APPENDIX B. Fish Species Profiles

Alewife
(Alosa pseudoharengus)

Alewives are members of the herring family. As with all members of the herring family, alewives spend the majority of their lives in the ocean. In the spring, adult alewives move into freshwater, migrating up coastal rivers from North Carolina to Newfoundland. Alewives spawn in lakes, ponds, and slow flowing backwaters of rivers. In late summer and fall, juvenile alewives migrate downstream to the ocean, where they will remain until sexual maturity in 3 to 5 years. Alewife numbers have declined throughout their range to the point that the species is currently a candidate for listing under the US Endangered Species Act. At normal population levels, alewives are a source of prey for a wide range of species from harbor seals in estuaries to chain pickerel in lakes and ponds.

Of the surveys included in this report, one alewife was recorded just downstream of Packers Falls in Durham. This incidental capture occurred during a seine survey targeting bridle shiners. NHFG has been working to restore river herring to the Lamprey River since the fish ladder was built on the McCallen Dam in Newmarket in the 1970s. Each year, alewives are transported from the fish ladder to inaccessible spawning habitat upstream of the Wiswall Dam. Stocking sites include Pawtuckaway Lake and Wadleigh Falls. Installation of a fish ladder at the Wiswall Dam in 2011 was intended to provide access to many miles of previously inaccessible spawning habitat. Alewives were observed passing through the fishway by NHFGD biologists in the spring of 2012. Schools of alewives were also observed downstream of the breached dam at Wadleigh Falls. No alewives were observed passing above Wadleigh Falls. Future surveys should be expected to show a seasonal increase in the presence of alewives in the Lamprey River watershed.

American Eel
(Anguilla rostrata)

The American eel is the only catadromous species in New Hampshire waters. Adult eels migrate from freshwater rivers throughout the Atlantic coast to their spawning grounds in the Sargasso Sea. American eel larvae drift on ocean currents back to the coast line, where they migrate up rivers as juvenile eels, known as elvers. Juvenile eels have the ability to ascend obstacles that block other fish species. They can work their way through cracks in dams and climb vertical surfaces with only a trickle of water. However, dams and other barriers have greatly reduced the distribution of eels, which were once present in nearly all freshwater habitats that could be reached from the ocean. Hydropower turbines are a major cause of mortality as the adult eels migrate downstream. Female eels tend to migrate greater distances upstream than males, which usually remain in estuarine habitat. Eels can remain in freshwater for over 20 years before migrating back to the ocean.

American eels are relatively widespread in the Lamprey River watershed, although their abundance drops considerably upstream of the Wiswall Dam. American eels were present at 23 0f 105 sites (22%) and accounted for 98 (2.3%) of the 4,226 fish counted in this survey. American eels can be difficult to net in electrofishing surveys, so the actual abundance of American eels is likely higher than what was recorded in this survey. However, eel abundance in the upper Lamprey River and its tributaries is far below what one would expect in an unfragmented river system. Over 67% of the eels counted were captured at the survey site just downstream from the Wiswall Dam. A fish ladder and an elver trap, monitored by NHFG biologists at the McCallenDam in Newmarket, improve access to freshwater habitat for elvers in the spring until the fish ladder is closed

in early summer. The fish ladder built at the Wiswall Dam and the recent removal of the Bunker Pond Dam should improve the accessibility of upstream habitat for American eels in the future. Sites in this survey could potentially be revisited to monitor trends in American eel distribution and abundance.

maximum length: 914mm
minimum length: 90 mm
average length: 334 mm

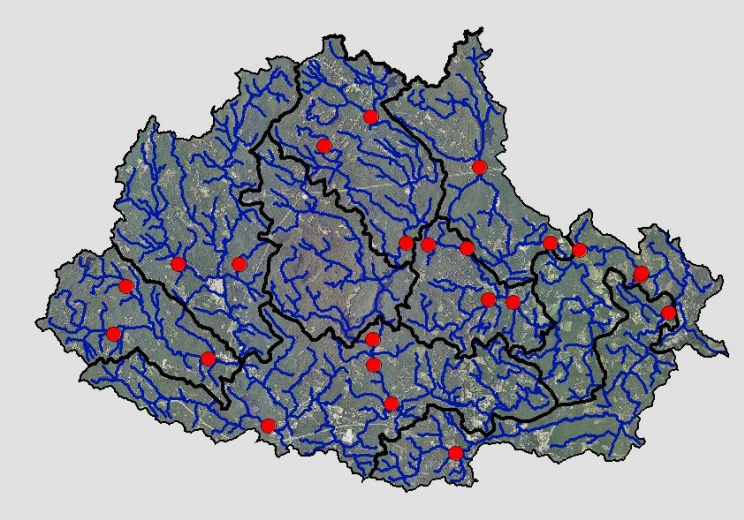

Figure B.1 – Locations of survey sites where
American eels were recorded in the Lamprey River watershed.

Banded Sunfish
(Enneacanthus obesus)
NH Species of Concern

Banded sunfish, New Hampshire's smallest sunfish species, inhabit ponds and small streams along the Atlantic coastal plain from Florida to southern New Hampshire. Although locally abundant in some watersheds, banded sunfish are at the northern edge of their range in New Hampshire and their distribution overlaps with some of the most rapidly developing parts of the state. Banded

sunfish are found in stands of submerged aquatic vegetation along the margins of lakes, ponds, and slow flowing rivers. They are often surprisingly far upstream in beaver ponds and wetland streams in the headwaters of a watershed. These smaller streams might provide refuge from introduced predators like largemouth bass. Banded sunfish are highly tolerant of acidic water. Little is known about the life history of banded sunfish. Research on the breeding behavior, feeding habits, population dynamics, and dispersal capabilities would be valuable for conserving the species. Their dependence on aquatic vegetation in shallow water makes the species vulnerable to the effects of shoreline development. Banded sunfish have been used for mosquito control in the acidic swamps and cranberry bogs of southeastern Massachusetts.

Banded sunfish were found at 15 of 105 sites (14%) in 7 of 9 subwatersheds. They were often found in small headwater streams and ponds and they appeared to survive in the variety of habitat conditions created by beavers. Although they were usually found associated with aquatic vegetation, banded sunfish were also found in shallow, sandy stream channels flowing through thick grassy meadows that grew after a family of beavers abandoned their dam. The fish were relatively uncommon at sites where they were found, accounting for just 1.3% (53) of the total fish count (4,226). The largest number of banded sunfish counted at one site was 13 in unnamed tributaries of the Little River and the Piscassic River. Banded sunfish are likely more abundant than indicated by this survey. A seine net would be a better method for assessing the status of banded sunfish in the muddy, vegetated habitat which it prefers. The relatively undisturbed wetland streams and beaver ponds in the Lamprey River watershed might be an important refuge for banded sunfish in southeastern New Hampshire.

maximum length: 78 mm
minimum length: 37 mm
average length: 59 mm

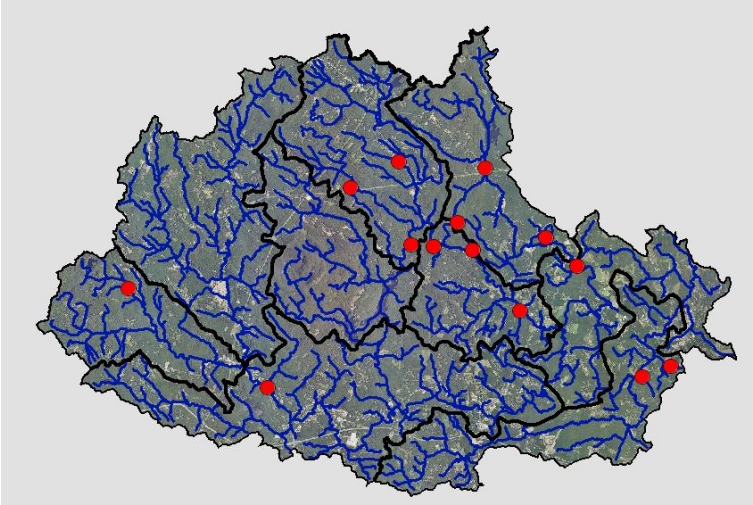

Figure B.2 – Locations of survey sites where banded sunfish were recorded in the Lamprey River watershed.

Black Crappie
(*Pomoxis nigromaculatus)*

Black crappies are a species of sunfish native to the Mississippi drainage area. They have been introduced to a number of New Hampshire water bodies. They are popular with anglers as an excellent tasting panfish. Black crappies prefer lakes, ponds, and large slow rivers with aquatic vegetation.

