2.9 Wildlife and Fisheries

A very young fawn crosses the Schoharie Creek, summer 2006.

The Schoharie watershed is literally crawling with life. An amazing variety of habitats, people, plants, and animals are all interconnected in a fragile web of life, often called biodiversity. Every member is essential to keeping this web in balance. For example, the list of species required for the life cycle of a single tree may be in the hundreds or thousands. Moreover, the list of animals that will utilize a single fallen tree is in the thousands, but a few of the more well known creatures include squirrels, woodpeckers, grouse, bears, foxes, skunks, beavers, otters, mice, and shrews as well as worms, salamanders, beetles, ants, centipedes, sowbugs, and other insect larvae. There are twice as many species of beetles that live on dead and dying wood as there are species of mammals, birds, reptiles, and amphibians in the entire world (Kyker-Snowman, 2003). The fallen tree also provides critical habitat, steady moisture, and food for a multitude of mosses, fungi, trees, and vascular plants. If our fallen tree had been removed either during land use changes or during "clean up" efforts after falling, the ramifications would reverberate throughout the web. Certainly, this doesn't preclude us from taking a few trees for firewood, but if enough fallen trees are removed, the structure of the overall community would likely change.

The fallen tree example was meant to demonstrate the complexity of the web of life, and how eliminating one organism or habitat will ultimately affect many. It is very difficult to predict the consequences of removing individual strands from the web of life. Therefore, as an integral piece of the web, humans should work toward protection and preservation of the functions necessary for our survival. There are many ecosystem functions we receive from nature including cleaner air through vegetation respiration, cleaner water through soil and wetland filtration, soil formation from forests, pollination of food crops from our native insects, natural flood water retention/groundwater recharge, and pest control from our native bats, birds, and insects (e.g. dragonflies/damselflies). For example, bees pollinate about a

trillion apple blossoms each year in New York State, micro-organisms biodegrade much of our garbage as well as fallen leaves, sticks and other dead animal and plant matter, soil bacteria turn nitrogen into nitrate fertilizer and plants use up carbon dioxide and produce oxygen, thereby slowing global climate change. One example that affects us locally is the maintenance of healthy biodiversity and community structure, which if done properly can reduce the incidence of Lyme disease (LoGiudice et al., 2003); and forest fragmentation which can increase white-footed mouse populations, that in turn increases the human risk of exposure to Lyme disease (Allan et al. 2003). Therefore, the benefits of a healthy and diverse ecosystem extend far beyond clean air and water and into the fabric of human health and quality of life.

In the United States the economic services provided by a vibrant/healthy biological web of life (biodiversity) contribute an estimated $319 billion per year, or 5% of the gross domestic product (Pimentel et al., 1997). The worldwide benefits are estimated to be $2,928 billion per year, or approximately 11% of the world economy (Pimentel et al., 1997). Closer to home, the economic impact of the Schoharie hasn't been calculated, but anecdotally considering it's uses for recreation, water supply and aesthetics the economic value is most likely high. Clearly, our economic vitality depends on maintaining healthy biodiversity, which in turn indicates clean water and a good quality of life.

The plants and animals that inhabit the Schoharie watershed are suited to the habitats provided by our temperate climate. The other major factor is human alteration of the landscape. Pre-European colonization the watershed was predominantly forested with some small areas cleared by Native Americans for hunting. Early European settlers attempted to farm the land, but abandoned it soon after due to a short growing season, steep slopes and rocky and shallow soils. Between 1800 and the early 1900s gristmills, woolen mills, sawmills, the tanning industry, quarrying for bluestone, logging, furniture making, railroads and resorts cleared the Catskills of its forest cover. Since the early 1900s these industries have declined and areas that were previously cleared have grown back into forest, with approximately 85% of the Schoharie-basin's land cover being classified as forest in a 2001 NYCDEP analysis. The reaction of wildlife has varied to the changing land uses. A few, such as the timber wolf, eastern cougar, New England cottontail and passenger pigeon have been extirpated from the region (passenger pigeon is extinct worldwide); and some such as

Small wood turtle (Clemmys insculpta) spotted along the Schoharie Creek, summer 2006. The wood turtle is a species of special concern in New York State

tiger beetle and timber rattlesnake are disappearing from the Catskills. Beaver, pileated woodpeckers, and bald eagles were once gone from this region due to over hunting, habitat loss, and pesticide poisoning respectively, but have since returned with reduced hunting pressure, an increase in second-growth forests, and a ban on DDT. Some species, such as the bobcat, black bear, river otter and osprey are less common than they were prior to European colonization. However, other common species, such as the white tailed deer, raccoon, skunk, red fox, robin, and painted turtle have thrived.

