Eastern Brook Trout photo by Dianne Timmins, Goldwater Fisheries Program Director of the New Hampshire Fish & Game Dept.

NACD's mission is to promote the wise and responsible use of natural resources for all lands by representing locally-led conservation districts and their associations through grassroots advocacy, education and partnerships.

National Association of Conservation Districts

Saving our brook trout with wood in streams

by Linda Brownson

As a first-time forestland owner located in the foothills of the White Mountains of New Hampshire, each spring, as soon as the snow melted and the ground firmed up, I would head down to the main stream that cuts through the valley in anticipation of work that needed to be done. Chainsaw in hand and, if lucky, a young muscular helper along to help move wood, we would start with an exploratory hike up the stream to see what 'damage' had been done after many winter windy storms and tree fall. I began this task with enthusiasm, recalling how satisfying it was to remove the fallen logs and woody debris that clogged the stream and restore the full flow and beauty of this winding waterway.

Many years later, after study and workshops on forest ecology and wildlife habitat, I can now see the folly of my ways. The more I learned about the interrelationships of trees, plants, water, and wildlife—our ecological system—the more my attention shifted. Native Americans well understand the concept, but we have been slow to learn from them. It implies another perspective, one could say a paradigm shift, in fact, to operate from 'cleaning up the environment' to one in which the approach is to protect the ecosystem of which we are a part along with the forests, streams, and wildlife.

More than 20 years ago, in the Pacific Northwest, the value of putting wood in streams was being evaluated closely, as work was being done to rescue the endangered salmon population. Interest in 'wood in stream' started picking up in the Northeast a few years after. Fish biologists were behind it, as our native population of Eastern Brook Trout was declining.

Brook trout [*Salvelinus fontinalis*] are the only native stream dwelling trout species located in the eastern United States. The species requires cold and clean water to survive. Brook trout are extremely sensitive to environmental changes and habitat alterations. Such sensitivity has made brook trout a particularly important indicator species, as its decline provides early warning signs of a reduction in the overall health of the aquatic ecosystem.

We have learned that large wood is a critical aspect of the forest stream ecosystem and, importantly, for the survival of trout that inhabit the streams. Large wood diverts water flow, changes water velocity to trap sediment, creates cascades and riffles increasing oxygen in the water. The wood helps form deeper pools where the fish can survive the summer heat and shade to reduce the water temperature. The logs and brush add structure to streams and provide escape cover and collects leaves and twigs. The leaves and twigs (organic matter) feeds insects and invertebrates, the food source for brook trout. The concentration of essential nutrient elements increases considerably as large pieces of wood decompose, providing improved habitat conditions for the fish and other aquatic creatures.

Trees don't fall in the streams anymore like they did when northern forests were older forests. Hundreds of years of land use, abuse, and control or elimination of most sources of natural disturbance has led to an even-aged mature forest. In addition, the beavers significantly altered the landscape, damning up small streams, felling trees, until their activities were considerably reduced by human intervention.

Until very recently, the importance of wood in streams for fish habitat was not very well understood, nor communicated. The Green Mountain National Forest in Vermont was one of the first in the east, to work with wood in stream applications with great success. After years of experimenting, they nearly doubled the amount of biomass in the streams they were working on and the fish were getting bigger and fatter. According to Don Keirstead, NH Resource Conservationist with the Natural Resources Conservation Service (NRCS), the GMNF provided the benchmark as to how much wood in stream to apply, which is being used today.

Providing the ecological benefits of older trees falling in the streams is possible through controlled practices that imitate these natural forces. "Mimicking nature is what we are doing by putting wood in streams," explained Nels Liljedahl, NRCS District Conservationist in Conway, NH, who has been working with NH Fish & Game, Trout Unlimited, and Tin Mountain Conservation Center to design and implement these new practices and collect the data.

As the scientific community was learning more and landowners were becoming more aware, suddenly there was a real surge of interest. NRCS led to that surge, according to John Magee, Fish Habitat Biologist with NH Fish & Game. NRCS created wood in stream cost-share practices to help landowners with the funding and technical tools to implement this conservation effort. As more was communicated about the importance of large (and small) wood in streams, the more landowners and foresters were asking questions.

This is where conservation districts started playing a key role. "We knew right away that we could start doing this work through our district," explained Belknap County Conservation District (BCCD) Chair Donna Hepp.