Black crappies are not usually captured during electrofishing surveys, but three incidental records of black crappie from seine and dip net surveys targeting bridle shiners or other species of concern occurred. These records are from a ponded section of the Lamprey River in Raymond, the North River in Nottingham, and upstream of the McCallen Dam in Newmarket. Black crappies in the North River likely originated from a known population in Pawtuckaway Lake, which drains into the North River from an outlet at the north end of the Lake. The population upstream from the dam in Newmarket is popular with anglers, especially during ice fishing season.

maximum length: 51 mm
minimum length: 38 mm
average length: 45 mm

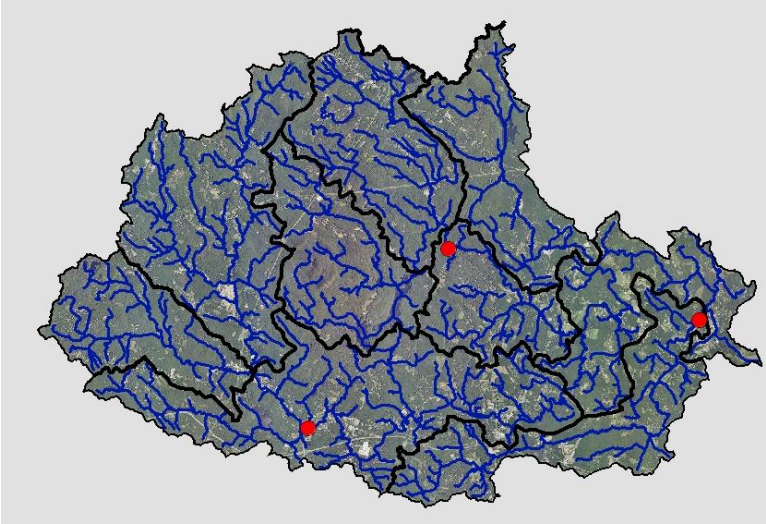

Figure B.3 – Locations of survey sites where black crappies were recorded in the Lamprey River watershed.

Blacknose Dace
(Notropis heterolepis)

Blacknose dace are found in rocky streams with a moderate to swift current. Less streamlined than their relative, the longnose dace, they take advantage of small pools and slower flowing water along the margins of streams with a swift current. They feed on a variety of invertebrates and algae. They are more common in small headwater streams than in larger rivers. Often found associated with brook trout, their higher temperature tolerance gives them a wider distribution throughout New Hampshire. They are considered tolerant of pollution and habitat alteration. Blacknose dace can be found in both disturbed and undisturbed habitats.

Blacknose dace are surprisingly rare in the Lamprey River watershed, compared to watersheds to the north and west where they are among the most common

species in rocky, headwater streams. Blacknose dace were found in four sites in the Lamprey River watershed, one site in the Little River subwatershed and three sites in the Lamprey River Headwaters subwatershed. Two of the sites had only one individual. The largest number of blacknose dace (26) was recorded in Hartford Brook. The second largest number (9) was recorded in the Little River.

maximum length - 93 mm
minimum length – 53 mm
average length – 90 mm

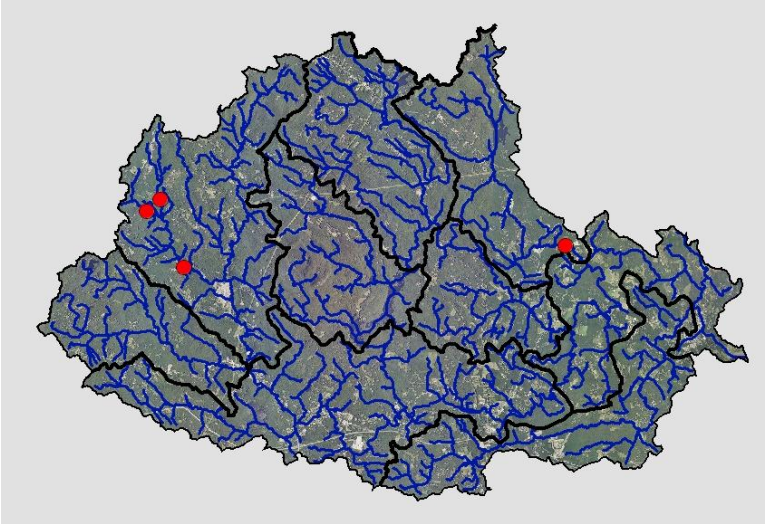

Figure B.4 – Locations of survey sites where blacknose dace were recorded in the Lamprey River watershed.

Bluegill
(Lepomis macrochirus)

The bluegill is a species of sunfish that has been introduced into most water bodies in New Hampshire and is now widespread. Bluegills inhabit ponds, lake shores, or slow flowing rivers with aquatic vegetation. They are often found with pumpkinseed sunfish. Bluegills thrive among thick aquatic vegetation where they feed on invertebrates and small fish. Like other sunfish, they lay eggs in shallow circular depressions, excavated by males, along the shoreline. Males aggressively defend their nests. Bluegill females can lay up to 27,000 eggs and they remain reproductively active as long as water temperatures are suitable, which in some years can extend into late fall. Bluegills have a high tolerance for warm water temperatures and are considered tolerant of pollution and habitat alteration (Grabarkiewicz and Davis 2008).

Bluegill sunfish were captured at 9 of 105 sites (9%), three of which were seine surveys. The bluegills captured in rivers or streams were found downstream of a lake, pond or a slow moving section of river. The total number of bluegills recorded was 34, which was 0.8% of the total fish count (4,226). The largest number of bluegills caught at one site was 16 in the upper North River.

maximum length: 176 mm
minimum length: 39 mm
average length: 92 mm

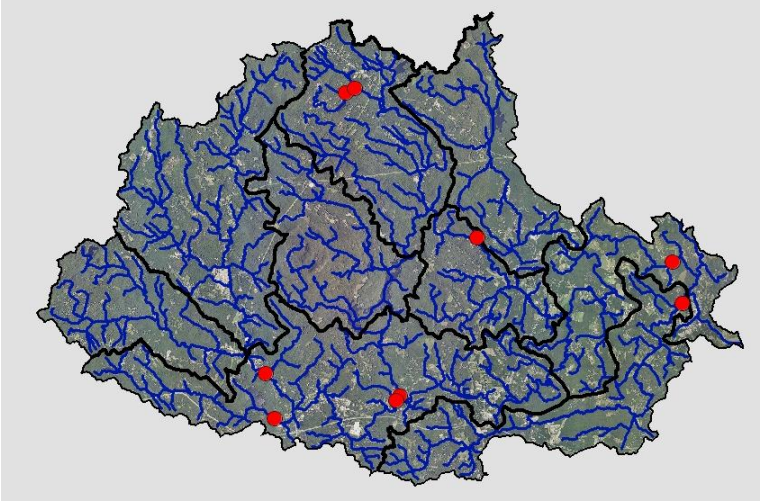

Figure B.5 – Locations of survey sites where bluegill were recorded in the Lamprey River watershed.

Bridle Shiner
(Notropis bifrenatus)
NH Threatened

The NH threatened bridle shiner is a small, short-lived species in the minnow family. Once common in suitable habitat from Ontario to North Carolina along the East Coast, bridle shiner populations have suffered significant declines over the last few decades. Only one population of bridle shiners remains in Pennsylvania, where the species was once considered abundant (Finger 2001).

Bridle shiners depend on communities of dense, submerged aquatic vegetation for survival (Harrington 1946). This habitat can be found along the shorelines and coves of lakes and ponds, the backwaters of larger rivers, and in slow flowing streams. During every phase of their life cycle, bridle shiners use aquatic plants. Spawning bridle shiners congregate in open spaces above dense stands of aquatic plants such as milfoil (*Myrophillum*). Recently hatched juvenile bridle shiners make use of nursery habitat found among aquatic vegetation with thick foliage, including milfoil, coontail (*Ceratophyllum*), and stonewort C*hara*), that grows lower in the water column. In the Lamprey River, bridle shiners were most often observed among stands of floating heart (*Nyphoides cordata*) and pondweed (*Potemegeton*). The presence of healthy aquatic plant communities is critical to maintaining the populations of bridle shiners that inhabit the slow moving sections of the Lamprey River in the Middle Lamprey River subwatershed.

Despite an extensive survey effort, the New Hampshire Fish and Game Department (NHFGD) documented bridle shiners at only 6 of 21 sites where they were present in 1938 (Bailey 1938). The reasons for the apparent extirpations from certain water bodies are not always clear and multiple causes are probable. In some waterbodies, submerged aquatic vegetation has been reduced to just a small fraction of the overall shoreline habitat. The loss of aquatic vegetation is a problem common to lakes and ponds with increasing levels of shoreline development (Radomski and Goeman 2001). Even marginal reductions in aquatic vegetation can make bridle shiners more vulnerable to predators, both

native and introduced, possibly reducing the population below the numbers required for replacement. Bridle shiners are known to coexist with bass and other introduced predators, like black crappie, in water bodies with intact shoreline habitat (NHFGD unpublished data). Removal of aquatic vegetation, whether on a small scale to create a beach or dock, or on a large scale, such as herbicide treatments to control invasive aquatic plants or to maintain recreational boating opportunities, will reduce the amount of habitat available to bridle shiners.

In some cases, bridle shiners have adapted to the impounded conditions upstream of a small dam, culvert, or bridge. Drainage of this upstream habitat may extirpate the local population of bridle shiners. Dam removal, culvert, or bridge replacement should proceed with caution in bridle shiner habitat. Sediment deposition upstream of the dam might have filled in the original wetland, pond, or slow flowing stream habitat that the bridle shiners inhabited before the construction of the dam or road. Rapid draining of the impoundment might result in a narrow channel with riffle habitat that is unsuitable for bridle shiners. Draw down of the impoundment should occur slowly to give aquatic plants time to adjust to the new water level.