We often focus on human-induced land use changes as the dominant factor in habitat and natural landscape changes. However, many wildlife and plant species also influence the landscape. Heavy deer browsing of seeds, seedlings, and saplings can dramatically alter the composition of a forest to encourage the growth of species that deer find less palatable (Curtis, 2004). Species imported from other areas that thrive in our region, often called invasive species, can also have dramatic effects on the landscape. For example, Japanese knotweed (*Polygonum cuspidatum*) is native to Asia, but has run rampant in the Schoharie basin choking out native species, diminishing recreation opportunities and possibly making soil more susceptible to erosion (more info in section 2.6). The wooly adelgid (*Adelges tsugae*), a small aphid-like insect pest native to China and Japan, is threatening to decimate our eastern hemlock (*Tsuga canadensis*) populations. Once infested, hemlock mortality rates range between 50%-99% (Orwig, 2002). The plant species most likely to replace hemlocks are hardwood tree species and possibly other invasive species. Ultimately, this will have a dramatic effect on the structure of these communities. For example, the distribution and abundance of brook trout and diversity of aquatic insects will likely decline

Tent caterpillars along the Schoharie Creek, summer 2006.

with the hemlock forests (Evans, 2002). Hemlock forests maintain stable, lower water temperatures and more stable hydrologic regimes (i.e. they don't dry up as much) than the hardwood forests that will likely replace them (Snyder et al., 2002). These are just a few examples of how, in a global society, careless actions that import and release invasive species can cause drastic changes in our ecological communities.

Tent caterpillar damage within the Schoharie Watershed, summer, 2006. Favorable climatic conditions were good, so many of these trees probably grew a second growth of leaves after the caterpillar population dwindled in late June.

Native pests often have native predators that control their populations. For example, the forest tent caterpillar (*Malacosoma disstria*) can cause a large amount of damage to Catskill forests. However, their population tends to be controlled by a natural predator fly (*Sarcophaga aldrichi*) whose population explodes following the explosion of the caterpillar's population and help bring the caterpillar populations back under control. A bacterial disease, known as "wilt" and cold, wet, weather conditions in early spring also help to control the caterpillar population. This demonstrates the checks-and-balances of native versus non-native pests. Native pests often have a naturally-evolved control measure that eventually bring the populations under control, but non-native species do not.

The upper Schoharie, and many of its tributaries, are primarily cold water streams, meaning they provide suitable water temperatures for organisms, such as brook trout and sculpins, which require cold water (less than 72˚ F (22˚C). The Schoharie main stem is stocked annually with 19,250 brown trout from the Prattsville fish barrier dam to the mouth of the Roaring Kill. Below the Prattsville fish barrier the primary sport fish species are smallmouth bass (*Micropterous dolomieu*) and walleye (*Stizostedion vitreum*). The fish barrier dam was constructed in 1939 to restrict the movement of bass upstream, and seemed to have some effect, but in the 1960s smallmouth bass were still the most abundant sport fish downstream of the Schoharie/East Kill confluence (Keller and Fieldhouse, 1993). Smallmouth bass in the Schoharie tended to grow very slow and were much smaller than

other streams in the region (Keller and Fieldhouse, 1993). Trout were the most abundant species above the East Kill/Schoharie Creek confluence. Gooseberry Creek, a Schoharie tributary near Tannersville, was stocked exclusively with brook trout and may provide sanctuary for these native trout. The upgrading of sewer treatment plants in the Schoharie basin, including the Tannersville STP on the Gooseberry Creek, should improve the fishery. Species collected since 1954 during NYSDEC fishery surveys upstream of the Prattsville fish barrier are available in Table 2.9.1. Interestingly, researchers found that over a relatively short period of time (3 years), modified-natural channel design restorations that incorporated fish habitats increased fish biomass, including trout biomass and numbers (Baldigo et al., 2006).

Table 2.9.1. Fish species collected since 1954 during NYSDEC fishery surveys upstream of the Prattsville fish barrier.