One of their first projects was the Poorfarm Brook Large-Wood Restoration Project in Gilford, NH. This project was initiated by the district in June of 2018, with assistance from numerous grants and partnerships—indicating the value and increase of popularity

A: Riffle B: Glide C: Cascade D: Pool

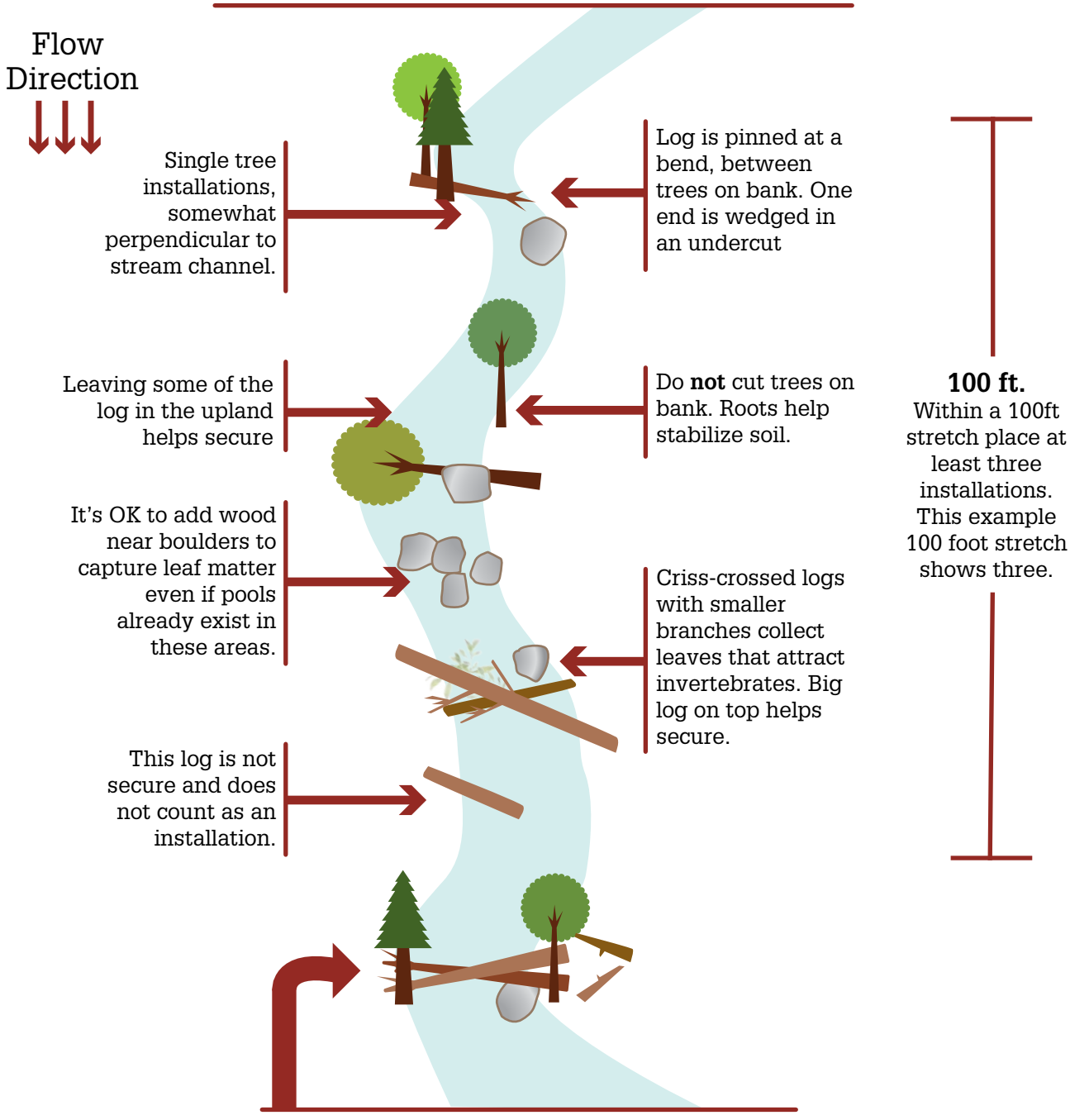
associated with this work. Along a 2.9 mile reach of Poorfarm Brook, a total of 96 instream large-wood structures were installed with the goal of creating and enhancing instream habitat for eastern brook trout and other local fish species by slowing water velocities, trapping sediment, and increasing the morphologic complexity of Poorfarm Brook—which empties into Lake Winnipesaukee, the largest lake in New Hampshire.

Optimal results, according to Colin Lawson of Trout Unlimited, are "pools forming downside of the wood work which create the hydraulics so freshets scour the banks with scour pools, and the bigger stuff moves down to a tailwater and goes over the top; we are looking for a 'pool-riffle combo!'

Already many wood in stream projects and workshops are in the works for the BCCD district including a statewide Stream Restoration Conference, in conjunction with the New Hampshire Association of Conservation Districts Annual Meeting, in October, 2019. "There are resources available to help communities and landowners. Our recent projects offer examples of what can be done at the local level," said Lisa Morin, BCCD District Manager.