The Bunker Pond Dam, on the Lamprey River in Epping, was removed in 2011. The bridle shiner population upstream of the dam is now restricted to a small pool upstream of the Route 27 bridge and a short stretch of river just above the old impoundment. Fortunately, a slow draw down in the spring of 2011 allowed bridle shiners to adjust to the new water level. NHFGD biologists will monitor this population to assess its ability to adapt to the new habitat conditions as the river continues to adjust to the dam removal.

As visual foragers, bridle shiners are sensitive to water clarity and are, therefore, susceptible to the effects of eutrophication and siltation (Harrington 1946). Declines in water quality have been associated with urbanization, which has been shown to alter fish communities (Weaver and Garman 1994). Eutrophication has the combined effect of reducing visibility, altering aquatic plant communities, and reducing oxygen levels. Bridle shiners are known to exist in dark or tea colored water, yet they are unlikely to persist in areas with chronic turbidity issues resulting from land use activities in the watershed or persistent boat wakes. Naturally vegetated buffers, with a width of at least 15 m, should be maintained along the shorelines of water bodies known to support bridle shiner habitats (Desbonnet et al. 1994). Preventing nutrient and sediment loading into bridle shiner habitat from fertilizers, failed septic systems, and stormwater runoff throughout the contributing watershed is critical (Jennings et al. 2003). An increased focus on water quality monitoring on the Lamprey River in the town of Raymond, where bridle shiners occupy only a fraction of the available habitat, might help identify changes in water quality that might be affecting aquatic habitat in that reach.

maximum length: 52 mm
minimum length: 38 mm
average length: 48 mm

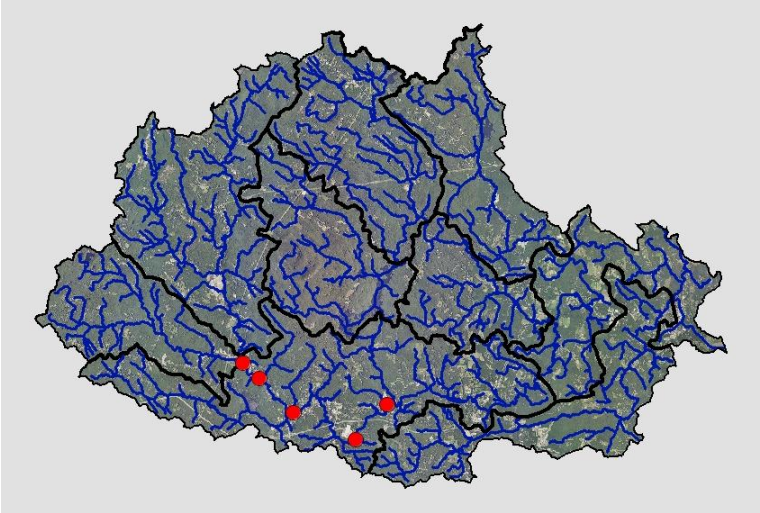

Figure B.6 – Locations of survey sites where bridle shiners were recorded in the Lamprey River watershed.

Brook Trout
(Salvelinus fontinalis)

Brook trout are members of the salmon family, although they are more closely related to Arctic char and lake trout than they are to salmon. Adapted to cold water streams, brook trout are rarely found in waters that exceed an average monthly temperature of 20^0C (68^0F) in July or August. Brook trout are powerful swimmers and are often found in steep, cascading mountain streams where no other fish are present. Although some individuals live their entire lives in one small stream, radiotagged brook trout have been documented to move many

miles in search of thermal refuge, spawning habitat, or quality foraging areas. Brook trout are “sit and wait” predators, usually taking up residence in a pool where they feed on both aquatic and terrestrial invertebrates. Spiders, beetles, and other terrestrial invertebrates that fall into streams are an important part of brook trout diets, especially in the spring. Brook trout seek out gravel beds with upwelling groundwater, often in small headwater streams, for spawning. Eggs are laid in small excavated nests in gravel, called redds, where they incubate through the winter and hatch in the early spring. Brook trout are more common in northern New Hampshire where cooler summer air temperatures maintain suitable summer water temperatures. As one moves south, brook trout become increasingly dependent on groundwater streams as a steady source of cool water in the summer.

Wild brook trout are rare in the Lamprey River watershed. They are restricted to small, spring fed streams in the North Branch River, Lamprey River Headwaters, North River, Middle Lamprey, and Lower Lamprey River subwatersheds. Brook trout were documented at 11 of 105 sites, although some of those sites contained hatchery raised trout. Of the sites where wild trout were captured, only 6 streams contained both juvenile trout and suitable habitat to support naturally reproducing brook trout populations. Of these 6 streams, 2 showed evidence of habitat degradation and fragmentation from driveway or road crossings.

Brook trout are sensitive to habitat disturbance. An intact riparian zone provides both shade and prey in the form terrestrial invertebrates. Removal of streamside vegetation can cause a stream to become too warm to support brook trout. Impervious surfaces and undersized culvers increase peak flows and cause erosion and sediment deposition, which can fill pool habitat and bury spawning gravel. Fragmentation is an important limiting factor when it comes to maintaining healthy brook trout populations, because impassable stream crossings prevent brook trout from accessing critical habitat, such as a cold stream in the summer or spawning habitat in the fall. Promoting groundwater recharge by limiting impervious surfaces and using LID stormwater practices is critical for protecting brook trout populations in the remaining spring-fed streams of southern New Hampshire.

Table B.1 – Number of brook trout caught in streams with evidence of natural reproduction.

stream name	town	# trout
Wednesday Hill Brook	Lee	70
Aunt Mary Brook	Candia	30
Rum Brook	Epping	28
unnamed stream (Little River subwatershed)	Lee	21
unnamed stream (North River subwatershed)	Lee	8
unnamed stream (Lamprey River Headwaters subwatershed)	Raymond	7

max length: 268 mm (10.5”) (stocked)
min length: 35 mm (1.5”)
average length: 98 mm (7”)

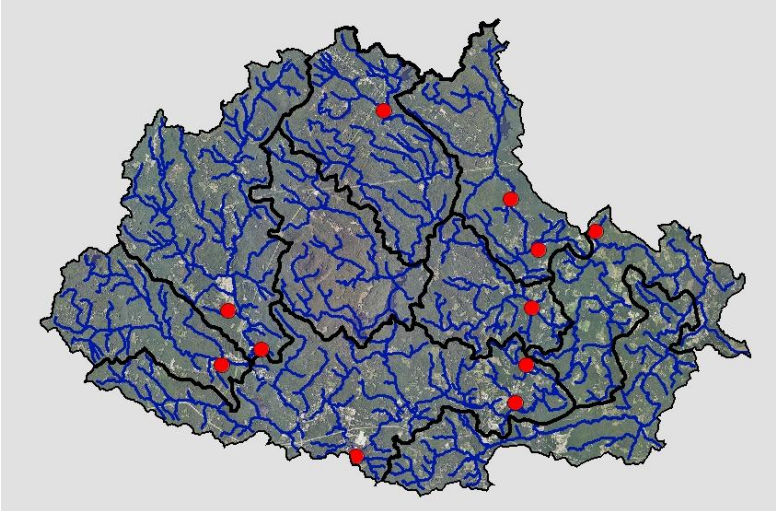

Figure B.7 – Locations of survey sites where brook trout were recorded in the Lamprey River watershed.

Brown Bullhead
(Ameiurus nebulosus)

Brown bullheads are members of the catfish family native to New Hampshire. They prefer lakes, ponds, and slow moving sections of rivers and streams, but they are widespread throughout New Hampshire and can be found in almost any habitat, including faster flowing streams with rocky substrate. Brown bullheads are extremely resilient and can tolerant dissolved oxygen levels of less than 1

part per million. For this reason, their presence should not be used as an indicator of good water quality. Brown bullheads survive in low oxygen conditions by gulping air into their air bladders and breathing through the skin. They can lie dormant for days in the mud of a dried up pond or stream.

Brown bullhead were often captured during the survey in sections of stream just below or above beaver ponds or wetlands. Their numbers are likely under-represented in the survey because of their preference for deeper water with a muddy bottom, a habitat that is difficult to sample by backpack electrofishing. Brown bullheads were captured at 22 of 105 sites (21%) with a total of 66 individuals counted, 1.6% of the total fish count (4,226).

maximum length: 194 mm
minimum length: 73 mm
average length: 126 mm

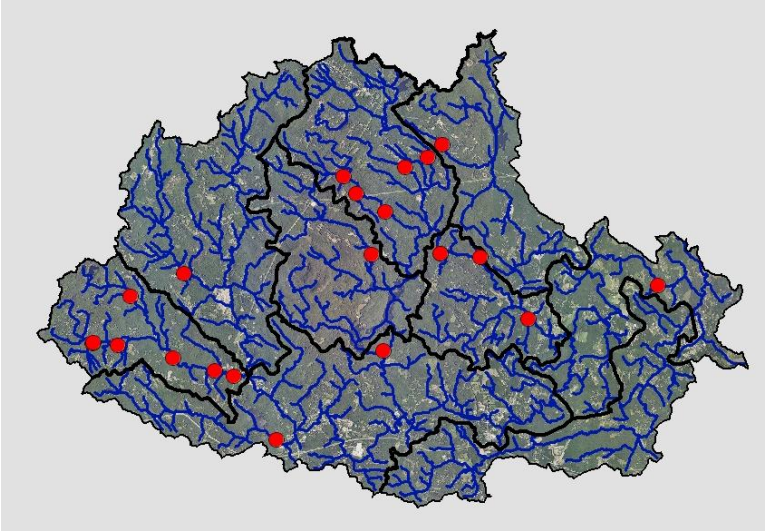

Figure B.8 – Locations of survey sites where brown bullheads were recorded in the Lamprey River watershed.