Common Name	**Scientific Name**
Creek chub	*Semotilus atromaculatus*
Common shiner	*Luxilus cornutus*
Pumpkinseed	*Lepomis gibbosus*
Golden shiner	*Notemigonus crysoleucas*
White sucker	*Catostomus commersoni*
Stone roller	*Campostoma anomalum*
Cutlips minnow	*Exoglossum maxillingua*
Marginated madtom	*Noturus insignis*
Brown trout	*Salmo trutta*
Brook trout	*Salvelinus fontinalis*
Rainbow trout	*Oncorhynchus mykiss*
Blacknose dace	*Rhinichthys atratulus*
Longnose dace	*Rhinichthys cataractae*
Tesselated darter	*Etheostoma olmstedi*
Largemouth bass	*Micropterus salmoides*
Slimy sculpin	*Cottus cognatus*
Stone cat	*Noturus flavus*
Bluntnose minnow	*Pimephales notatus*
Fallfish	*Semotilus corporalis*
Northern hog sucker	*Hypentelium nigricans*
Brown bullhead	*Ameirus nebulosus*
Banded killifish	*Fundulus diaphanous*
Smallmouth bass	*Micropterus dolomieu*
Yellow perch	*Perca flavescens*

It should be noted that a high-predatory warm-water species was sited often during the 2006 assessment in areas that would typically support a cold water fishery. These largemouth bass were stocked or escaped into the stream from adjacent ponds and could compete with trout for resources. However, they may also migrate to more suitable habitat conditions and/or suffer high mortality rates during the cold winter months.

Largemouth bass in the East Kill, summer 2006.

Wildlife of Stream Corridors and Conservation Recommendations for the Upper Schoharie Watershed, Greene County, March, 2007

The Upper Schoharie Watershed contains a high degree of biological diversity with a species assemblage that is unusual within the Hudson River Valley. Forests with features such as talus slopes, cliffs, and mature stands are habitat for plants and animals adapted to these conditions. The large, unfragmented nature of the forests creates favorable habitat for wide-ranging animals (such as black bear and bobcat) and wildlife that prefer forest interiors (such as black-throated blue warbler). It is likely that forests of the Upper Schoharie watershed are important breeding areas for raptors such as broad-winged hawk, Northern goshawk, and sharp-shinned hawk.

Forests that occur adjacent to the stream create habitat for a wide range of small mammals, including rarely seen moles, voles, and shrews, and fox, weasel, mink, beaver, and muskrat. The change in elevation from stream valley floor to Catskill peaks, and the presence of both evergreen and deciduous forests contribute to the watershed's biodiversity. High-altitude coniferous forests are habitat for the rare Bicknell's thrush and blackpoll warbler.

In the Upper Schoharie watershed, abundant streams with cobble beds, undercut banks, and streamside wetlands and forests are habitat for damselflies, dragonflies, stream salamanders, turtles, and frogs. The wood turtle lives almost exclusively in and near streams, while spotted turtles might be found in streamside wetlands. Riparian forests are particularly important breeding habitat for birds such as the Lousiana waterthrush and yellow-throated

vireo. Stream corridors are the preferred foraging habitat for the many bat species that are likely to occur in the watershed.

Grassy fields, open woods, and shrubby patches make important contributions to biodiversity of the watershed. These open and scrubby areas can provide nesting habitat for the wood turtle and shrubland bird species that are declining in New York State as old farms revert to forests. Young forests are habitat for Canada warbler, American woodcock, and ruffed grouse, while open shrublands and dense thickets are preferred by brown thrasher.

Many species, like American woodcock and wood turtle, require a complex of different habitats to complete breeding, foraging, overwintering, and migration portions of their life cycles. As a result, maintaining connectivity between the stream and the adjacent uplands is very important for biodiversity conservation. NYSDEC Species of Greatest Conservation Need (SGCN), included in the State Wildlife Plan, and Hudson Valley regionally rare species that may use the Schoharie basin are listed in Table 2.9.2. A complete list of potential species and an occurrence map is provided in Appendix C, and a map of rare species and significant ecosystems is provided in Figure 2.9.1.

Management Recommendations

Stream managers should consider the following general recommendations to maintain and protect important stream corridor habitats:

- Limit disturbance and protect both small and large stream corridor wetlands that provide significant habitat for amphibians, reptiles, and breeding birds in the watershed;
- Most shrubland breeding birds are relatively tolerant of human development if appropriate habitats exist, and unlike some grassland birds, do not require large habitat patches for breeding. While open lands should not be created at the expense of mature, unfragmented forests, agricultural and suburban landowners who maintain shrubby thickets in the uplands adjacent to stream corridors can support shrubland birds;
- Where possible, plant native species appropriate to the pre-existing or predicted ecological community for a site;

- Stream managers are encouraged to learn to recognize the Appalachian tiger beetle and other declining and threatened species and report observations to the NY Natural Heritage Program.

