

Gully-washing Storms & Overland Flow

How to Slow, Spread, & Sink Stormwater in Vermont's Forests



Extensive flood damage along lower Ireland Road in Starksboro. Reducing the volume and velocity of storm flow starts in headwater forests. Most soil erosion and stormwater runoff from forests comes from access roads.

Restoring Spongy Catchments

In 1609, when Samuel de Champlain sailed up the lake that now bears his name, Vermont's forests were spongy catchments. When hard rains fell, the forests absorbed them. Though we can't say for sure that overland flow never happened in pre-settlement forests, it's safe to call it a rarity.

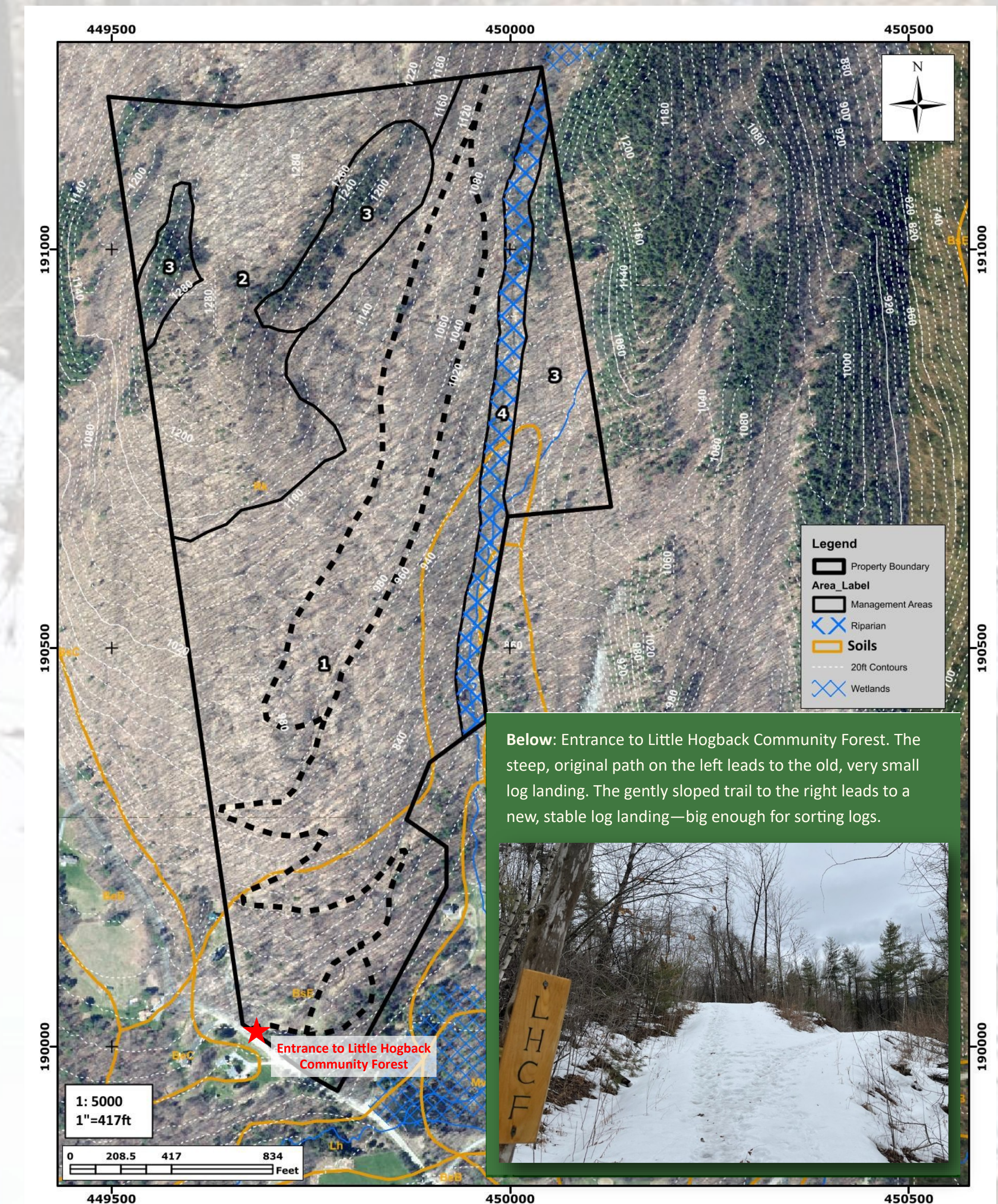
Settlers soon turned these spongy catchments into ditched watersheds, and they remain so today. Culverts and roadside ditches speed water downhill, adding volume and velocity to nearby streams. These freighted waterways roar toward the valleys, scouring their banks as they go. Here in western Vermont, these sediment-laden waters pour into Lake Champlain, adding to the phosphorus load in this aquatic community.