Chain Pickerel
(Esox niger)

Chain pickerel are found throughout New Hampshire. They are usually associated with aquatic vegetation which they use as cover for ambushing prey. They are voracious predators of other fish species, as well as snakes, frogs, ducklings, and even muskrats. Chain pickerel spawn in wetlands and marshy backwaters just after ice melt. Early spawning is an adaptation which allows their young to grow large enough to feed on the young of other fish species that hatch later in the spring. Chain pickerel are a relatively short-lived but fast-growing species, reaching lengths of up to 600 mm (2 feet) in their third year. Although they are usually associated with slow flowing backwaters and ponds, they are strong swimmers and sometimes are found in faster flowing habitat. Chain pickerel, and the pike family in general, are considered moderately tolerant of pollution and habitat disturbance. As visual predators, they can be impacted by excessive turbidity or the loss of aquatic vegetation.

Chain pickerel specimens were found at 31 of 105 sites (30% of the total) in all 9 subwatersheds of the Lamprey River watershed. Although it was the fourth most commonly encountered species, it was not one of the most numerous fish. A total of 59 chain pickerel were counted at all sites combined, which was 1.4% of the total number of fish counted. The largest number counted at one site was 10 in a small unnamed brook in the Pawtuckaway Pond subwatershed. As predators at the top of the food chain, it is not surprising that they are less abundant than their prey. Their widespread distribution is a reflection of the abundant wetland stream habitat in the Lamprey River watershed. The largest chain pickerel (285 mm) was captured below an impounded section of the stream that drains Onway Lake, at the site of an old mill structure.

maximum length: 285 mm
minimum length: 54 mm
average length: 92 mm

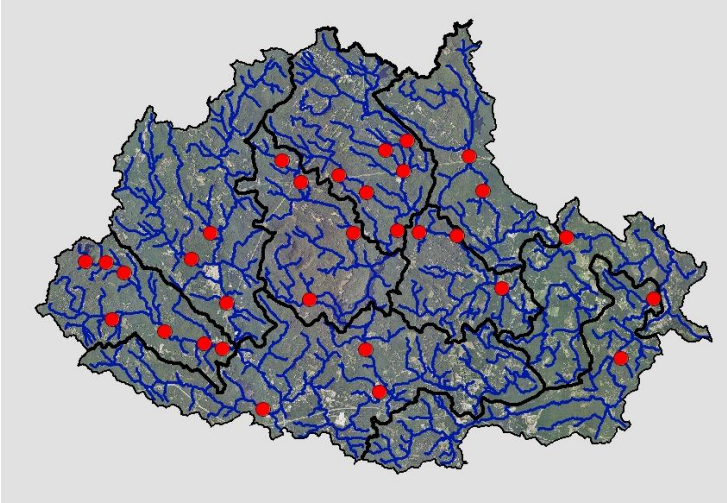

Figure B.9 – Locations of survey sites where chain pickerel were recorded in the Lamprey River watershed.

Common Shiner
(Luxilus cornutus)

Common shiners are found in small streams to medium sized rivers with unvegetated, gravel to rubble bottoms. They are a short lived species, rarely exceeding 200 mm in length. They tend to concentrate in pool habitat. Common shiners lay adhesive eggs in nests which they excavate in sand or gravel. They have also been known to lay eggs in the nests of other fish species. At first glance, common shiner habitat appears suitable for brook trout, but a higher temperature tolerance and a more omnivorous diet allows common shiners to thrive in warmer streams. During periods of high turbidity, common shiners have been found to shift from feeding on small invertebrates to a diet of plant matter. Their tolerance of warm temperatures and adaptable foraging strategy make common shiners relatively tolerant of habitat disturbance.

The common shiner was the 5th most common species found in the Lamprey River watershed. It was recorded at 30 of 105 sites in every subwatershed except for Pawtuckaway Pond. Common shiners were the second most numerous species captured at a total of 791 (19%) of the 4,226 fish counted in this survey. Fallfish, which are often associated with common shiners, were the most numerous species found in the survey. Fallfish and common shiners are difficult to tell apart at small sizes, so total counts of these species should be viewed with caution. The high abundance is somewhat skewed by the large number (282) of individuals captured in the rocky, riffle/pool habitat below the Bunker Pond Dam before it was removed in 2011. The second largest number of common shiners captured was 94 in the North River.

maximum length: 190
minimum length: 27
average length: 92 mm

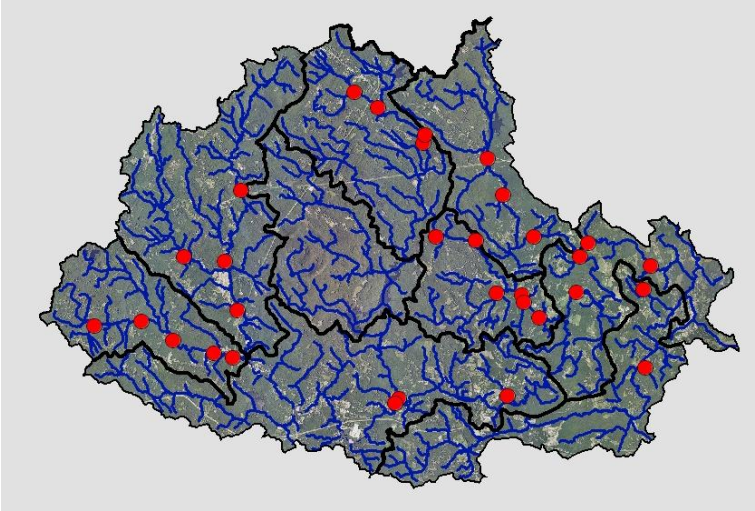

Figure B.10 – Locations of survey sites where common shiners were recorded in the Lamprey River watershed.

Common White Sucker
(Catostomus commersoni)

Common white suckers are one of New Hampshire's most common fish species. Extremely adaptable, they can be found in almost any habitat type. Larger individuals prefer lakes, ponds, or deeper sections of rivers and streams. White suckers migrate into swift flowing streams with gravel bottoms to spawn. Juvenile suckers are found in streams of all sizes where they forage along the bottom for invertebrates and algae. As a relatively long-lived and abundant species, white suckers have the potential to be indicators of aquatic ecosystem health, but their value as indicators is offset by their tolerance of low oxygen levels and habitat disturbance. White suckers are an important forage species for many predators. Adult white suckers are generally between 255 and 460 mm (10 to 18 inches), but some individuals can grow as large as 600 mm (about 2 feet) in length.

White suckers were the second most common fish encountered in this survey. They were captured in 39 of 105 sites (37%) and all 9 HUC12 subwatersheds in a wide variety of habitats. In total, 506 individuals were counted at the 39 sites, which is 12% of the total number of fish captured. The average length was 92 mm, which suggests that most of the white suckers captured in this survey were juveniles. Adult white suckers tend to inhabit deeper water which is difficult to electrofish. Most of the large specimens sampled were found in relatively wide sections of the mainstem Lamprey and North Rivers with deeper pools.

maximum length: 350 mm
minimum length: 24 mm
average length: 91 mm

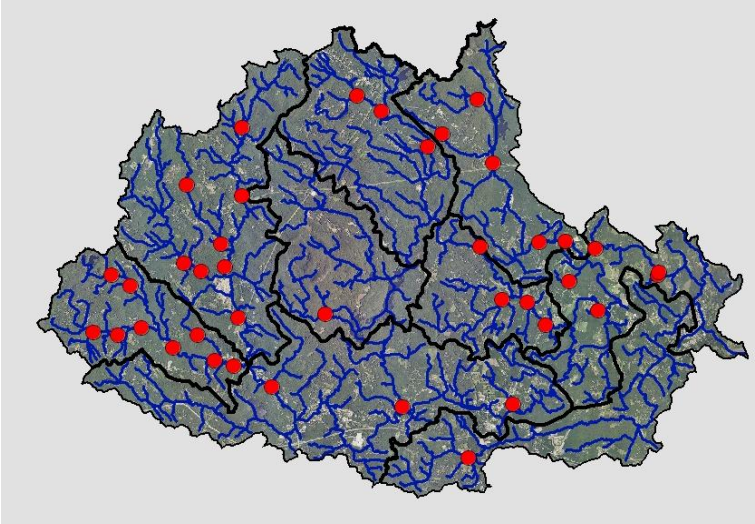

Figure B.11 – Locations of survey sites where common white suckers were recorded in the Lamprey River watershed.