Riparian buffer widths can be established to conserve habitat function, in addition to water quality, hydrologic, and geomorphic functions. It is particularly important to maintain habitat connectivity needed by wildlife to complete their life cycles. To evaluate connectivity, consider the needs of indicator species, or species of conservation concern in the watershed.

- The forest area within 300 ft of the forest edge is considered "edge" habitat. Edge habitats support increased densities of deer and invasive plants, and are avenues for nest predators to enter forests. A minimum 300 ft forested stream buffer will protect forest health and provide better breeding habitat for forest wildlife;
- Riparian forests at least 50 acres in size with an average total width of at least 300 ft can provide forest interior habitat and should be highly valued. Breeding bird diversity increases substantially between 300 and 1,500 ft from the stream's edge;
- Most of the amphibian and reptile observations in this watershed are within or near stream corridors. Seek to create a minimum 500 ft forested buffer around stream corridor wetlands to provide terrestrial habitat required by stream- and vernal pool-breeding amphibians to complete their life cycles, and to protect wetlands from adjacent land uses;
- Stream buffers up to 1,000 ft will encompass most wood turtle nesting sites and summer habitats (wood turtles are on land during the spring and summer and over-winter in rivers). These buffers should be maintained along one or more miles of stream length to accommodate the yearly movements of wood turtles up and down the stream channel;
- Buffer widths of 30-100 ft should be maintained for riparian forest canopies to provide enough shading and cooling of streams to maintain trout populations. These buffers need to be nearly continuous. Some studies suggest 80% of banks

along a stream supporting trout populations must have forests at least 30 ft wide to provide sufficient shade for trout;

- Minimum buffers of 50-100 ft are often recommended to protect aquatic communities. Large woody debris deposited into streams provides important shelter for fish, and in particular for trout. At a minimum, a 50 ft buffer appears necessary to maintain sufficient woody debris inputs to streams. Riparian vegetation provides leaves and other forms of litter that feed macroinvertebrates. In turn, aquatic macroinvertebrates are the major food source for most freshwater fish. A minimum 100 ft buffer is recommended to protect aquatic macroinvertebrate and fish abundance.

Typically, the locations of wood turtle nesting sites are not known. However, stream managers can use the following information to identify possible nesting areas near the stream and maintain adequate buffer widths to protect nesting wood turtles:

- Wood turtles typically nest in sandy, bare areas well exposed to sunlight and close to water, but elevated. Usually, nesting areas are within 200 ft of the stream channel, but wood turtles will travel up to 2,000 ft from the stream to reach suitable nesting areas. Nesting sites are often exposed stream banks, but can include cultural features such as nearby railroad tracks, abandoned sand and gravel mines, utility right-of-ways, and meadows/fields with gravelly soils. Wood turtles will nest in corn fields and other recently disturbed areas. If possible, identify potential wood turtle nesting sites near streams and protect them. Buffers between the stream and suitable nesting areas should be used lightly or not at all, particularly during nesting season (May to July, peak in June);
- Where the wood turtle is likely to occur, maintain stream geomorphology with naturally elevated banks and gravel deposits (used for winter hibernation, basking, and nesting).

A number of stream corridor species depend on natural channel processes to provide habitat during parts of their life cycles:

- Stream salamanders are generally sensitive to siltation, scouring, nutrient enrichment, channelization, and diversion of water. Maintain natural stream processes and riparian buffers to protect salamander habitats. Spring salamander is probably the most sensitive species and is found in relatively unpolluted headwater streams of the Catskills;

- There is one known remaining occurrence of Appalachian tiger beetle in this watershed. There are only 10 rivers in NYS with populations of this species. The Appalachian tiger beetle (right) is typically found on riverside sand and cobble bars at the edges of forested streams. Stream management practices should maintain natural stream processes, including natural flooding regimes that prevent dense plant growth on cobble bars. Gravel mining and off-road vehicle use of sand and gravel bars can destroy beetle larvae.

