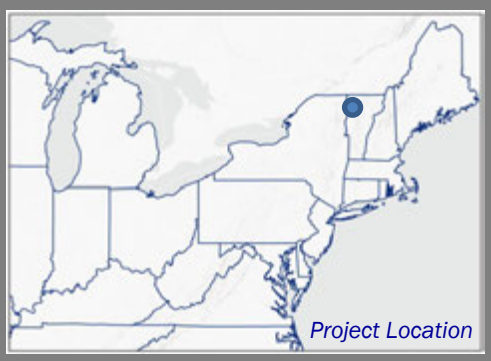
## RESTORATION

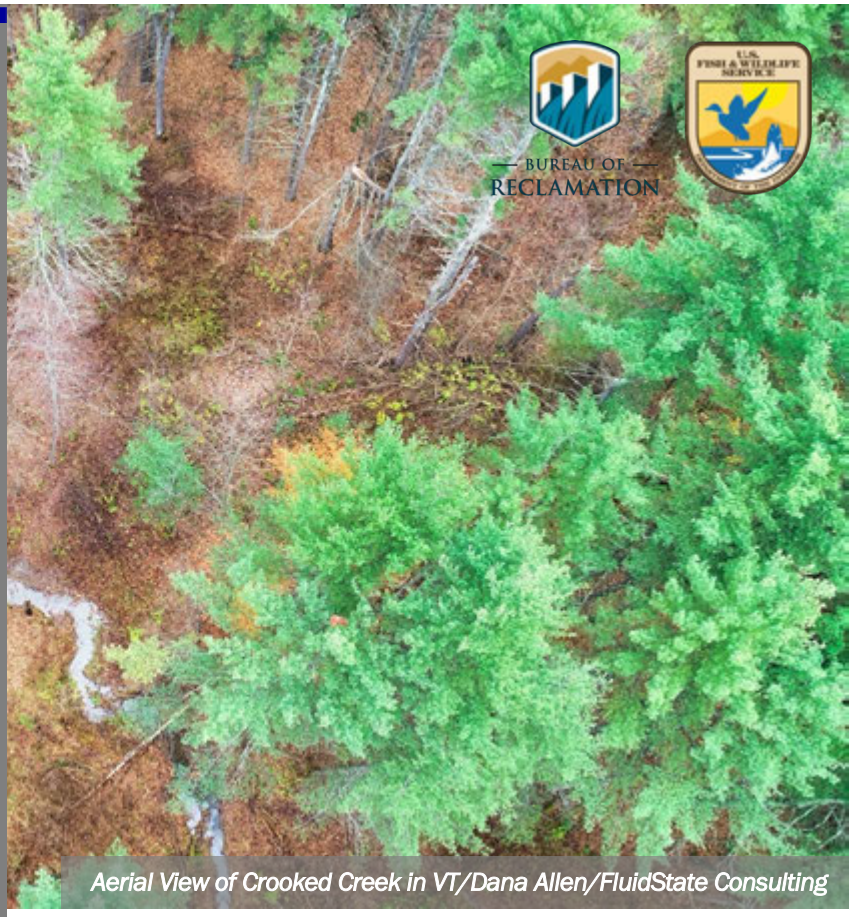
# Using Woody Materials to Restore Crooked Creek

Vermont Land Trust
UNITING LAND AND LIVES

The Nature Conservancy

Crooked Creek, a small stream on a farm in Colchester, VT, became disconnected from its floodplain through historic clearing and land management that has reduced deposition of large woody material from floods and beaver activity, historically common in this stream. In-stream wood deposition slows floodwaters and creates micro-habitats for aquatic and terrestrial wildlife. In 2021, the Vermont Land Trust (VLT), the Vermont Nature Conservancy (TNC), and Habitat Restoration Solutions, Inc. worked with volunteers from the University of Vermont to install beaver dam analogues (BDAs) and post-assisted log structures (PALs) to recreate the natural systems and restore connections between the stream and floodplain.



*Aerial View of Crooked Creek in VT/Dana Allen/FluidState Consulting*

## KEY ISSUES ADDRESSED

Natural wood creates structure and helps to slow water, trap sediment, prevent bank erosion, and connect the creek to its floodplain. Crooked Creek no longer has significant woody deposits, and as a result suffers from high water velocity, high sedimentation rates, and increased channel erosion, and is less able to handle the inundations associated with the heavier rainfall caused by climate change. Additionally, the creek cannot hold water long enough to support the surrounding wetland habitat. The Crooked Creek restoration applied the principles of process-based restoration (PBR), a low-cost, low-tech approach to stream rehabilitation. Typical PBR structures like BDAs and PALs trap smaller wood and silt in high water flows.

## PROJECT GOALS

- Reconnect Crooked Creek to its floodplain by installing human-made wood structures to slow water and prevent sediment from washing into Lake Champlain
- Demonstrate the viability of process-based restoration techniques
- Increase awareness of local creek restoration

*UVM Students Constructing a BDA/Allaire Diamond/VLT*

**BUCKTHORN TO BDA**

**A year prior to the restoration, partners cleared invasive buckthorn from the banks of Crooked Creek. This wood was used to build the BDAs and PALs installed in the creek.**

## PROJECT HIGHLIGHTS

**Restoration Day Results:** Partners worked with student volunteers from the University of Vermont. Together, they built 24 structures in four hours, including nine BDAs and 15 PALS, structures that are designed to hold more wood and silt in the waterway. The team built the structures using hand tools and woody material sourced from the site. Students also conducted twelve cross-section surveys along the creek to provide a baseline for measuring changes to erosion levels as the creek responds to the restoration.

**Restoring Hydrological Function:** Post-implementation, the structures are collecting and slowing water, allowing water to spread into the floodplain. As more water is slowed with each rainfall and additional natural wood is caught in the installed structures, more natural structures will build up in the waterway.

**Improving Wetland Health:** The riparian restoration is contributing to the health of the adjacent wetland. In Spring 2022, a VLT ecologist noted the establishment of wetland plants like water plantain (*Alisma subcordatum*) that had not been seen prior to the restoration. This may indicate that the area is holding water longer.

## Collaborators

- Vermont Land Trust
- Vermont Nature Conservancy
- University of Vermont (UVM)
- Bob Hyams, Habitat Restoration Solutions

CCAST Author: Lindsey Smith, Miami University, March 2023.
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Visit CCAST:

## LESSONS LEARNED

While PBR can be completed in a single day, the design process takes longer and requires significant technical expertise. The design team spent a lot of time walking the property to determine how to apply PBR principles to this particular stream site. The placement of the BDAs and PALS was an important consideration in slowing water while accommodating the steep descent of the creek; however, the team also knew that natural movement of placed materials is an expected part of PBR projects.

Crooked Creek restoration provides a model of how to work with regulators like the Army Corps of Engineers (ACE) on a process-based restoration project. The project only required completion of a simple form with ACE (Eng Form 4345). The stream's small size meant that additional stream alteration permits, including any NEPA review, were not required.

Crooked Creek restoration partners found that some specialized tools helped in moving the wood in and around the site as they were installing the streambed structures. Ice fishing sleds, for example, were a good way to get wood into place along the stream.

## NEXT STEPS

- Use the Crooked Creek restoration site as an outdoor riparian lab for UVM students and faculty.
- Monitor the impact of PALS and BDAs on the streambanks through ongoing research activities.
- Encourage the return of beavers to continue to bring woody structures into the system, further slowing the flow of water and restoring the river's floodplain system.

**For more information on this project, contact Allaire Diamond: allaire@vlt.org**

*Water Pooling Upstream of BDA/Allaire Diamond/VLT*