In Grafton County, NH, the Grafton County Conservation District is providing landowners with answers to the question: Can water quality and fish habitat be improved by adding wood to streams? Grafton County borders the Connecticut River on the western part of the state and every stream in the county flowing into that river has brook trout. Last October, the District, NRCS, and UNH Cooperative Extension educators convened on Bruce and Sarah Schwaegler's Tree Farm in Orford, NH to offer a "Wood Additions to Stream Workshop." They focused on the environmental benefits, site selection, permitting, and what it takes for a successful project, encouraging local landowners to take a fresh look at wood in streams.

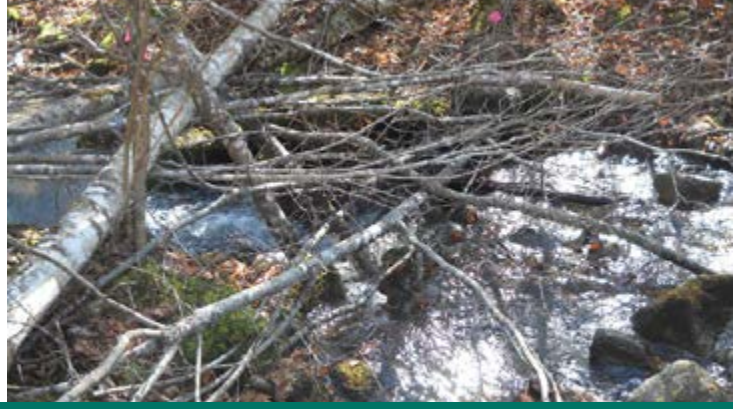
A Sample Stream with Added Wood



Make a larger "strainer" every ≈300 feet to catch any loose logs from upstream.

Strainers also help spread water into floodplain during high flow if channel is not too deep.

Wood Loading in Stream, USDA-NRCS diagram concept, by Kelly Boland.
Created with input from NH Fish & Game, Tin Mountain, and Trout Unlimited



These two photos reflect the original installation and then the revisit two years later. You can see the development of the pool below the structure. This installation would involve the hand placement technique to engage the stream immediately. (Trout Unlimited photos)

Foresters are attending these workshops too, as they also want to learn about a practice they have not necessarily paid attention to, especially as, in the past, guidance provided to landowners was often to remove wood from streams. "As a forester, I will say that streams tend to be overlooked; and I don't know if we are always also thinking about fish," commented Andy Fast, a county forester with UNH Cooperative Extension (UNHCE).

"This is a very interesting practice from a forester's perspective," explained Karen Bennett, Forestry State Specialist with UNHCE, "because 'best management practices' has been to keep wood out of streams, and the laws generally don't allow it." The knowledge base is growing, but "there needs to be a readjustment mindset," added Bennett. "Are there ways for us to accomplish this when doing a logging operation? This needs to be explored!"

But, in fact, a unique opportunity exists during timber harvesting to place large wood in streams to enhance fish habitat. During the timber harvest, the equipment is on site, as well as the trained personnel capable of placing the wood strategically and properly into the streams. Thus, fish habitat enhancement can be accomplished through wood addition as an add-on to the existing logging operation. 'Chop and drop' is the primary installation method in these cases, accompanied by hand placement. Most installations should touch the water at low flow. Of course, there are guidelines to follow and, in NH, permits are required from the Department of Environmental Services.

"Most of the research on wood in streams is focused on how wood affects brook trout," Fish Biologist Magee stated. He is a big proponent of placing large wood in streams—though with careful review by an experienced professional. There are situations when, for public safety concerns, for example, it is not advisable to put wood in streams. It also makes sense to choose the right stream types that are suitable for the active restoration of instream wood and woody habitat. These would include relatively small streams with channels less than 15 ft across, a stream with little or no instream wood in it, no public or private infrastructure immediately downstream that would be damaged if added wood moved, and streams with wild brook trout present.

As putting wood in streams becomes a new interest on private land, conservation districts are becoming the contact point for helping landowners make such decisions and providing the educational tools through workshops and demonstrations. Conservation districts keep a pulse on changing resource concerns through their local work groups and networks. Working with their key partner NRCS, they can help accommodate changes in thinking and research as it relates to natural resource concerns.

Arguably, a shifting forestry paradigm is a reflection of our changing cultural values. Some trends related to this shift might be the growing interest in organic and regenerative agriculture, and the decline, or extirpation, of various species of wildlife. The findings of modern science offer strong support for a more ecological paradigm. Mimicking nature by putting wood in streams may offer the best hope for our native brook trout.

Linda Brownson lives in the western foothills of the White Mountains in Wentworth, NH, where she manages 200 acres of mixed northern hardwoods and conifers for wildlife habitat. She is NACD Executive Board member for the Northeast Region and Vice-President of the New Hampshire Timberland Owners Association.