

III. RIVERINE SYSTEM

The riverine system consists of the aquatic communities of flowing, non-tidal waters that lack persistent emergent vegetation, but may include areas with submerged or floating-leaved aquatic vegetation. The riverine communities in this classification are distinguished primarily by position of the stream in the watershed, and water flow characteristics. These communities are broadly defined, and may include two or more finer scale habitats, such as riffles, runs, springs, pools, and waterfalls; these habitats may have distinctive species assemblages. A riffle is a part of the stream that is shallow and has a comparatively fast current; the water surface is disturbed by the current and may form standing waves. A run is a part of the stream that has a moderate to fast current; the water is deep enough that the water surface is smooth and unbroken by the water current (although it may be disturbed by wind). A pool is a part of the stream that is deep and has a comparatively slow current; the water surface is calm unless disturbed by wind. The riverine communities are also distinguished by size of the stream. Large streams have an average width greater than 100 ft (about 30 m), medium streams are from 10 ft to 100 ft (about 3 to 30 m) wide, and small streams have an average width less than 10 ft (about 3 m). The fish assemblages in the riverine communities (especially in main channel streams) vary according to the watershed. A finer scale classification of streams that distinguishes types according to watershed needs to be evaluated.

This classification of riverine communities is based entirely on literature review and discussions with aquatic ecologists. Bob Daniels of the New York State Museum provided much of the information on fish communities. The Heritage program has done limited inventory work on streams; we do not currently have in our files sufficient field data for evaluating the riverine classification. Therefore the riverine classification is more tentative than the classification of estuarine, palustrine, and terrestrial communities; it needs to be tested with field surveys, and it will probably need further refinement after field data are evaluated.

A. NATURAL STREAMS

This subsystem includes streams in which the stream flow, morphometry, and water chemistry have not been substantially modified by human activities, or the native biota are dominant. The biota may include some introduced species (for

example, introduced fishes), however the introduced species are not usually dominant in the stream community as a whole.

1. Rocky headwater stream: the aquatic community of a small- to moderate-sized rocky stream with a moderate to steep gradient, and cold water that flows over eroded bedrock in the area where a stream originates. These streams may include alternating riffle and pool sections. Most of the erosion is headward, and deposition is minimal. Waterfalls and springs may be present; these are here treated as features of the more broadly defined community. The predominant source of energy to the stream is terrestrial leaf litter or organic matter; trees shading the stream reduce primary productivity. Characteristic fishes include eastern blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), slimy sculpin (*Cottus cognatus*) or mottled sculpin (*C. bairdi*), and brook trout (*Salvelinus fontinalis*). Common introductions are rainbow trout (*Salmo gairdneri*) and brown trout (*S. trutta*). These streams typically have mosses and periphytic algae present, but few larger rooted plants. Characteristic mosses include: *Brachythecium rivulare*, *B. plumosum*, *Eurhynchium riparioides*, *Hygroamblystegium tenax*, and *Rhizomnium punctatum*.

Distribution: throughout upstate New York north of the Coastal Lowlands ecozone

Rank: G4 S4

Sources: Slack and Glime 1985, C. L. Smith 1985.

2. Marsh headwater stream: the aquatic community of a small, marshy brook with a low gradient, slow flow rate, and cool to cold water that flows through a marsh, fen, or swamp in the area where a stream originates. Most of the erosion is headward, and deposition is minimal. Springs may be present; these are here treated as a feature of the more broadly defined community. The substrate is gravel or sand, with silt, muck, peat, or marl deposits along the shore. Characteristic fishes are fathead minnow (*Pimephales promelas*), northern redbelly dace (*Phoxinus eos*), golden shiner (*Notemigonus crysoleucas*), and central mudminnow (*Umbra limi*). Characteristic aquatic macrophytes include water milfoil (*Myriophyllum heterophyllum*), coontail (*Ceratophyllum demersum*), pondweeds (*Potamogeton* spp.), duckweed (*Lemna minor*),

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water stargrass (*Heteranthera dubia*), and waterweed (*Elodea nuttallii*).

Distribution: throughout New York State.

Rank: G4 S4

Example: Campbell Marsh, Jefferson County.