Creek Chubsucker
(Erimyzon oblongus)

Creek chubsuckers are found in slow flowing rivers and streams with muddy substrate and aquatic vegetation. Like the white suckers, the creek chubsuckers spawn over gravel in swift current. Creek chubsuckers feed on a variety of invertebrates found on the bottom and among aquatic plants. Juvenile creek chubsuckers were frequently observed feeding in small schools during surveys for bridle shiners on the Lamprey River in Raymond. Creek chubsuckers are considered moderately pollution tolerant, but intolerant of habitat disturbance (Grabarkiewicz and Davis 2008). They rely on vision to forage and might be more sensitive to turbidity.

Creek chubsuckers were widespread throughout the Lamprey River watershed in suitable low gradient, wetland stream or river habitat. They were often found associated with other fish species, such as common sunfish (pumpkinseed), juvenile largemouth bass, and golden shiners, all of which depend on aquatic vegetation for food and shelter. As juveniles, creek chubsuckers have a black lateral band and can be confused with bridle shiners. The top two fish in the picture above are creek chubsuckers, while the bottom fish is a bridle shiner. Note that the black lateral band extends through the eye in the bridle shiner, but not in the juvenile creek chubsucker.

Creek chubsuckers were found in 23 of 105 (22%) sites in all 9 subwatersheds. A total of 88 creek chubsuckers were counted out of a total fish count of 4,226 (2.1%) at all survey sites combined. The largest number captured at one site was 20 in the lower North Branch River.

maximum length: 163 mm
minimum length: 33 mm
average length: 89 mm

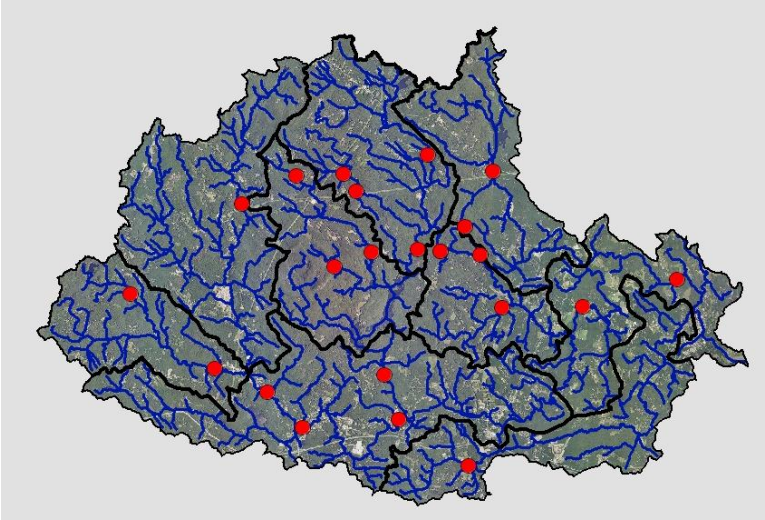

Figure B.12 – Locations of survey sites where creek chubsuckers were recorded in the Lamprey River watershed.

Fallfish
(Semotilus corporalis)

The fallfish are New Hampshire's largest minnow species and are among the most common fish species in the state. They can grow to 255 mm (10") in length and live over 10 years. They can be found in nearly any river or stream, but are most abundant in medium sized rivers with a mix of rocky and gravel substrate. Fallfish males build nest mounds out of pebbles, one stone at a time. Spawning is communal, although usually initiated by the nest builder, with a number of females and surrounding males using a single nest. Larger individuals sometimes move into smaller streams to spawn. Fallfish are generally considered indicators of river and stream habitat with year round flow.

Fallfish were the most commonly encountered species in this survey (43 of 105 sites or 43%). They were also the most abundant, with 1,238 fallfish counted (30.2% of the total number of fish). Juvenile fallfish are easily confused with common shiners, so the exact number might not be accurate. Without question, however, fallfish are among the most abundant fish species in the Lamprey River watershed. They were not found in two of the 9 subwatersheds (Piscassic River and Pawtuckaway Pond), but fewer sites were surveyed in these watersheds. Their abundance and distribution makes them an important source of forage for both aquatic and terrestrial species. The highest number of fallfish sampled at one site was 333 in the Lower Lamprey River downstream of Lee Hook Road.

maximum length: 228 mm
minimum length: 20 mm
average length: 92 mm

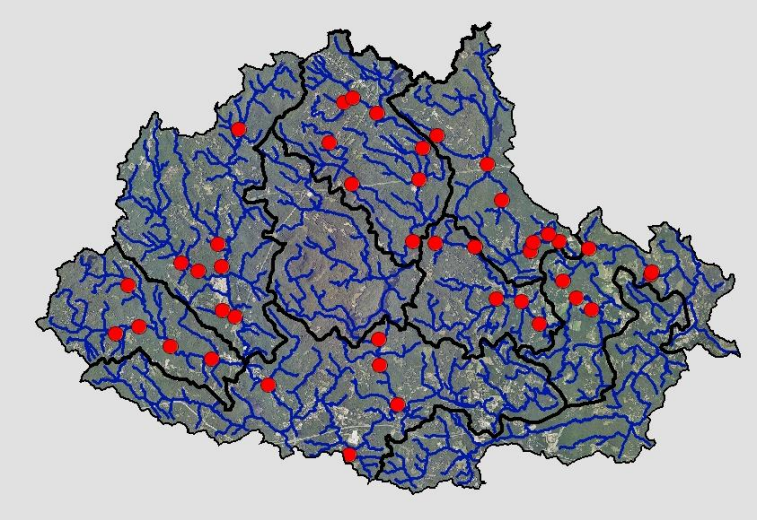

Figure B.13 – Locations of survey sites where fallfish were recorded in the Lamprey River watershed.

Golden Shiner
(Notemigonus crysoleucas)

Golden shiners are a common minnow species found throughout New Hampshire. They are usually associated with aquatic vegetation in lakes, ponds, or slow moving sections of rivers and streams. Golden shiners lay adhesive eggs that stick to stands of aquatic vegetation. Extremely prolific, the female golden shiner can lay 200,000 eggs multiple times during the growing season. Plant material makes up a large portion of their diet, but they are also capable of filter feeding and catching small invertebrates or fish. They are widely used as bait by anglers.

Golden shiners were the third most commonly encountered species, behind fallfish and white sucker. Not typically associated with the wadable streams that

are suitable for electrofishing, golden shiners in this survey were usually encountered in the outlet streams of active or abandoned beaver impoundments, wetlands, or ponds with abundant aquatic vegetation. Their widespread distribution reflects the abundant warm water vegetated stream habitat throughout the Lamprey River watershed. Golden shiners are usually extremely abundant in suitable habitat. The relatively low numbers in this survey (total count of 126 or 3% of the total number of fish recorded) are because most of the individuals captured were likely washed down from suitable habitat upstream.

The largest number of golden shiners captured at one site was 40 in a ponded section of the upper North Branch River. The largest individual was captured below Onway Lake.

maximum length: 156 mm
minimum length: 30 mm
average length: 91 mm

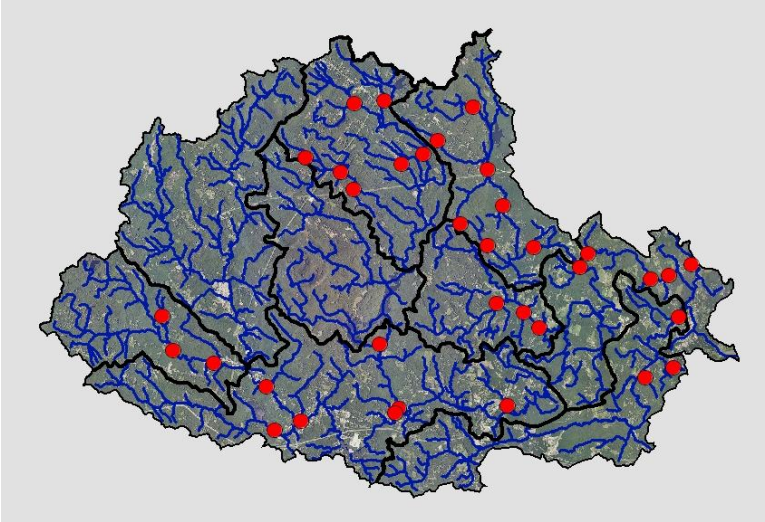

Figure B.14 – Locations of survey sites where golden shiners were recorded in the Lamprey River watershed.

Largemouth Bass
(Micropterus salmoides)

Largemouth bass are native to the Mississippi drainage area and the coastal watersheds of the southeastern United States. They have been widely introduced into the water bodies of New Hampshire and are now common. Largemouth bass prefer weedy backwaters, ponds, and lake shores with aquatic vegetation and a muddy substrate. They are often associated with golden shiners, brown bullheads, chain pickerel, and bluegill. Like the other members of the sunfish family, largemouth bass males defend a nest in shallow water during the spring. Largemouth bass have a higher tolerance for warm temperatures than do smallmouth bass. They may be found in shallow water well into the summer after smallmouth bass have moved into deeper water away from shore. The record largemouth bass taken by angling in New Hampshire was 10.5 pounds.

