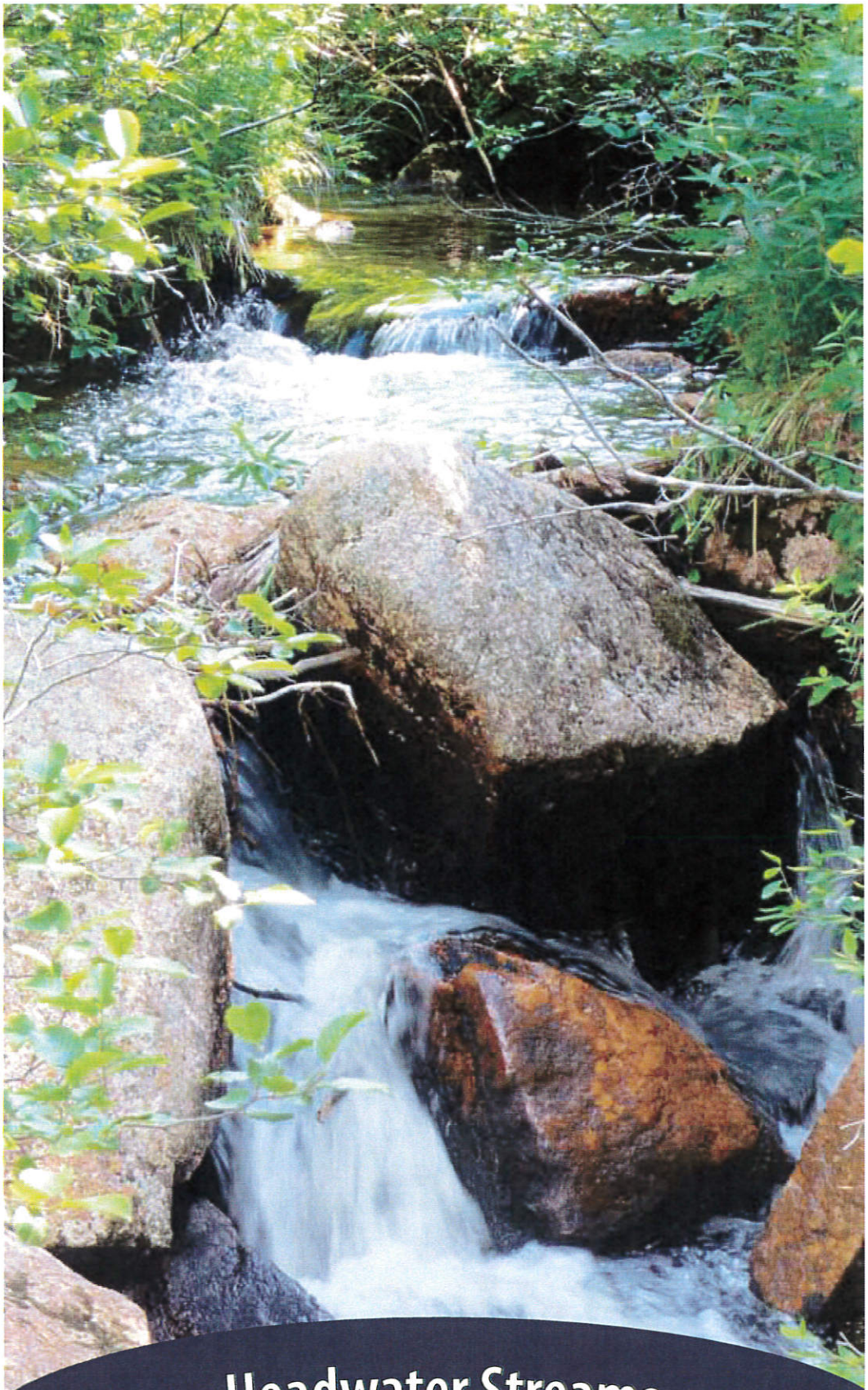


Headwater Streams

Habitat Stewardship Series

NEW HAMPSHIRE WILDLIFE ACTION PLAN

Recognizing

headwater streams

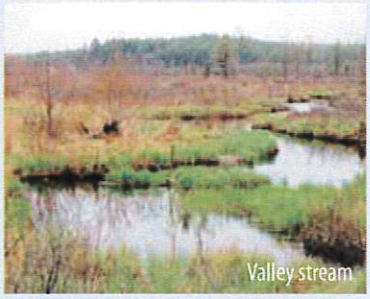
Headwater streams are small streams and wetlands at the highest end of a watershed. Some are so small that they don't show up on maps. If a river network is the circulatory system of the landscape, headwater streams are the small capillaries that fan into the larger veins and arteries.