Sources: Gilman 1979; Haslam 1978; Peverly 1979; C. L. Smith 1985.

3. Midreach stream: the aquatic community of a stream that has a well-defined pattern of alternating pool, riffle, and run sections. Most of the erosion is lateral. Waterfalls and springs may be present; these are here treated as features of the more broadly defined community. Characteristic fishes include creek chub (*Semotilus atromaculatus*), pumpkinseed (*Lepomis gibbosus*), common shiner (*Notropis cornutus*), and trout-perch (*Percopsis omiscomaycus*) in pools; rosyface shiner (*Notropis rubellus*) at the head of pools; tessellated darter (*Etheostoma olmstedii*), greenside darter (*E. blennioides*), longnose dace (*Rhinichthys cataractae*), slimy sculpin (*Cottus cognatus*) or mottled sculpin (*C. bairdi*), and stonecat (*Noturus flavus*) in riffles; and bluntnose minnow (*Pimephales notatus*) and northern hog sucker (*Hypentelium nigricans*) in runs. Common introductions are rainbow trout (*Salmo gairdneri*), brown trout (*S. trutta*), and (in streams where it is not native) smallmouth bass (*Micropterus dolomieu*). Typical aquatic macrophytes include waterweed (*Elodea canadensis*) and linear-leaved pondweeds such as sago pondweed (*Potamogeton pectinatus*). More data on this community are needed.

Distribution: throughout New York State.

Rank: G4 S4

Example: French Creek, Chautauqua County.

Sources: C. L. Smith 1985; NHP field surveys.

4. Main channel stream: the aquatic community of a large, quiet, base level sections of streams where there are no distinct riffles. Main channel streams usually have clearly distinguished meanders. They are characterized by considerable deposition, with a relatively minor amount of erosion. Waterfalls and springs may be present; these are here treated as features of the more broadly defined community.

Characteristic fishes are deep-bodied fishes such as suckers (Catostomids) - especially redborses (*Maxostoma* spp.), sturgeon (*Acipenser* spp.), and shad (*Alosa* spp.). Many of the fishes are anadromous. The species of these genera present in any one stream varies with the watershed. Five major watersheds in upstate New York were distinguished by C. L. Smith (1985): the St. Lawrence River basin, Hudson River, Delaware River, Susquehanna River, and Allegheny River. Based on the fish communities, these watersheds could be treated as 5 separate community types; however an analysis of the invertebrate fauna and the flora of main channel streams in these watersheds may show a greater similarity in the invertebrate fauna and flora between watersheds than is found in the fish assemblages. Other characteristic fishes include warmwater fishes such as pickerel (*Esox americanus*), northern pike (*E. lucius*), largemouth bass (*Micropterus salmoides*), and smallmouth bass (*M. dolomieu*). Although the middle of a main channel stream is too deep for aquatic macrophytes to occur, the shallow shores and backwaters typically have rooted macrophytes. Mosses in the genus *Fontinalis* are characteristic of shallow areas. Two exotic weeds, Eurasian milfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*) may also occur along shores and backwaters. More data on flora and invertebrate fauna are needed.

Distribution: throughout the state north of the Coastal Lowlands ecozone.

Rank: G4 S4

Example: Mohawk River from Utica to the Hudson River

Source: C. L. Smith 1985.

5. Backwater slough: the aquatic community of quiet to stagnant waters in sloughs that form in embayments and old meanders that are partially cut off from a main channel stream by deposition of a levee. Aquatic vegetation is usually abundant. Characteristic aquatic plants include waterweed (*Elodea canadensis*), and milfoil (*Myriophyllum* spp.). Characteristic fishes are golden shiner (*Notemigonus crysoleucas*), pumpkinseed (*Lepomis gibbosus*), brown bullhead (*Ictalurus nebulosus*), and chain pickerel (*Esox niger*). More data on this community are needed.

Distribution: throughout upstate New York north of the Coastal Lowlands ecozone.

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Rank: G4 S2S3

Sources: C. L. Smith 1985; NHP field surveys.

6. Intermittent stream: the community of a small, ephemeral streambed with a moderate to steep gradient, where water flows only during the spring or after a heavy rain. Fauna is limited to species that do not require a permanent supply of running water, or that inhabit the streambed only during the rainy season. The streambed may be covered with mosses; a characteristic moss is *Bryhnia novae-angliae*. More data on this community are needed.

