was observed along the eastern side of Sand Pit Avenue not too far south from the intersection with Klopp Avenue. Large piles of slash and soil are present on this steeply sloped lot. A stream flows parallel to Sand Pit Ave at the bottom of the recently cleared hill. The stream has minimal buffer on the cleared side, debris within the stream, and no stormwater control measures were observed such as silt fences or coir logs to keep the disturbed land and slash from eroding into the stream and to Northwood Lake. There is approximately 400 feet of stream length between this site and Northwood Lake. The ground appears to be comprised of very loose soil.

Recommendations: Contact the landowner and work to remove slash from the stream channel and to install erosion control measures along the stream bank. Ensure the future land use intended for this area has erosion control measures because of the steep grade down to the stream.

(Left) View north down Sand Pit Ave towards Klopp Ave. (Middle and right) the recent clear-cut and stream at the bottom.

POINTS OF INTEREST

Sand/Gravel Quarry Ponds



Location: 43.1913, -71.2383 Impact: NA Land use: NA

Observations: The quarry ponds located between Winding Hill Rd and Gulf Road were visited to determine the influence, if any, they have on Northwood Lake's water quality. During the visit, which was conducted in a drought, water levels in the ponds were very low, and were not discharging to an outlet stream. However, had the field visit been conducted during a wetter time of year, we would expect water levels to be higher and discharge could be possible.

Recommendations: None. Continue to monitor the water quality of "the Gulf" tributary where it outlets into Northwood Lake.

(1) The first pond from an inlet stream. Water does not appear unusual, a lot of aquatic vegetation is present.

(2) The second pond has a greenish hue. Water level is low, no outlet was found.

(3) The third pond also had lots of aquatic vegetation growing in it, and the water did not appear unusual. Water level was too low to outlet.

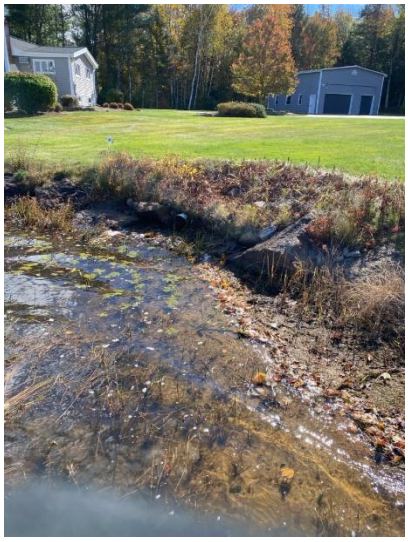
Loose sand piles were present to the east of pond #3, though a berm between the piles and the pond would keep any of this sediment from entering the pond.

Oil Sheen in Northwood Lake at Sleepy Hollow Ln

Location: 43.2188, -71.2838 Impact: NA Land use: NA

Observations: Residents have observed an "oil sheen" in the water of Northwood Lake between 55 and 57 Sleepy Hollow Lane. An outlet pipe is present at this location and may connect to a wetland on the opposite side of Sleepy Hollow Lane. An oil sheen was not present at the time of the survey. No obvious sources were present near the inlet pipe or on the surrounding landscape. It is possible the oil sheen is being caused from naturally occurring oils from the wetland ecosystem. A bus company and bus parking lot is present higher up in the drainage area to this wetland, but this lot was not visited during the time of the survey so possible drainage connections to the wetland could not be determined.

Recommendations: If the oil sheen reappears, conduct the "stick test" and poke the oil sheen with a stick. If the sheen swirls around in arcs and ripples it is likely from a synthetic source. If the sheen breaks apart into smaller bits and pixelates, then it is likely of natural source. If the sheen is from a natural source, no further action is needed. If the sheen is from a synthetic source, contact the bus company to see if a volunteer may access the property to search for a stream connecting the lot to the wetland. Explain the situation and see where collaborations can be made and support provided.



(Left) the shoreline where the pipe outlets on the day of the watershed survey. (Middle and right) The oil sheen as observed by a local resident.