Headwater streams can start as small forested wetlands, beaver impoundments, or cascading mountain streams, varying according to the topography and geology of the surrounding landscape. Topography and geology influence the speed of water flow, the river bottom material, the plants growing around the streams, whether the stream sometimes or always contains water, and which wildlife species live in or use the stream.

Mountain streams

Mountain streams tend to have large rocks, steep grades, and flash floods. Stream salamanders, brook trout, and certain aquatic invertebrates are well adapted to these dynamic habitats.

Mountain stream


Valley stream

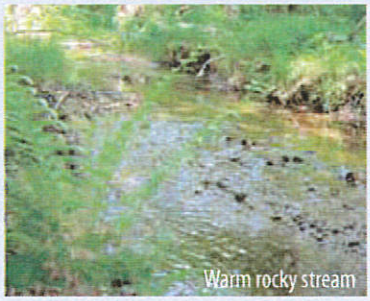
Valley streams

These streams flow through broad, flat valleys. They tend to be slow-moving and surrounded by wetland plants and shrubs. Beaver activity creates a patchwork of wetlands around the streams, including shrub swamps, wet meadows, and ponds. Wildlife are drawn to these areas including ducks, geese, turtles, amphibians, and fish.

Spring-fed brooks

These small streams flow through glacially deposited sand and gravel and originate from natural springs. Their year-round supply of cool water provides a stable environment for brook trout, particularly during hot weather.

Spring-fed brook


Warm rocky stream

Warm rocky streams

The riffles and pools of these rocky brooks are reminiscent of mountain or brook-fed streams, but they are too warm to support cold-water fish. They often flow between beaver ponds in hilly terrain, serving as corridors and hunting grounds for mink, northern water snake, and other wildlife.

Why are headwater streams important?

Many headwater streams are scoured by ice in winter, flood in the spring and fall, and are dry in the summer. Wide variations in water flow and temperature make life difficult in headwater streams. A unique group of plants, amphibians, and insects are adapted to survive in these difficult conditions. These small streams also have a large impact on the health and integrity – both for water quality and wildlife – of major rivers downstream.

Headwater streams are places where forest and stream habitats converge, leading to high densities of insects around the streams. Stoneflies, mayflies, and dragonflies, whose larvae live underwater, are found alongside upland insects such as moths, beetles, and grasshoppers. This concentration of food attracts predators from the surrounding forest including northern long-eared bat, red-shouldered hawk, raccoon and ribbon snake.

Stonefly larvae

Small streams also help remove excess nutrients, such as nitrogen, from a watershed, helping ensure cleaner water downstream. Wood in the small, upriver streams traps leaves and other nitrogen sources, preventing them from accumulating in the lower reaches of the river.

Eastern brook trout may live year-round in tiny streams, feeding on both upland and aquatic insects. They may also travel over 20 miles from larger rivers to headwater streams during the fall spawning season or, if the streams have enough water, to find a cool refuge during the summer months.

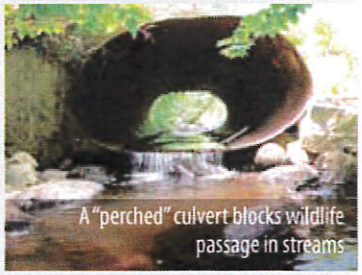
Refuge streams

Many species take advantage of the relative safety of headwater streams for reproduction. Green frogs and spring and two-lined salamanders lay their eggs in intermittent, fishless streams. Common white suckers and rainbow smelt, two fish species, migrate every year into small streams to spawn. Headwater streams also can act as travel corridors for wildlife such as mink, otter, beaver, forest birds, and forest-dwelling bats.