Table 2.9.2. NYSDEC Species of Greatest Conservation Need and other species of conservation concern that may occur in the Upper Schoharie watershed (a complete list of species and NYNHP classification descriptions are available in appendix C) (Prepared by the NYSDEC Hudson River Estuary Program, Feb. 2007).

Predicted Terrestrial Vertebrate Species (source: Hudson River Valley GAP)

Terrestrial, vertebrate species that are predicted to occur within the watershed based upon presumed associations of species with habitats. See the HRV-Gap Analysis Project report to view predicted species distribution maps.

Key: TNC Status: For State and Global Rank explanations see www.nynhp.org; Legal Status: FE = Federal Endangered, FT = Federal Threatened, SE = State Endangered, ST = State Threatened, G = Game species, SC = State Special Concern; NYNHP Species: Rare species tracked by the NY Natural Heritage Program; NYSDEC SGCN: Species of Greatest Conservation Need included in State Wildlife Plan; Hudsonia Regional: Hudson Valley regional status: R = regionally rare, Rm = regionally rare migrant, S = regionally scarce, D = declining, V = vulnerable

Mammals		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**	**Regional**
Eastern Pipistrelle	Pipistrellus subflavus	G5, S3				R
Eastern Red Bat	Lasiurus borealis	G5, S5B, SZN			X	R
Hoary Bat	Lasiurus cinereus	G5, S4B, SZN			X	R
Indiana Myotis	Myotis sodalis	G2, S1	FE, SE	X	X	
Silver-haired Bat	Lasionycteris noctivagans	G5, S4B, SZN	SC		X	Rm
Woodland Jumping Mouse	Napaeozapus insignis	G5, S5				R
Long-tailed Shrew	Sorex dispar	G4, S4				R
Southern Bog Lemming	Synaptomys cooperi	G5, S4				R
Porcupine	Erethizon dorsatum	G5, S5				R
Black Bear	Ursus americanus	G5, S5	G			S

Fisher	Martes pennanti	G4G5, S4	G			S
Bobcat	Lynx rufus	G5, S4	G			V
Eastern Cougar	Felis concolor cougar	G5TH, SX	FE, SE		X	
River Otter	Lutra canadensis	G5, S5	G		X	S
Amphibians		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**	**Regional**
Jefferson Salamander	Ambystoma jeffersonianum	G5, S4	SC		X	
Jefferson Salamander Complex	Ambystoma jeffersonianum x laterale	G4, S3	SC		X	
Spotted Salamander	Ambystoma maculatum	G5, S5				V
Northern Dusky Salamander	Desmognathus fuscus	G5, S5				D, V
Longtail Salamander	Eurycea longicauda longicauda	G5, S2S3	SC	X	X	
Four-toed Salamander	Hemidactylium scutatum	G5			X	
Common Mudpuppy	Necturus maculosus	G5, S4			X	
Northern Red Salamander	Pseudotriton ruber ruber	G5, S3S4			X	
Northern Leopard Frog	Rana pipiens	G5, S5	G			R
Wood Frog	Rana sylvatica	G5, S5	G			V
Reptiles		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**	**Regional**
Wood Turtle	Clemmys insculpta	G4, S3	SC, G		X	
Timber Rattlesnake	Crotalus horridus	G5, S3	ST		X	
Smooth Greensnake	Opheodrys vernalis	G5, S4			X	D
Eastern Box Turtle	Terrapene c. carolina	G5, S3	SC		X	

Observed Breeding Birds (source: 1980-1985 Breeding Bird Atlas)

Breeding bird species known or suspected to be breeding within the watershed. The species list is derived from reports of observed breeding bird activity within Breeding Bird Atlas Blocks that overlap the watershed. Parties using these data for environmental review purposes do so at their own risk.

Key: TNC Status: For State and Global Rank explanations see www.natureserve.com; Legal Status: FE = Federal Endangered; FT = Federal Threatened; SE = State Endangered; ST = State Threatened; G = Game species; SC = State Special Concern; NYNHP Species: Rare species tracked by the NY Natural Heritage Program; NYSDEC SGCN: Species of Greatest Conservation Need included in State Wildlife Plan; Other Ranking: Listed Partners in Flight WatchLIst