Largemouth bass were found throughout the Lamprey River watershed in all 9 subwatersheds. At 29 of 105 sites (28%), it was among the most commonly encountered species in the survey. Similar to golden shiners, largemouth bass encountered in this survey were usually downstream of a pond or wetland with more suitable habitat. The total number of largemouth bass captured was 92, which was just 2.2% of the total number of fish captured in this survey (4,226). This number would have been significantly greater if the survey had included lake and pond habitat in the Lamprey River watershed. The greatest number of individuals captured at one site was 20 in the Piscassic River. Only one individual captured was over 121 mm (4.75 in), which suggests that most bass encountered in this survey were juveniles, often trapped in the shallow pools of streams connecting larger ponds or wetland systems. The only adult bass measured was caught below the Wiswall Dam with a length of 251 mm (10”).

maximum length: 251 mm
minimum length: 30 mm
average length: 91 mm

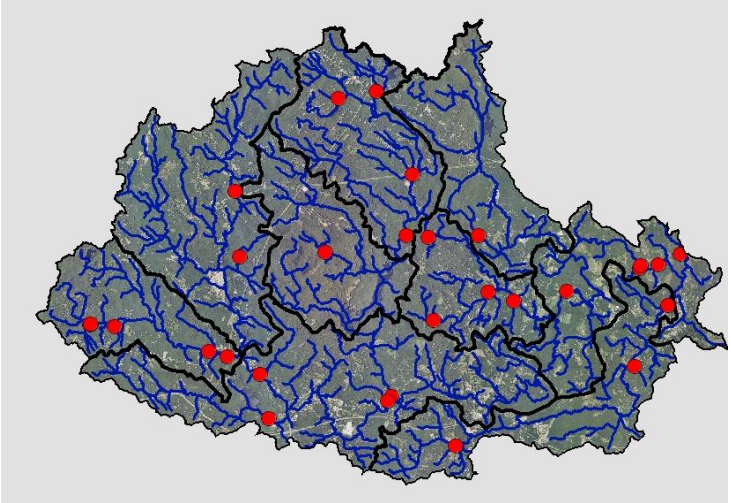

Figure B.15 – Locations of survey sites where largemouth bass were recorded in the Lamprey River watershed.

Longnose Dace
(Rhinichthys cataractae)

Longnose dace inhabit swift flowing riffle sections of rivers and streams with boulder, cobble, and gravel substrate. Their streamlined shape and small air bladders make them well adapted to living along the bottom in flowing water. They feed on invertebrates in the crevasses between rocks and boulders. During spawning in late May and early June, males defend territories where females lay adhesive eggs in protected cavities between rocks. Longnose dace generally prefer flows greater than 45 cm/sec and temperatures below 23^0C.

Longnose dace were found at 16 of 105 sites (15%). Although not one of the most common species encountered, they were relatively widespread, occurring

in 7 of 9 subwatersheds. Longnose dace were not captured in watersheds with an area less than 10 km^2, except for Dudley Brook in Raymond which was sampled at its confluence with the Lamprey River. Due to their specific flow requirements and preference for cool water relative to many of the other resident fish species in the Lamprey River drainage, longnose dace could be used as an indicator species.

If the Lamprey River watershed experiences an increase in impervious surfaces or an increase in water withdrawals that reduces summer flows, one would expect a reduction in the distribution of longnose dace, especially in the upper watershed. Longnose dace are also vulnerable to sedimentation that fills the interstitial spaces between cobble and boulders. This survey provides a baseline upon which to compare the status of longnose dace in future surveys. Particular focus should be given to watersheds that undergo rapid development.

A total of 287 longnose dace were counted (6.8%), 117 of which were caught at one lower river site downstream from Lee Hook Road. Excluding this site, the average number of longnose dace captured per site was 11.

maximum length: 145 mm
minimum length: 36 mm
average length: 95 mm

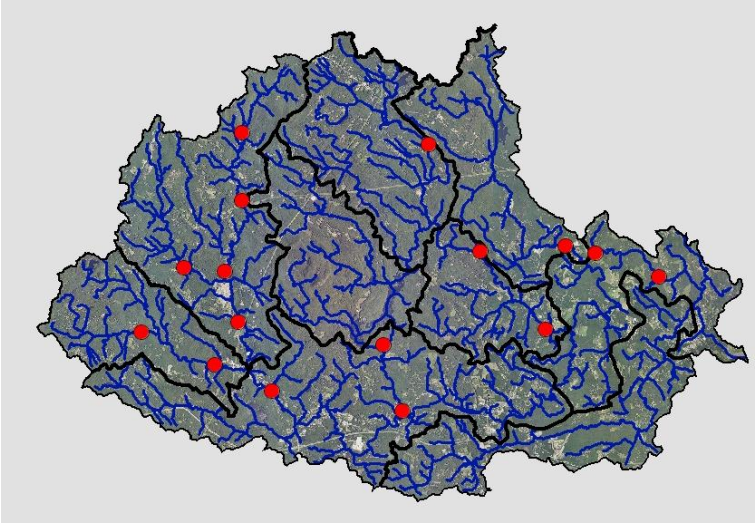

Figure B.16 – Locations of survey sites where longnose dace were recorded in the Lamprey River watershed.

Margined Madtom
(Noturus insignis)

Margined madtoms are a small species of catfish native to rivers and streams on the eastern slope of the Appalachian Mountains from New York to Georgia. They were likely introduced into New Hampshire due to their past use as a bait fish. The use of margined madtoms as bait is now illegal. Margined madtoms live in rocky sections of medium sized rivers, where they can be locally very abundant. Female madtoms lay clusters of eggs under stones in the quiet sections of riffles, after which the eggs are defended by the males. Madtoms feed on invertebrates living in the spaces between rocks and boulders. They are considered moderately tolerant of pollution.

Margined madtoms were found at 10 of 105 sites (10%). Eight of the ten records were from the North Branch River and Lamprey River Headwaters subwatersheds, with just one record each from the Middle and Lower Lamprey River subwatersheds. Margined madtoms were locally abundant in Hartford Brook in Deerfield, with 66 individuals counted. Margined madtoms might be increasing their range in the watershed. No margined madtoms were recorded in 16 electrofishing surveys conducted in the Lamprey River watershed between 1984 and 1986. In total, 139 margined madtoms (3.3% of the total for all fish) were counted in this survey.

maximum length: 145 mm
minimum length: 14 mm
average length: 97 mm

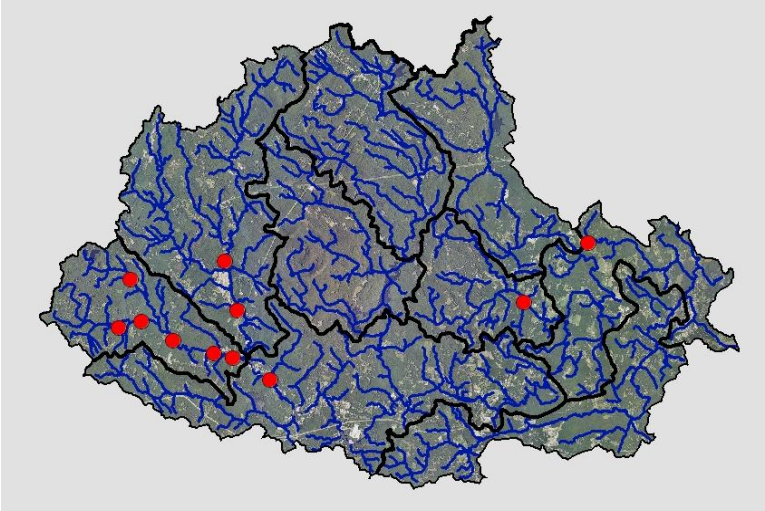

Figure B.17 – Locations of survey sites where margined madtoms were recorded in the Lamprey River watershed.

Pumpkinseed (Common Sunfish)
(Lepomis gibbosus)

Pumpkinseed sunfish, also known as common sunfish, are an adaptable species capable of living in both lacustrine and riverine habitats. They are usually found associated with aquatic vegetation, but in rivers they can be found in the pools of faster moving sections if slower flowing reaches are nearby. Pumpkinseed males excavate a circular nest in shallow water, often in groups or colonies. Females spawn with males in multiple nests where the eggs are aggressively defended by the males until they hatch.

In the Lamprey River, pumpkinseeds were usually found in slow flowing water with aquatic vegetation. Individuals captured in higher gradient, faster flowing reaches were usually found below a pond or wetland, often with beaver activity.