The isolation and harsh conditions of headwater streams can also provide native fish with a refuge from introduced species. Natives such as banded sunfish, redfin pickerel, and redbelly dace can thrive in headwater streams, but are over-run by introduced fish in the more stable and often degraded habitats of larger rivers and lakes.

Overlooked streams

Despite their ecological value, headwater streams are often overlooked by conservation efforts and are not covered by New Hampshire's Comprehensive Shoreland Protection Act. Their small size makes them vulnerable to human impacts, particularly those caused by human development. Use of groundwater by residential or commercial wells can cause streams to dry up. Roads, driveways, and poorly designed or placed culverts fragment streams, causing sedimentation, and isolate wildlife populations. Runoff from paved surfaces can introduce pollutants, increase flooding, and cause spikes in stream temperature. These and other threats are compounded by the tendency to dismiss small streams because they don't command the same recreational and aesthetic appeal of larger lakes and rivers, and because they are often considered too small to provide important habitat.


A "perched" culvert blocks wildlife passage in streams

Stewardship Guidelines

for headwater streams

- **Conserving land from development around headwater streams** will allow for the natural processes that prevent flooding, maintain water quality, quantity, and temperature, recycle nutrients, and provide food and habitat at the source and downstream. Maintaining intact, undeveloped headwaters may also buffer the predicted higher temperatures and increased flooding and rainfall associated with climate change.
- **Incorporating headwater stream protection into town and regional planning** through conservation easements and zoning ordinances will have lasting benefits by conserving species, protecting water quality and preventing flood damage.
  - When possible, **keep development, permanent roads, and driveways at least 300 feet away from streams.** Suggested development buffers vary, but a minimum of 300 feet is commonly recommended for protecting wildlife habitat along stream corridors. The benefits of riparian buffers increase with their width.
  - **Maintain pervious (permeable) surfaces** on as much of the landscape as possible. Natural ground is the best filter for storm water, but pervious pavement (as opposed to typical pavement) can reduce stream contamination from storm water in developed areas. Watersheds with as little as 4% of their land area in buildings and pavement have degraded headwater stream habitat.

Roadside salt and sand draining into stream

- **Avoid the use of fertilizers or pesticides near any stream or wetland habitat.** Many pesticides are toxic to aquatic organisms. Excess nutrients from fertilizers pollute water by reducing oxygen levels, killing fish and other species.
- **Avoid culverts, drains or ditches that discharge storm water directly into streams.** Instead, apply designs that filter storm water into the ground, including porous pavement, gravel wetlands, or tree box filters. The UNH Stormwater Center is an excellent resource for the latest research in stormwater management.
- **Properly sized and installed stream crossings are critical for restoring or maintaining the function of streams of all sizes.** Before installing any stream crossing associated with development, consult the New Hampshire Stream Crossing Guidelines available from the UNH Stream & Wetland Restoration Institute and follow all NH wetland laws. For crossings associated with timber harvesting, see best management practice references below.
- **Timber harvesting around headwater and small streams should maintain enough shade and large trees** to maintain stream temperatures, filter run-off, and allow for woody material (dead and dying trees, leaves, branches) to naturally fall into streams. For headwater streams, buffers that maintain about 60% of the canopy in a zone as wide as the height of a mature tree (100 feet) are likely to maintain cold water temperatures and woody material in the stream. In larger streams, riparian buffers of 300 feet or more provide more effective wildlife travel corridors and habitat.
- When doing forest management work near headwater streams, minimize impacts by:
  - **Maintaining dead standing trees, overhanging vegetation, and downed branches and trees** to provide moist cover and shade for wildlife and insects;
  - **Maintaining downed logs** in streams to enhance trout pool habitat;
  - **Consulting the publications** *Good Forestry in the Granite State, 2nd edition* and *Best Management Practices for Forestry: Protecting NH's Water Quality*, both available from UNH Cooperative Extension.
- **Consult a licensed New Hampshire forester before conducting a timber harvest on your property.** Understand and follow all laws pertaining to tree harvesting near wetlands and waterbodies. Follow established best management practices, and harvest timber near headwater streams only when the soils are either frozen (winter) or very dry (summer).