Birds		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**	**Other Ranking**	**# Blocks (35 total)**
American Black Duck	Anas rubripes	S4, G4	G		X	WL, PIF	3
American Woodcock	Scolopax minor	S5,G5	G		X	WL, PIF	9
Bicknell's Thrush	Catharus bicknelli	S2S3B, G4	SC	X	X	WL, PIF	5
Black-billed Cuckoo	Coccyzus erythropthalmus	S5, G5			X		2
Black-throated Blue Warbler	Dendroica caerulescens	NR, G5			X		23
Blue-winged Warbler	Vermivora pinus	S5, G5			X	WL, PIF	3
Bobolink	Dolichonyx oryzivorus	S5, G5			X	PIF	15
Brown Thrasher	Toxostoma rufum	S5, G5			X		21
Canada Warbler	Wilsonia Canadensis	S5, G5			X		13
Cooper's Hawk	Accipiter cooperii	S4, G5	SC		X		5
Eastern Meadowlark	Sturnella magna	S5, G5			X		14
Golden-winged Warbler	Vermivora chrysoptera	S4, G4	SC		X	WL, PIF	1
Louisiana Waterthrush	Seiurus motacilla	NR, G5			X		18
Northern Bobwhite	Colinus virginianus	S4, G5	G		X		1
Northern Goshawk	Accipiter gentiles	S4B, S3N, G4	SC		X		7
Olive-sided Flycatcher	Contopus cooperi	S5, G5			X	WL, PIF	3

Prairie Warbler	Dendroica discolor	S5, G5			X		12
Red-headed Woodpecker	Melanerpes erythrocephalus	S4, G5	SC		X	WL, PIF	1
Ruffed Grouse	Bonasa umbellus	NR, G5	G		X		20
Scarlet Tanager	Piranga olivacea	NR, G5			X		34
Sharp-shinned Hawk	Accipiter striatus	S4, G5	SC		X		9
Vesper Sparrow	Pooecetes gramineus	S5, G5	SC		X		3
Whip-poor-will	Caprimulgus vociferous	S4, G5	SC		X	PIF	2
Willow Flycatcher	Empidonax traillii	S5, G5			X	WL, PIF	5
Wood Thrush	Hylocichla mustelina	S5, G5			X	WL, PIF	30
Worm-eating Warbler	Helmitheros vermivorus	S4, G5			X		1

Observed Rare Species and Significant Ecological Communities (source: NY Natural Heritage Program)
Rare plant and animals species with known populations within the watershed and documented examples of rare and high quality ecosystems within the watershed. Information regarding the locations of rare species is considered sensitive. The distribution of information which identifies the locations of rare species or their habitats may lead to the collection or disturbance of the animals and plants at those locations.

Key: TNC Status: For State and Global Rank explanations see www.natureserve.com; Legal Status: FE = Federal Endangered; FT = Federal Threatened; SE = State Endangered; ST = State Threatened; G = Game species; SC = State Special Concern; NYNHP Species: Rare species tracked by the NY Natural Heritage Program; NYSDEC SGCN: Species of Greatest Conservation Need included in State Wildlife Plan; Other Ranking: Listed Partners in Flight WatchLIst

Rare Birds		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**
Bald eagle	Haliaeetus leucocephalus	S2S3B, S2N, G5	ST, FT	X	X
Bicknell's Thrush	Catharus bicknelli	S2S3B, G4	SC	X	X
Rare Plants		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**
Blunt-lobe Grape Fern	Botrychium oneidense	S2S3, G4Q	SE	X	
Climbing Fern	Lygodium palmatum	S1, G4	SE	X	
Musk Root	Adoxa moschatellina	S1, G5	SE	X	
Rough Avens	Geum virginianum	S2, G5	SE	X	
Whorled Mountain-mint	Pycnanthemum verticillatum var. verticillatum	S1S2, G5T5	ST	X	
Rare Invertebrates		**TNC Status**	**Legal Status**	**NYNHP Species**	**NYSDEC SGCN**
Appalachian Tiger Beetle	Cicindela ancocisconensis	S1, G3	U	X	X
Natural Communities		**TNC Status**	**Legal Status**	**NYNHP**	**NYSDEC SGCN**
Hemlock-northern hardwood forest		S4, G4G5		X	
Beech-Maple Mesic Forest		S4, G4		X	
Spruce-Northern Hardwood Forest		S3S4, G3G4		X	
Mountain fir forest		S2, G3		X	
Mountain Spruce-Fir Forest		S2S3, G3		X	

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NY Natural Heritage Program Conservation Guides
Online at: http://www.acris.nynhp.org/