BMP MATRIX

Table 1. Site ID, location description, water quality impact, estimated load reduction, and implementation costs for the 53 nonpoint source sites identified in the Northwood Lake watershed. Pollutant load reduction and cost estimates are preliminary and are for planning purposes only. Cost estimates are based on pre-COVID19 ranges (adjusted for 2025 inflation), and thus actual construction costs could be highly variable at this time. Sites are priority ranked from 1-52 for lowest to highest cost per kilogram of phosphorus load reduced with remediation and weighted by impact.

Site ID	Location	Impact	Town	TP (kg/yr)	TN (kg/yr)	TSS (metric tons/yr)	Low Cost Est.	High Cost Est.	Avg. Cost Est.	Rank
NWL-27	Frary Road	Low	Northwood	0.42	1.08	1.60	$4,000	$5,000	$4,500	1
NWL-29	Lagoon Road - Stream Crossing	Moderate	Northwood	0.46	1.18	1.74	$5,000	$10,000	$7,500	2
NWL-26	Lynn Lane	High	Northwood	0.14	0.37	0.54	$5,000	$5,000	$5,000	3
NWL-25	Griffin Brook at Route 107	High	Epsom	3.43	12.24	3.36	$100,000	$200,000	$150,000	4
NWL-38	Wildwood Ave to Lakeshore Drive	Moderate	Northwood	0.18	0.00	0.08	$3,000	$5,000	$4,000	5
NWL-39	Northwood Town Beach	High	Northwood	0.78	4.31	0.27	$40,000	$50,000	$45,000	6
NWL-49	Sand Pit Avenue	High	Deerfield	0.05	0.42	0.04	$1,000	$5,000	$3,000	7
NWL-51	Community beach southern gully	Low	Northwood	0.18	0.46	0.68	$3,000	$5,000	$4,000	8
NWL-9	Harvey Lake Boat Launch	High	Northwood	0.57	1.93	1.59	$40,000	$50,000	$45,000	9
NWL-21	Main Street Paved Swale	High	Pittsfield	0.30	1.64	0.10	$20,000	$30,000	$25,000	10
NWL-53	Birch Street Road Shoulder	Moderate	Northwood	0.23	0.60	0.89	$10,000	$10,000	$10,000	11
NWL-4	Ridge Road Ditch	Low	Northwood	0.17	0.44	0.65	$1,000	$10,000	$5,500	12
NWL-41	Camp Road to Cabins (Camp Conrad)	Moderate	Northwood	0.40	1.04	1.53	$20,000	$30,000	$25,000	13
NWL-46	Intersection of Blake's Hill Road & Route 4	Low	Northwood	0.28	0.73	1.08	$10,000	$15,000	$12,500	14
NWL-30	Pine Point Road	High	Northwood	0.12	0.30	0.44	$15,000	$25,000	$20,000	15
NWL-20	Catamount Road #2	Moderate	Pittsfield	0.15	0.38	0.55	$10,000	$15,000	$12,500	16
NWL-22	Ye Olde Canterberry Road	Moderate	Pittsfield	0.45	1.17	1.73	$30,000	$50,000	$40,000	17
NWL-37	Driveway on Maple Avenue	Moderate	Northwood	0.04	0.09	0.14	$2,000	$5,000	$3,500	18
NWL-23	School Street & Route 4 at Heritage Market	High	Northwood	0.63	4.53	0.25	$100,000	$160,000	$130,000	19
NWL-15	Clough Road #1	Moderate	Northwood	0.10	0.27	0.39	$10,000	$15,000	$12,500	20
NWL-11	Route 4 Construction	Moderate	Northwood	0.16	0.21	0.10	$15,000	$25,000	$20,000	21
NWL-36	Park Avenue	High	Northwood	0.26	0.68	1.00	$50,000	$80,000	$65,000	22
NWL-7	Route 4 by School & Church	Moderate	Northwood	1.18	7.71	0.44	$100,000	$200,000	$150,000	23
NWL-12	Olde Canterbury Road	Moderate	Northwood	0.11	0.29	0.43	$10,000	$20,000	$15,000	24
NWL-16	Clough Road #2	Moderate	Northwood	0.11	0.28	0.42	$10,000	$20,000	$15,000	25
NWL-13	Jenness Pond Road	Low	Northwood	0.08	0.20	0.30	$5,000	$10,000	$7,500	26