Distribution: throughout New York State.

Rank: G4 S4

Source: comments by Nancy Slack (of Russell Sage College).

7. Coastal plain stream: the aquatic community of slow-moving, often darkly-stained streams of the coastal plain of Long Island. Often there is abundant submerged vegetation: characteristic aquatic plants include pondweeds (*Potamogeton pusillus*, *P. epihydrus*), naiads (*Najas flexilis*, *N. guadalupensis*), waterweeds (*Elodea nuttallii*, *E. canadensis*, *E. densa*), stonewort (*Nitella* sp.), bladderwort (*Utricularia vulgaris*), duckweed (*Lemna minor*), and white water-crowfoot (*Ranunculus trichophyllus*). Watercress (*Nasturtium officinale*), an introduced species, is also common. Characteristic fishes include American eel (*Anguilla rostrata*), redbfin pickerel (*Esox americanus americanus*), eastern banded killifish (*Fundulus diaphanus diaphanus*), pumpkinseed (*Lepomis gibbosus*), banded sunfish (*Enneacanthus obesus*), and swamp darter (*Etheostoma fusiforme*).

Distribution: restricted to the Coastal Lowlands ecozone.

Rank: G3G4 S1

Sources: Beitel 1976; Greeley 1939; Muenscher 1939.

B. RIVERINE CULTURAL

This subsystem includes communities that are either created and maintained by human activities, or are modified by human influence to such a degree that stream flow, morphometry, water

chemistry, or the biological composition of the resident community are substantially different from the character of the stream community as it existed prior to human influence.

1. Acidified stream: the aquatic community of a stream that has received so much acid deposition that the pH of the stream has decreased significantly. The dominant anions in precipitation in the Northeast are sulfate and nitrate; the pH of this precipitation is less than 4.7. The biota of streams may be more sensitive to acidification than the biota of lakes. In the Algonquin Highlands of Ontario, several species of mayflies and stoneflies have disappeared from acidified reaches of streams. Fish kills have been observed in streams following acid pulses (for example, after snowmelt). More data on this community are needed.

Distribution: most common in the Adirondacks, may also occur throughout eastern New York in the Appalachian Plateau, Taconic Highlands, and Hudson Valley ecozones.

Rank: G5 S5

Source: Schindler 1988.

2. Canal: the aquatic community of an artificial waterway or modified stream channel constructed for inland navigation or irrigation. Most canals have a low gradient between locks; however, some feeder canals (built to supply water to another canal) have a steep gradient and are not navigable. Characteristic fishes include brook stickleback (*Culaea inconstans*), central mudminnow (*Umbra limi*), brook silverside (*Labidesthes sicculus*), and pikes (*Esocidae*).

Distribution: throughout New York State.

Rank: G5 S5

3. Ditch/artificial intermittent stream: the aquatic community of an artificial waterway constructed for drainage or irrigation of adjacent lands. Water levels either fluctuate in response to variations in precipitation and groundwater levels, or water levels are artificially controlled. The sides of ditches are often vegetated, with grasses and sedges usually dominant. Exotic or weedy species are common. Purple loosestrife (*Lythrum salicaria*), reedgrass (*Phragmites australis*), and reed canary grass (*Phalaris*

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arundinacea) often become established and may form dense, monospecific stands. Reed canary grass is often planted along ditches for erosion control. Other plants that are characteristic include sedges (*Carex* spp.) and cattails (*Typha* spp.).

Distribution: throughout New York State.

Rank: G5 S5

4. Industrial effluent stream: the aquatic community of a stream or a small section of a stream in which the temperature, chemistry, or transparency of the water is significantly modified

by discharge of effluent from an industrial, commercial, or sewage treatment plant. The water or sediments may contain elevated concentrations of heavy metals, PCBs, ammonia, and other pollutants. Relative to unpolluted streams of similar morphology, species richness of fishes is low, and pollution-intolerant species (e.g. lampreys, darters, sculpins) may be absent.

Distribution: throughout New York State.

Rank: G5 S5

Source: Reash and Berra 1987.