NYS Amphibian and Reptile Atlas

Online at: http://www.dec.state.ny.us/website/dfwmr/wildlife/herp/

NYS Breeding Bird Atlas

Online at: http://www.dec.state.ny.us/website/dfwmr/wildlife/bba/index.html

NYS Comprehensive Wildlife Conservation Strategy

Online at: http://www.dec.state.ny.us/website/dfwmr/swg/cwcsmainpg.html

NYS Threatened, Endangered & Special Concern Species List

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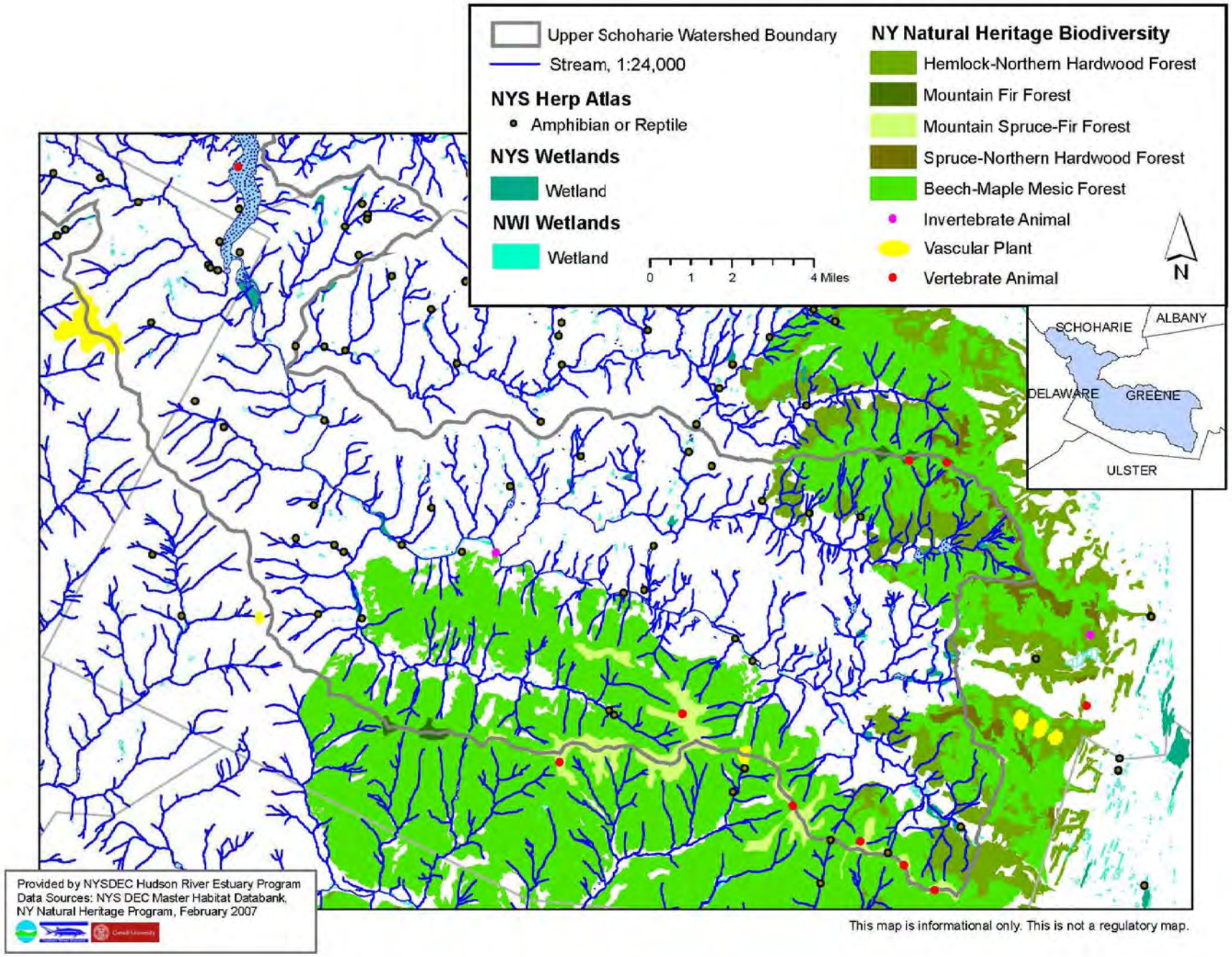

Figure 2.9.1. Known examples of plants, animals, and significant ecosystems in the Schoharie Basin. Other significant wildlife habitats exist, but have not been mapped.