Site ID	Location	Impact	Town	TP (kg/yr)	TN (kg/yr)	TSS (metric tons/yr)	Low Cost Est.	High Cost Est.	Avg. Cost Est.	Rank
NWL-28	End of Lagoon Road	Moderate	Northwood	0.14	0.36	0.54	$15,000	$30,000	$22,500	27
NWL-47	Old Richie Road	Low	Deerfield	0.11	0.29	0.43	$10,000	$15,000	$12,500	28
NWL-24	McEvoy Lane	Low	Epsom	0.25	1.33	0.08	$20,000	$40,000	$30,000	29
NWL-1	Harmony Road	Low	Northwood	0.20	0.52	0.77	$20,000	$30,000	$25,000	30
NWL-35	Lake Road Behind Boat Yard	Moderate	Epsom	0.27	1.37	0.08	$40,000	$65,000	$52,500	31
NWL-8	Pine Street & Harvey Lake Road	Low	Northwood	0.10	0.00	0.05	$10,000	$15,000	$12,500	32
NWL-32	Sleepy Hollow - Settling Basin	Low	Epsom	0.02	0.00	0.01	$1,000	$5,000	$3,000	33
NWL-6	Range Road	Low	Northwood	0.28	0.73	1.06	$25,000	$50,000	$37,500	34
NWL-40	Northwood Lake Boat Ramp	Moderate	Northwood	0.21	1.12	0.07	$40,000	$50,000	$45,000	35
NWL-17	Jenness Pond Boat Launch	High	Pittsfield	0.10	0.52	0.00	$40,000	$50,000	$45,000	36
NWL-33	Boat House	Low	Epsom	0.03	0.13	0.01	$5,000	$5,000	$5,000	37
NWL-19	Catamount Road #1	Low	Pittsfield	0.07	0.19	0.27	$10,000	$20,000	$15,000	38
NWL-2	Harmony Road - Tucker Brook	Low	Northwood	0.04	0.09	0.14	$5,000	$10,000	$7,500	39
NWL-14	Long Pond Road	Low	Northwood	0.01	0.03	0.05	$1,000	$5,000	$3,000	40
NWL-52	Voydatch Pond Roads	Moderate	Northwood	0.25	1.28	0.12	$70,000	$100,000	$85,000	41
NWL-48	Baker Avenue	Moderate	Deerfield	0.05	0.13	0.20	$15,000	$20,000	$17,500	42
NWL-3	Route 4 - Road Shoulder	Low	Northwood	0.03	0.07	1.06	$5,000	$10,000	$7,500	43
NWL-42	Williams Lodge	Low	Northwood	0.13	0.41	0.00	$30,000	$50,000	$40,000	44
NWL-18	Hill Road	Moderate	Pittsfield	0.16	1.12	0.00	$60,000	$90,000	$75,000	45
NWL-31	Sleepy Hollow Intersection	Moderate	Epsom	0.05	0.12	0.04	$20,000	$30,000	$25,000	46
NWL-43	Road to Boat House at Camp	Low	Northwood	0.10	0.52	0.04	$30,000	$40,000	$35,000	47
NWL-45	Camp Boat House Area	Low	Northwood	0.06	0.25	0.02	$25,000	$40,000	$32,500	48
NWL-10	Harvey Lake Road - Stream Crossing	Low	Northwood	0.02	0.05	0.08	$15,000	$25,000	$20,000	49
NWL-5	Ridge Road - Stream Crossing	Low	Northwood	0.02	0.04	0.06	$2,000	$5,000	$3,500	50
NWL-50	Community Beach	Low	Northwood	0.01	0.00	0.00	$10,000	$15,000	$12,500	51
NWL-34	Side of Boat Yard	Low	Epsom	0.45	2.27	0.17	-	-	-	NA
TOTAL				**14.13**	**55.54**	**25.67**	**$1,143,000**	**$1,870,000**	**$1,506,500**	