Pumpkinseed sunfish were found at 25 (24%) of 105 sites in all 9 subwatersheds. In total, 149 pumpkinseeds were counted out of a total fish count of 4,226 (3.5%). The greatest number of individuals captured at one site was 80 at the upstream end of a wetland in the upper North Branch River. The second highest number of pumpkinseeds captured was 15 at the site of an old mill downstream from Onway Lake.

maximum length: 186 mm
minimum length: 39 mm
average length: 87mm

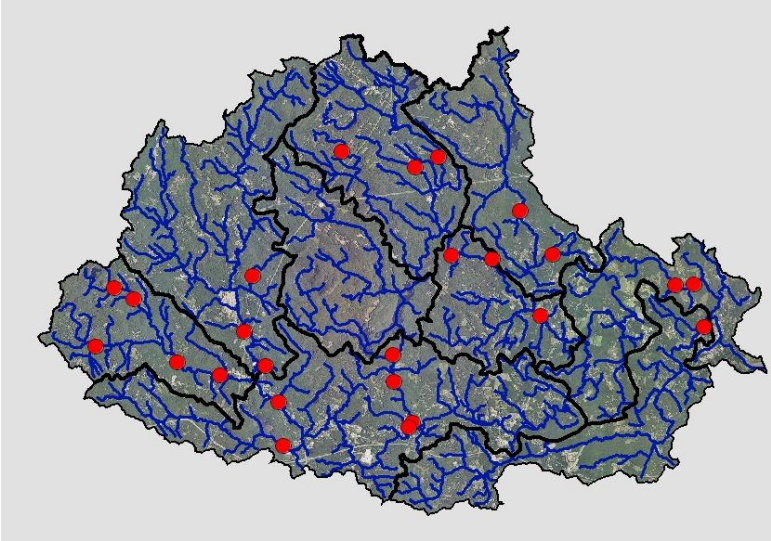

Figure B.18 – Locations of survey sites where pumpkinseeds (common sunfish) were recorded in the Lamprey River watershed.

Redbreast Sunfish
(Lepomis auritus)

Redbreast sunfish are native to New Hampshire and can be found throughout the state, although they are more common in southern watersheds. Unlike the other sunfish species found in New Hampshire, redbreast sunfish are less dependent

on aquatic vegetation as habitat. They prefer slow-to-moderate flowing sections of medium/large rivers where they take advantage of fallen trees, overhanging shrubs, or large boulders for cover. Spawning takes place in shallow water in a nest excavated by the male. As visual predators with a diet of invertebrates, redbreast sunfish may be vulnerable to extended periods of high turbidity.

Redbreast sunfish occurred at 5 of 105 sites (5%). The five records occurred in 3 subwatersheds: the Middle Lamprey River, the North River, and the Lower Lamprey River. A total of 69 redbreast sunfish were counted, which was 1.6% of the total fish count (4,226). The largest number of redbreast sunfish counted at one site was 30, captured below the Bunker Pond Dam in Epping before the dam was removed in 2011.

maximum length: 173 mm
minimum length: 30 mm
average length: 95 mm

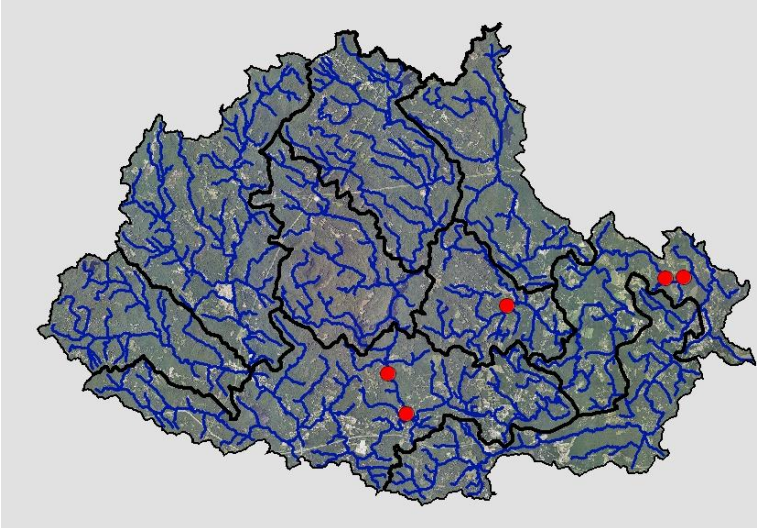

Figure B.19 – Locations of survey sites where redbreast sunfish were recorded in the Lamprey River watershed.

Redfin Pickerel
(Esox americanus americanus)
NH Species of Concern

Redfin pickerel are the smallest members of the pike family, attaining a maximum length of about 12 inches. They are native to the Atlantic coastal plain and reach the northern extent of their range in New Hampshire. Although redfin pickerel are relatively common in southern New England, populations in New Hampshire are limited to lower-elevation rivers and streams along the coastal plain in the lower Merrimack and southern coastal drainage areas. These aquatic habitats are rapidly becoming degraded due to increasing development pressure. Redfin pickerel are listed as endangered in Maine, with just a few isolated populations.

These fish frequent shallow weedy backwaters with stands of aquatic vegetation or thick overhanging grasses and shrubs. They spawn in early spring by laying strings of eggs over vegetation or submerged branches in shallow water. They are often found in smaller watersheds than the chain pickerel occupies. In New Hampshire, they are frequently found in streams flowing through abandoned beaver ponds in very small watersheds that can dry up in some years.

Redfin pickerel were found at 10 of 105 sites (10%). Their distribution was restricted to lower elevation sites in the Middle Lamprey River, Piscassic River, North River, and Lower Lamprey River subwatersheds. The Piscassic River subwatershed appears to have widespread suitable habitat for redfin pickerel and the fish are probably more common than indicated by this survey. Redfin pickerel were found in or near wetland habitat as well as in very small streams. They were found in clear, cold streams as well as muddy, turbid water. Many of the sites where redfin pickerel were found showed signs of habitat degradation in the form of riparian vegetation removal, bank erosion, and undersized/perched culverts. In total, 58 redfin pickerel were captured (1.4% of the fish total). The largest number of individuals captured at one site was 20 in the Piscassic River subwatershed.

maximum length: 190 mm
minimum length: 54 mm
average length: 106 mm

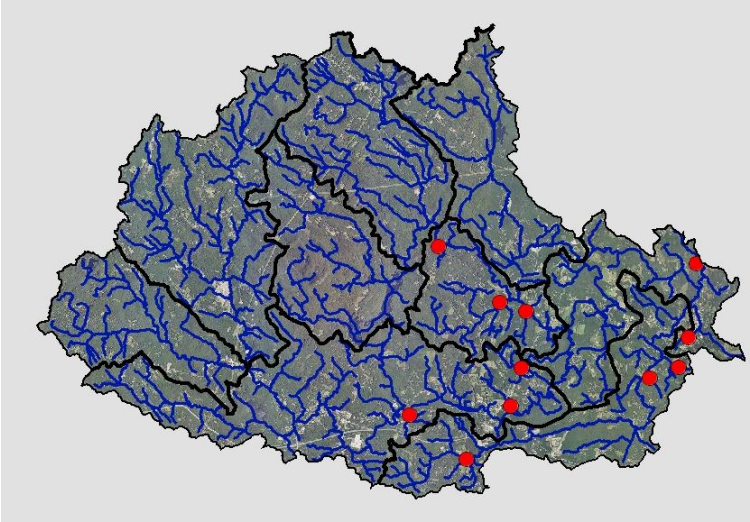

Figure B.20 – Locations of survey sites where redfin pickerel were recorded in the Lamprey River watershed.

Smallmouth Bass
(Micropterus dolomieui)

Smallmouth are native to the Great Lakes and Mississippi drainage area of the central United States. They were introduced into New Hampshire in the mid-1800s and are now widespread. Smallmouth bass prefer clear, rocky areas of lake and pond shores or medium sized to larger rivers. They use boulders and fallen trees as cover to ambush prey including small fish, crayfish, and insect larvae. They are less tolerant of warm temperatures than are largemouth bass and tend to move into deeper water during the summer. Smallmouth bass spawn near shore in the spring when water temperatures rise above 15^0C (59^0F). Males aggressively defend a nest containing the fertilized eggs of multiple females. Males will continue to defend the fry after they emerge from the nest, moving in a

school for about a week before they disperse. Smallmouth bass are extremely popular with anglers as a strong fighting fish prone to leaping from the water when hooked.

Smallmouth bass were found at 5 of 105 sites (5%). In all, 61 smallmouth bass were captured, or 1.4% of the total fish count (4,226). Small headwater streams were the focus of this survey, so smallmouth bass were probably under-represented. They were found primarily in boulder and cobble riffle habitat in wider river sites in the North Branch River, Middle Lamprey, and Lower Lamprey River subwatersheds. The Wiswall Dam site had the greatest number of smallmouth bass (33), as well as the largest individual (281 mm / 11 inches). Fishing for stocked trout is popular downstream from the Wiswall Dam, but the number of anglers targeting smallmouth bass in this or other sections of the Lamprey River is not known.

maximum length: 281 mm
minimum length: 49 mm
average length: 95 mm

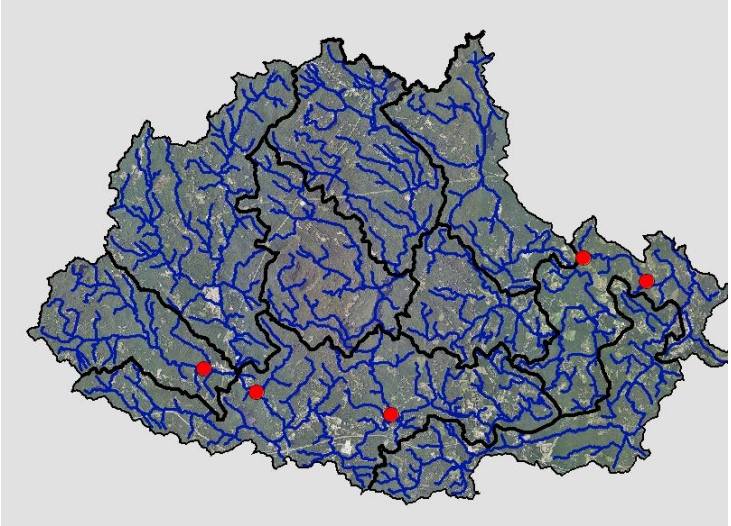

Figure B.21 – Locations of survey sites where smallmouth bass were recorded in the Lamprey River watershed.