Overland flow on an old logging skid trail following a one-inch rainfall. Though the deeply incised path is unused and revegetated, it continues to concentrate storm flow, contributing to the "flashiness" of streams and rivers downstream.

Lines of Grace—Stability & Beauty

As the contour lines on the map of Little Hogback Community Forest (below) show, this land is mighty hilly. Many of the original trails climbed straight uphill. Since 2006, Vermont Family Forests has worked with the landowners to close steep roads and reroute them to gentler grades, creating what we call "Lines of Grace"—beautiful, functional, stable access paths. The long-term hydrological benefits of slowing, spreading, and sinking storm flow outweigh the short-term site disturbance of rerouting forest paths, especially given the increasingly intense storms caused by climate change.



Below: Entrance to Little Hogback Community Forest. The steep, original path on the left leads to the old, very small log landing. The gently sloped trail to the right leads to a new, stable log landing—big enough for sorting logs.

Created by Vermont Family Forests in 2007, Little Hogback Community Forest (LHCF) is an experiment in community-based forest ownership. Within LHCF, 16 shareholders jointly own a 115-acre forest parcel in Monkton. A conservation easement held by the Vermont Land Trust ensures that it will not be subdivided or developed. The remaining rights—to carry out conservation practices, harvest firewood and timber, tap maples, hike, and such—belong to the shareholders. Half the shares are reserved and subsidized for Addison County residents whose family income is below the county median. LHCF is an example of how VFF works to cultivate mutually beneficial relationship with the land and with each other, here in our home place.

12 Practices for Drought & Flood Resilience

1. Retain healthy forest cover.
2. Monitor forest health.
3. Limit access paths to 5% of forest area.
4. Aim for 7% average grade.
5. Build paths under dry summer conditions.
6. Install erosion control structures per Vermont's *Acceptable Management Practices* manual.
7. Use broad-based dips. Avoid culverts and ditches.
8. Out-slope trails to shed water into forest.
9. Avoid building paths in steep areas (>35%) or near surface water.
10. Log under frozen winter conditions.
11. Use forwarders, not skidders.
12. Directionally fell low-value trees across slopes.



Vermont Family Forests Executive Director David Brynn (right) watches as Chris Cram excavates a broad-based dip on a forest access road.

Broad-based Dips Rock!

Broad-based dips are a great choice for controlling erosion on forest paths. They need little maintenance, and they direct water into the forest, where it can soak in. Culverts are expensive to buy and install and must be kept clear of debris. Teamed with ditches, they funnel runoff out of the forest and into waterways. If they clog during a storm, culverts can cause road washout, sending sediment into streams and necessitating costly repairs.

Distance Between Broad-based Dips on Forest Paths	
Grade (% Slope)	Distance (feet)
1	300
2	250
4	170
5	135
6	120
8	100
10	80



Bill Torrey uses a forwarder to collect logs in the forest. Forwarders are much lighter on access paths than skidders, which drag logs.

