Water Quality Observations and Recommendations for Trail Planning and Maintenance at Fairlee Town Forest

As Requested by Fairlee Town

On Friday, June 4th, 2021, Danielle Owczarski, Watershed Planner for the Department of Environmental Conservation (DEC) in the Lake Morey Watershed, participated in a site visit organized by the Department of Forests, Parks and Recreation (FPR) to review current conditions of the trails in Fairlee Town Forest and provide feedback on water quality observations and recommendations. We visited several example problem areas of trail erosion where, during rain events throughout the year, sediment discharges into surface waters. The following are recommendations based on site observations. We were not able to visit all the potential problem sites identified. The recommendations can be used as guidance for those sites with similar conditions.

Background

The DEC has been working in collaboration with lay monitoring volunteers to monitor water quality in Lake Morey for over 30 years. During the past three years (2019, 2020 and 2021), due to increasing nutrient trends, the DEC has added tributary monitoring to assess nutrient and chemical concentrations in the tributaries flowing into Lake Morey. This monitoring is being conducted to better understand where the increase in nutrients is coming from, with a focus on total phosphorus.

Phosphorus is a common pollutant in surface waters. When phosphorus concentrations are too high, it can cause excessive growth of plants and algae. But different forms of phosphorus have different impacts on water quality in our water bodies. Dissolved phosphorus is the phosphorus that remains in water after that water has been filtered to remove particulate matter. Phosphorus attached to the particulate matter that remains on the filter is called particulate phosphorus. The amounts or loads of phosphorus entering some of Vermont's lakes and ponds have been increasing in recent years.

Particulate phosphorus is more common in forested watersheds like those of Big Brook and Glens Falls. There are three major factors that lead to increased particulate phosphorus in the Fairlee Town Forest:

1. Erosion of trails leading to runoff of sediment into streams
2. Increased water volume and velocity eroding stream banks
3. Improperly sized culverts and stream crossings that create scouring and plugging of stream channels

Phosphorus is attached to the sediment particles that runoff into streams due to erosion of trails and stream channels during rain events, this sediment is considered excessive and can lead to increased particulate phosphorus in lake bottom sediment. A baseline amount of this sediment bound phosphorus is expected to runoff into lakes and ponds in natural conditions, but manmade features that are not designed and maintained to mitigate erosion can speed up the process of nutrient delivery to the lake.

Increases of water volume and velocity delivered by poorly designed and maintained trails lead to stream channel erosion. Steep trails with poor drainage will channelize flow and deliver it to the streams faster than properly managed forest trails. The increase in flow can create "flashy" conditions that lead to quick increases in flow during rain events that will erode streambanks. If trails are properly managed, that flow will be dispersed more evenly over time.

Improperly sized culverts and stream crossings block the natural movement of water, sediment, and woody material, especially during high intensity rain events. Culverts can easily become clogged and act as dams to flow which can erode stream substrate and disconnect streams from their floodplains. Floodplain connection is important because it helps to dissipate and slow flow during high intensity rain events. Undersized stream crossing structures can also lead to clogging that will wash out roads and prevent aquatic organisms, such as Brook Trout, from traveling to cooler waters for refuge and reproduction.

The following observations and recommendations are offered with the goal to decrease erosion and nutrient runoff into the forested tributaries of Lake Morey.

Observations

The group visited several areas with visible erosion features. Most of these features were observed on wide, steep slopes that were old skidder trails with no or minimal erosion control features (Figure 1 and 2).

Figure 1. An ephemeral stream channel has formed on this trail which channelizes water and sediment that flows downhill into the stream. After years of erosion, this trail is much lower than the surface of the forest floor.

Figure 2. Sediment from the trail surface deposited downhill by the stream channel. Some of this sediment made its way directly into the stream channel. In this area, a second channel is eroding parallel to the stream channel. Further erosion could result in the stream "capturing" the old logging trail.

The trails were not built with trail access in mind. Most of the trails were located on old skidder trails that were built for one time use every 15-30 years. If they were closed out properly, the water bars and erosion control features had been removed by time and ATV use.

A second type of water quality issue was identified adjacent to the Fairlee Town Forest and appeared to be mostly caused by unregulated ATV use on private land. The trails crossed a series of connected wetland seeps that were partially destroyed, and the hydrology had been altered by the rutting and compaction caused by ATV use (Figure 3).

We visited on small ford crossing that was experiencing some erosional impacts but was not in bad condition. A few options were identified for addressing future erosion in that area (Figure 4). Beaver activity was observed upstream of the ford site and the beaver dams have failed in years past. Beaver activity is common in most upland forested areas where streams flow through gently sloping open terrain. Beaver wetland complexes support many wildlife functions and create aquatic and open meadow habitats in forested areas. Excessive ATV use by and around beaver wetlands can weaken dams and cause dam failure.

Figure 3. A seepage wetland with altered hydrology caused by unregulated ATV use. The seepage flow has been channelized and erosion of soil was evident into a small stream (outside to the left of the photo).

Figure 4. Stream ford crossing below beaver wetland complex.

Recommendations

The goal of these recommendations is to protect the water quality in the Lake Morey tributary watersheds in the Lake Fairlee Town Forest. These are recommendations by the Watershed Planner, not requirements of DEC regulatory programs. DEC regulatory staff should be consulted for regulatory obligations.

FPR Logging AMPs and recommendations for trail design and maintenance from the FPR Recreation staff should be followed to ensure the correct management of trails and forestry infrastructure. Areas that are excessively steep and difficult and costly to manage should be retired and stabilized based on FPR trail standards. Any direct discharges should be mitigated as soon as possible to prevent discharge and address the cause of the discharge, this may include: installation of water bars and other best management practices for roads and logging activities, trail closure, and trail retirement and stabilization.

Any areas with evidence of direct discharge into surface waters should be prioritized for remediation. As these areas are addressed, it will be prudent to work with a recreational trail designer to assess the existing trails and develop a recreational trails plan that will guide future efforts to build a stable and long-lasting trail network and maintenance plan.

All ATV use in close proximity to beaver dams that impacts hydrology, creating ruts, and impacts dam structures, should be discontinued to prevent accidental failure of beaver dams and impact to aquatic and terrestrial species that rely on the beaver wetland complex for survival.