Swamp Darter
(Etheostoma fusiforme)
NH Species of Concern

With a maximum length of 2 inches and a life span of shorter than two years, the swamp darter is New Hampshire's smallest and shortest-lived species. Swamp darters have a patchy distribution along the Atlantic coastal plain from North Carolina to southern Maine, where they are listed as threatened. Swamp darters are usually found in vegetated backwaters and pond shorelines, but they also inhabit gravel or sandy sections of river and streams. Little is known about swamp darter life history. They are thought to spawn in the spring among aquatic vegetation and their diet consists of small insect larvae. Swamp darters are difficult to capture and, as a result, they might be more widely distributed than records indicate. Due to their short life span, however, swamp darters might be susceptible to extirpation as their habitat becomes degraded. Removal of aquatic vegetation and draining or filling of wetlands extirpate local populations. Swamp darters are a species of conservation concern in New Hampshire, because their range is limited to southeastern New Hampshire, where aquatic habitats are increasingly degraded by expanding development.

Swamp darters were found at only 2 of 105 sites (2%) in this survey, with a total of 4 individuals counted. The species is probably more common than the survey record indicates. Small seines and dip nets are more effective than backpack electrofishing for capturing swamp darters. Swamp darters were found in the upper Little River downstream of Mendum's Pond and the mouth of the Piscassic River in Newmarket. Suitable swamp darter habitat is common in the Lamprey River watershed. A targeted survey for swamp darters in the watersheds of southeastern New Hampshire would help determine the relative importance of the Lamprey River watershed for conserving this species.

maximum length: 39 mm
minimum length: 28 mm
average length: 32 mm

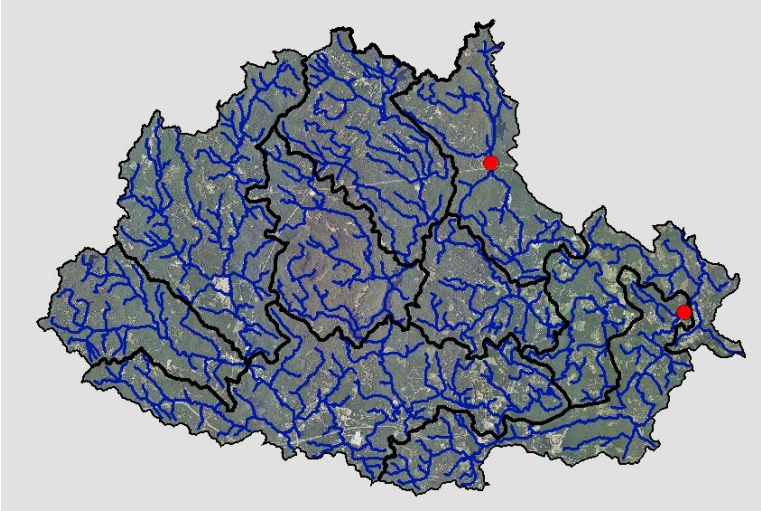

Figure B.22 – Locations of survey sites where swamp darter were recorded in the Lamprey River watershed.

Yellow Bullhead
(Ameiurus natalis)

Yellow bullheads are native to the midwestern and southeastern United States. They were first introduced in New Hampshire into the Merrimack River watershed and have now been spread to many coastal rivers. Yellow bullheads prefer faster flowing, more riverine habitats than brown bullheads, but much overlap exists between the two species. Eggs and fry are guarded by both parents in shallow nursery areas with adequate cover. They are similar to brown bullheads in size, reaching lengths up to 18 inches (457 mm) and weights of 3 pounds (1.4 kg).

Yellow bullheads were found in 5 of 105 sites (5%). They were restricted to larger river sites in the Middle Lamprey, North River, and Lower Lamprey River subwatersheds. In this survey, yellow bullheads were commonly associated with

smallmouth bass and redbreast sunfish. The total number of yellow bullheads captured was 31, which was 0.7% of the total number of fish captured at all sites combined (4,226). The largest number of individuals captured, 15, was below the Bunker Pond Dam in Epping.

maximum length: 190 mm
minimum length: 53 mm
average length: 130 mm

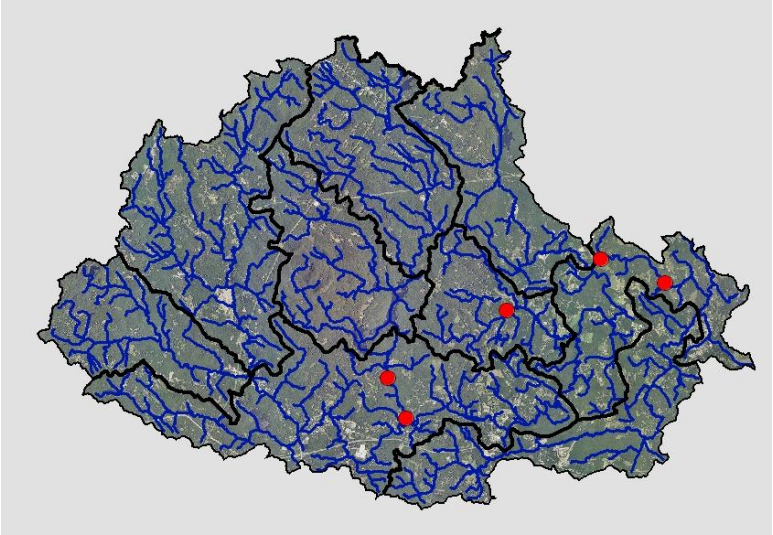

Figure B.23 – Locations of survey sites where yellow bullheads were recorded in the Lamprey River watershed.

Yellow Perch
(Perca flavescens)

The yellow perch are native to ponds, lakes, and slow flowing rivers throughout New Hampshire. They are usually abundant in stands of aquatic vegetation along shorelines in the summer. The species consumes a wide variety of invertebrates and small fishes. Spawning takes place in the spring as water temperatures warm along the shorelines. Eggs are strewn in long ribbons over dead vegetation and the branches of fallen trees. Each female is followed by a group of males attempting to fertilize the eggs as they are extruded. Between 3,000 and 60,000 eggs are laid, depending on the size of the female. The abundance of yellow perch in most waters makes them an important forage species for many predators, including loons, otters, and largemouth bass.

Yellow Perch were captured at 7 (7%) of 105 sites with a total of 14 (0.3%) individuals counted out of a total fish count of 4,226. Yellow perch are common throughout the Lamprey River watershed, but their preference for pond shores and deeper slow flowing sections of rivers and streams makes them uncommon in backpack electrofishing surveys. Yellow perch captured by electrofishing were downstream of ponds or in the Lower Lamprey River subwatershed. The largest number of yellow perch caught by electrofishing was 9 below the bridge on Lee Hook Road in Lee. The rocky ledge substrate at the survey site was not typical yellow perch habitat, but there were slower moving sections of river nearby. Yellow perch were commonly observed in the slow flowing sections of the Lamprey River in Raymond, where abundant juvenile perch were often associated with bridle shiners, golden shiners, pumpkinseeds, largemouth bass, and creek chubsuckers.

maximum length: 132 mm
minimum length: 47 mm
average length: 98 mm

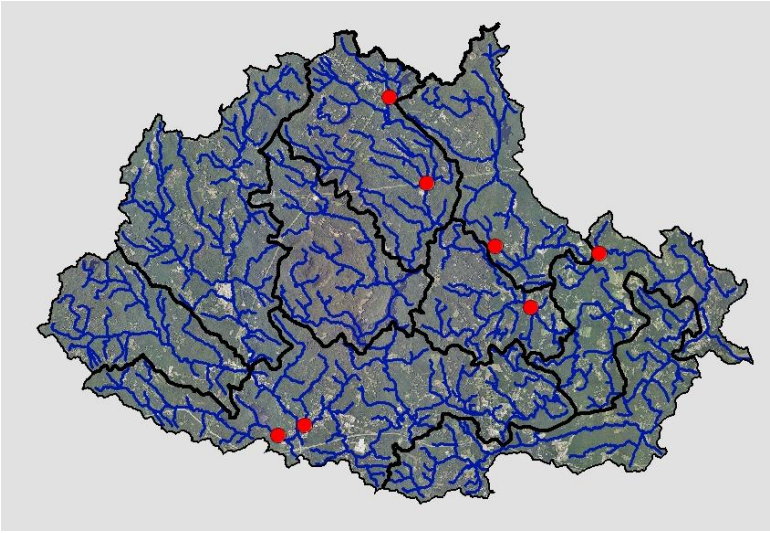

Figure B.24 – Locations of survey sites where yellow perch were recorded in the Lamprey River watershed.