Species Focus
of conservation concern

Eastern brook trout

Brook trout depend on clean, cold water and are well-adapted to living in small streams where they compete for feeding territories in small pools. During much of the year, brook trout eat insects such as beetles and spiders that fall into the stream from overhanging vegetation. In hot weather, brook trout may travel miles upriver to headwater streams seeking cooler water and to find spawning habitat in the fall. New Hampshire remains a stronghold for brook trout in the Eastern U.S., but even here, populations are declining.

Eastern brook trout

Stream salamanders

Stream salamanders are the top predators in streams with no fish. These streams are often seasonal, drying up for part of the year, or they may be protected from upstream fish movement by a barrier such as a waterfall. Spring salamanders, two-lined salamanders, dusky salamanders, and eastern spotted newts are examples of salamanders that may be found in New Hampshire's headwater streams. Stream salamanders are considered indicators of good water quality and healthy stream habitat, but they are sensitive to upland habitat destruction beyond the stream corridor.

Dusky salamander

Riffle snaketails

Riffle snaketails are dragonflies that live in streams and small rivers with gravel or sandy bottoms and lots of riffles. Riffle snaketails are very sensitive to damming, and although they are not rare, they are at risk from disturbance. Larvae burrow in the gravel and sand, feeding on aquatic invertebrates that share their sheltered space.

Riffle snaketail

Wildlife found in headwater streams

The species listed here are some of the wildlife that use headwater streams. Be on the lookout for these species and follow stewardship guidelines to help maintain or enhance headwater stream habitats. Species of conservation concern—those wildlife species identified in the Wildlife Action Plan as having the greatest need of conservation—appear in **bold** typeface.

- **American eel**
- **Banded sunfish**
- **Blanding's turtle****
- **Bridle shiner***
- Caddisflies
- Craneflies
- Cusk
- Dusky salamander
- **Eastern brook trout**
- Eastern spotted newt
- Ebony jewelwing
- Fishing spider
- **Little brown bat**
- Louisiana waterthrush
- Mayflies
- Mink
- Northern long-eared bat
- Northern water snake
- Raccoon
- **Redfin pickerel**
- Riffle snaketail
- Spring salamander
- Stoneflies
- **Swamp darter**
- Two-lined salamander
- White sucker

*state-threatened species
**state-endangered species

Eastern spotted newt/red eft

Where to get help

If you have information about a wildlife species of conservation concern, contact NH Fish & Game's Wildlife Division at 603-271-2461. Contact the UNH Cooperative Extension Wildlife Specialist at 603-862-3594 for technical assistance for landowners or your community.

Publications and assistance on forestry and wildlife topics are available through the UNH Extension Educators in Forest Resources in each county. Contact information for each UNH Cooperative Extension office is provided below. Additional publications, contact information, resources, and web versions of all brochures in the Habitat Stewardship Series are available on the UNH Cooperative Extension website at: **nhwoods.org.**

Belknap County	603-527-5475	Grafton County	603-787-6944	Rockingham County	603-679-5616
Carroll County	603-447-3834	Hillsborough County	603-641-6060	Strafford County	603-749-4445
Cheshire County	603-352-4550	Merrimack County	603-225-5505	Sullivan County	603-863-9200
Coös County	603-788-4961				

Authorship

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About the Habitat Stewardship Series

Much of the land in New Hampshire is privately owned. These individuals are the primary stewards of our wildlife and forests, and also our clean water, scenic views, fresh air, natural and cultural heritage, and recreational resources. The Habitat Stewardship Series has been created to help landowners and land managers recognize the habitats critical for wildlife species at risk, and to illustrate the role private landowners can play in sustaining those species through conservation, management, and sound land stewardship.

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UNIVERSITY of NEW HAMPSHIRE Cooperative Extension

SUSTAINABLE FORESTRY INITIATIVE

These brochures are printed on paper derived from sustainably managed forests.